UNIT I. INTRODUCTION TO MULTIMEDIA

INTRODUCTION

Multimedia is a combination of text, graphics art and sound ,animation and video elements.

Definiton of Multimedia

comprehensive material presented in a combination of text, graphics, video, animation and sound. Any system that is capable of presenting multimedia is called multimedia system

Where to Use Multimedia

The technology used for business, education and entertainment.

- **Business**: multimedia exists in the form of advertisements, presentations, videoconferencing ,voice mail etc

- **Educations:** multimedia tools for learning are widely used to learn easily and quickly when they are presented information with the virtual effect.
- **Entertainment:** Home PCs equipped with CD-ROMs and game machine hooked up with TV screens have brought home entertainment to new levels. Interactive maps at public places like libraries museums airports and the standalone terminal. Virtual reality helps us feel a real life like experience. Games using virtual reality effect are very popular.

Multimedia Elements

Multimedia applications require dynamic handling of data consisting of a mix of text, voice, audio components, video components and image animation. Integrated multimedia applications allow the user to cut sections of all or any of these components and paste them in a new document or in another application such as animated sequence of events or a desktop publishing system or a spread sheet

- **Fascimile**: FAX was the first practical means of transmitting document images over telephone lines. This basic technology having lower dpi of 100 to 200.
- **Document Images:** Document images are used for storing business documents that must be retained for long periods of time or may need to be accessed by a large number of people. Providing multimedia access to such documents remove the need for making several copies of the original for storage or distribution.
- **Photographic images**: Photographic images are used for a wide range of applications-such as employee records for instant identification at a security desk, real estate systems with photograph of houses in the database containing the description of houses and medical case histories.
- **Geographic information systems map**: Map created in a GIS systems are being used widely for natural resources and wild life management as well as urban planning. The map containing database items containing wildlife statistics or details of the floors and rooms and workers in an office building.
- **Voice commands and voice synthesis:** Voice synthesis is used for presenting the results of an action to the user in a synthesized voice. Application such as a patient monitoring system in a surgical theatre will be prime beneficiaries of these capabilities. Voice commands allow the user to direct computer operation by spoken commands.
- **Audio message**: annotated voice mail already uses audio or voice messages as attachments to memos and documents such as maintenance manuals.
- **Video messages**: they are being used in a manner similar to annotated voice mail.
- **Holographic images**: All the technologies so far essentially present a fault view of information. Holographic images extend the concept of virtual reality by allowing the user to get "inside" a part .

Multimedia Applications

Multimedia is used in many applications. The image management is the basic application. It is for scanning documents and retaining their images. Image processing is an application it is also known as image recognition. It is intended for recognizing objects by analyzing their raster images.

Document Imaging: The fundamental concepts of storage, compression and decompression and display technologies used for multimedia systems were developed for document image

management. Organizations such as insurance agencies, law offices country and state governments and the federal government manage large volumes of documents.

It is adopted by Department of Defense for applications ranging from military personal records to maintenance manuals and high speed printing systems. Almost document image system use workflows i.e sequence for scanning images, performing data entry based on the contents of the images, indexing them and storing them on optical media.

Image processing and image recognition: An image processing system may actually alter the contents of the image itself. Image processing systems employ the compression and decompression technique, a wide range of algorithm for object recognition, comparing images of objects with predefined objects, extrapolating finer details to view edges more clearly, gray scale balancing and gray scale and color adjustments.

Image enhancement: Most image display systems feature some level of image adjustment . Increasing the sensitivity and contrast makes the picture darker by making border line pixels black or increasing the gray scale level of pixels

Image calibration: The overall image density is calibrated and the image pixels are adjusted to a predefined level.

Real-time alignment: The image is aligned in real time for skewing caused by improper feeding of paper.

Gray scale normalization: The overall gray level of an image or picture is evaluated to determine if it is skewed in one direction and if it needs.

RGB hue intensity adjustment: Too much color makes picture garish and fuzzy. Automatic hue intensity adjustments bring the hue intensity within predefined ranges.

Color separation: A picture with very little color contrast can be dull and may not bring out the details. The hardware used can detect and adjust the range of color separation.

Frame averaging: the intensity level of the frame is averaged to overcome the effects of very dark or very light areas b adjusting the middle tones

Image animation: Computer created or scanned images can be displayed sequentially at controlled display speeds to provide image animation that simulates real processes. The basic concept of displaying successive images at short intervals to give the perception of motion is being used successfully in designing moving parts such as automobile engines.

Image Annotation: It can be performed in one of two ways. As a text file stored along with the image or as a small image stored with the original image the annotation is over layered over the original image for display purposes. It requires tracking multiple image components associated with a single page, decompressing all of them and ensuring correct spatial alignments they are over layered.

OCR: (optical character recognition) :Data entry is the most expensive component of data processing because it requires extensive clerical staff work to enter data. OCR technology is used for data entry by scanning typed or printed words in a form. OCR technology is available in software.

Handwritten recognition: Research for handwritten recognition was performed for CAD/CAM systems for command recognition. Pen based systems are designed to allow the user to write

commands on an electronic tablet. Two important factors in it are the strokes or shapes being entered and the velocity of input or vectoring that is taking place. The strokes are parsed and processed by shape recognizer, which determine the geometry and topology of the strokes by compared with predefined characters.

Full motion digital video applications. Full motion video has applications in the games industry and training as well as the business world. It is most complex and most demanding component of multimedia applications.

Full motion video messages: Electronic mail capability allows embedding of voice messages and video messages. Video messages may consists of video snapshots or live video with full motion picture and sound. The important concepts in it are the storage and transmitted of a very large volume of data at a high rate and decompression of that data to present a continuous play back.

Audio and Video indexing: Making a position is called indexing. Audio and video indexing are used in full motion video in a manner similar to any video sequence. Key points for indexing of stored video clips. Indexing is useful only if the video are stored is lost. When sound and video are decompressed and managed separately synchronization is very important. Depending on the application indexing information must be maintained separately for sound and video components of a video clip.

Virtual Reality

Virtual Reality requires terrific computing horse power to be realistic. In virtual reality, the cyberspace is made up of many thousands of geometric objects implanted in three dimensional space. The more objects and the more points that describe the objects, the higher the resolution and the more realistic view. Each motion or action requires the computer to recalculate the position, angle, size and shape of all the objects that make up the view and many thousands of computations must occur as fast as 30 times per second.

On the world wide web standards for transmitting virtual reality worlds or scenes in VRML(Virtual Reality Modeling Language)documents (with the file name extension .wrl) have been developed. Intel and software makers such as Adobe support for new 3D technologies.

Delivering Multimedia

Multimedia requires large amounts of digital memory when stored in an end user's library or large amounts of bandwidth when distributed over wires, glass fiber or airwaves on a network. the greater the bandwidth, the bigger the pipeline so more content can be delivered to end users quickly.

CD-ROM discs can be mass produced, contain up to 80 minutes of full screen video, mages or sound. The disc can also contain unique mixes of images, sounds, text, video and animations controlled by an authoring system to provide unlimited user interaction.

Many systems also come with a DVD player combination that can read and burn CD_ROMs as well. Multi layered Digital Versatile Disc (DVD) technology increases the capacity ad multimedia capability of CDs to4.7 GB o a single sided single layered disc to as much as 17.08GB of storage on a double sided double layered disc. CD and DVD burners are used for reading discs and for making them , too, in audio, video and data formats. DVD authoring and integration software allows the creation of interactive frontend menus for both films and games. Now flash drives and thumb drives are replacing CD_ROMs and DVDs.

The multimedia products are reach the maximum people by having easy installation, with simple operational features, attractive package and along with detailed documentation.

MULTIMEDIA SYSTEMS ARCHITECTURE:
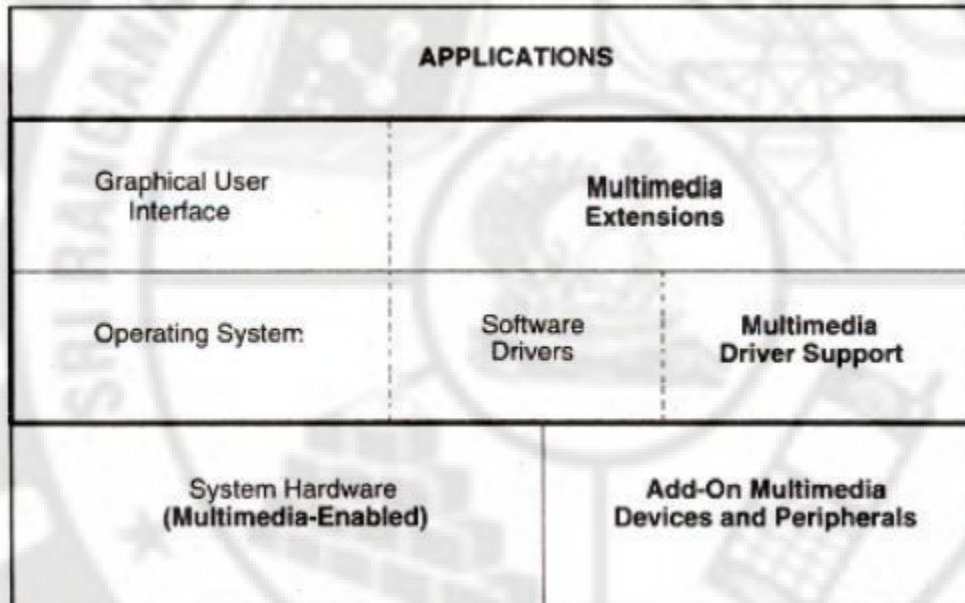
Multimedia Workstation Architecture

Fig 1.1. Multimedia System Architecture

Applications: The multimedia are applied in the areas of business ,education and entertainment. To run these applications application programming interface(API) are required to isolate the application from the hardware. The application is designed to operate with any hardware or operating environment that supports the API..

Graphical user interface: The add on devices and peripherals include scanners , video cameras , VCRs and sound equipment along with their associated device controllers and encoding hardware(such as DVI-JPEG or MPEG enabled boards.)For each of these special devices a software device driver is needed to provide the interface from an application to the device. The graphical user interface designed primarily for windows

Multimedia extensions: mmx is a Pentium microprocessor from INTEL that is designed to run faster when playing multimedia applications. It is 60% faster than one with a microprocessor having the same clock speed without mmx. They are managed by applications at fixed resolutions require control extensions to support applications such as full motion video or remote desktop. Multimedia encompassed a large variety of technologies and integration of multiple architectures interacting in real time, all of these multimedia capabilities must integrate with the standard user interfaces such as Microsoft windows.

High resolution graphics displays:

The various graphics standards such as MCA, GGA and XGA have demonstrated the increasing demands for higher resolution for GUIs.

Combined graphics and imaging applications require functionality at three levels.

VGA mixing: the image acquisition memory serves as the display source memory, thereby fixing its position and size on screen.

VGA mixing with scaling: Use of scalar ICs allows sizing and positioning of images in pre-defined windows.Resizing the window causes the things to be retrieved again.

Dual-buffered VGA/Mixing/Scaling: double buffer schemes maintain the original images in a decompression buffer and resized image in a display buffer.

The IMA architectural Framework

The interactive multimedia association has a task group to define the architecture for multimedia to provide, interoperability. The task group has concentrated on the desktops and the servers. Desktop focus is to define the interchange formats. This format allows multimedia objects to be displayed on any workstation. The architecture is based on defining interfaces to a multimedia interface bus. This bus would be the interface between systems and multimedia sources. It provides streaming I/O services including filters and translators.
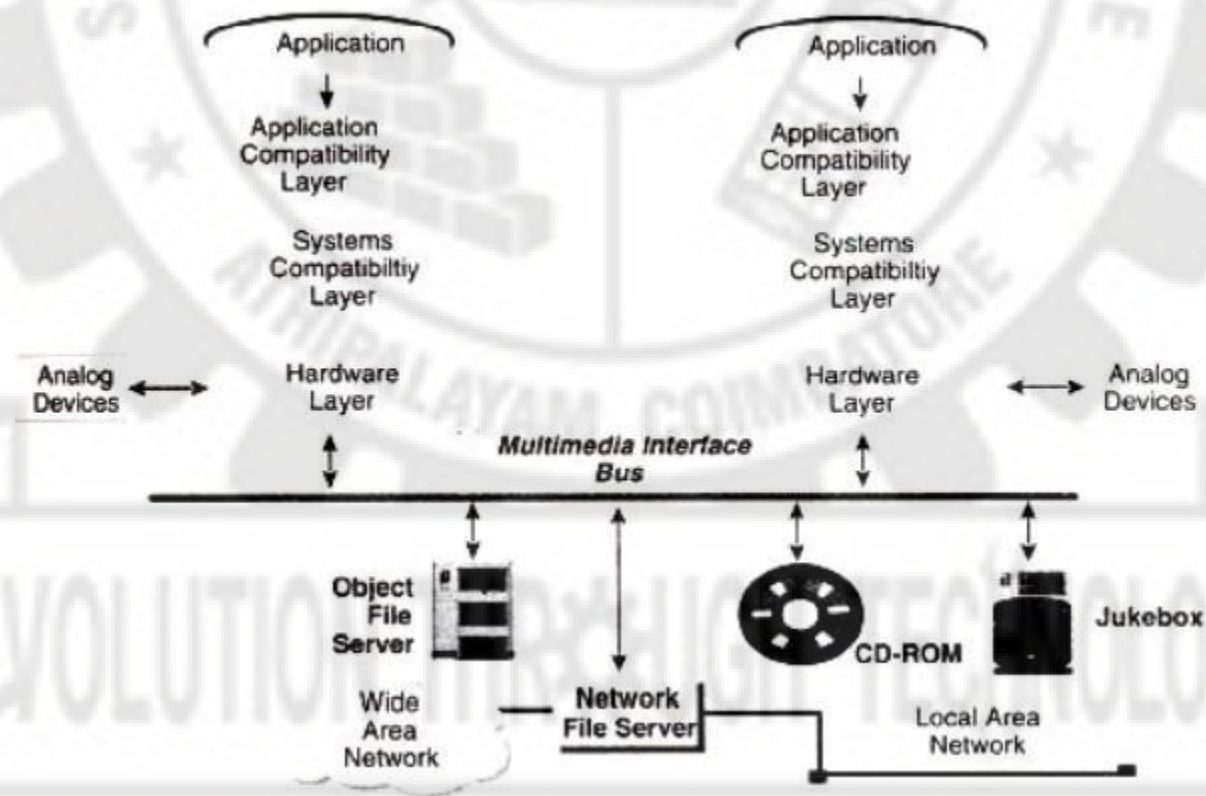

Fig 1.2. IMA Architecture

Network architecture for multimedia systems:

- As large volumes of images and video messages are being transmitted a special network is needed.

- Asynchronous transfer mode technology(ATM) simplifies transfers across LANs and WANs. Task based multilevel networking is utlised.
- Higher classes of service require more expensive components in the workstation as well as in the servers supporting the workstation applications.
- Rather than impose this cost on workstations, an alternate approach is to adjust the class of service to the specific requirement for the user. This approach is to adjust the class of services according to the type of data being handled at a time also. This approach is known as task based multi- level networking.
- High speed server to server links
- Duplication: It is the process of duplicating an object that the user can manipulate. There is no requirement for the duplicate object to remain synchronized with the source object.
- Replication: It is defined as the process of maintaining two or more copies of the same object in a network that periodically re-synchronize t provide the user faster and more reliable access to the data replication is a complex process.
- Networking standards: The two well known network standards are Ethernet and token ring
- ATM: This topology was originally designed for broad band applications in public networks. It is a method of multiplexing and relaying(cell-switching) 53 byte cells(48 bytes of user interface and 5 bytes for header information.
- Cell switching: It is a form of fast packet switching based on the use of cells.(Short fixed length packets are called cells).
- FDDI: Fiber Distributed Data interface network is an excellent candidate to act as the hub in a network configuration   or as a backbone that interconnects different types of LANs. It presents apotential for standardization for high speed networks,allows large distance networking. It can be used as high performance backbone networks to complement and extent current LANs.

EVOLVING TECHNOLOGIES FOR MULTIMEDIA SYSTEMS:

Multimedia applications use a number if technologies generated for both commercial business application as well as the video game industry.

Hypermedia documents

Hypermedia documents are documents which have text, embedded or linked multimedia objects such as image, audio ,hologram or full motion video.

Hyper text: hypertext systems allow authors to link information together create information paths through a large volume of related text in documents. It also allows to annotate existing text and append notes. It allows fast andeasy searching and reading of selected experts.

Hypermedia:It is an extension of hypertext which include texts, any kind of information that can be stored in electronic storage such as audio, animated video, graphics and full motion video.

Hypermedia documents used for electronic mail and work flow applications provide a rich functionality for exchanging a variety of information types. The hypermedia document is a definition of a document and a set of pointers to help locate the various elements of the document on the network.

Hyper speech: Multimedia simulated the development of general purpose speech interfaces. Speech synthesis and speech recognition are fundamental requirement for hyper

speech systems. Speech recognition is nothing but converting analog speech into computer action and into ASCII text. Speech recognition systems cannot segment a stream of sounds without breaks into meaningful units. The user must speak in a stilted fashion. He should make sure to interpose silence between each word.

HDTV and UDTV: High definition television is HDTV. The broadcasting standards such as NTSC,PAL ,SECAM ,NHK have an idea of bringing the world together on a singlehigh definition television broadcasting standard.the japanse broadcasting services developed a 1125 lines along MUSE system. A competing standard in the US direction from analog to digital technology :NHK of japan trying to leapfrog the digital technology to develop ultra definition television (digital UDTV) featuring approximately 3000 lines.

3D technology and Holography:

Three dimensional technologies are concerned with two areas. Pointing devices and displays. 3D pointing devices are essential to manipulate object in a 3D display system. 3D displays are achieved using holography techniques. The technique developed for holography have been adapted for direct computer use.

DEFINING OBJECTS FOR MULTIMEDIA SYSTEMS:

The basic data types of object using in multimedia include text,image audio holograms and full motion video.

Text: it is the simplest of data types and requires the least amount of storage.text is the base element of a relational database and basic building of a document. The major attribute of text include paragraph styling font families and sizes and relative location in a document.

Hypertext: it is an applicaito of indexing text to provide a rapid search of specific text strings in one or more documents. It is an integral component of hypermedia documents. A hypermedia document is the basic complex object of which text is a sub object include images, sound and full motion video.

> **Images**: image object is an object that is represented in graphics or encoded form. It is a sub object of the hypermedia document object. There is no direct relationship between successive representations in time. The image object includes all data types that are not coded text. Document images, facsimile systems,fractals , bitmaps, metafiles and still pictures or still video frames are grouped together.

NON-VISIBLE: the data types are not stored as images but displayed as images. Eg: pressure gauges and temperature gauges.

Abstract: Abstract images are computer generated images based on some arithmetic calculations. They are not really images that ever existed as real world objects. Eg. Fractals

> **Audio and voice:** Stored audio and video objects contain compressed audio information. This can consists of music speech telephone conversation and voice commands. An audio object needs to store information about the sound clip. Information here means length of the sound clip, its compression algorithm, playback characteristics and any annotation associated with the original clip.

1.4.4 Full motion and live VIDEO: Full motion video refers to pre stored video clips. Live video refers to live and it must be processed while it is captured by the camera. From a storage perspective we should have the information about the coding algorithm used for compression. it need decoding also.

From a processing perspective video should be presented to user with smooth and there should not be any unexpected breaks.

Hence video object and its associated audio object must be transferred over the network to the decompression unit. It should be then played ar the fixed rate specified for it.

For successful playback of compressed video there are number of technologies. They are databse storage, network media and protocols, decompression engines and display engines.

MULTIMEDIA DATA INTERFACE STANDARDS:

- File formats for multimedia systems.

Device independent bitmap file format contains bit map, color and color palette information.

RIFF device independent bitmap for resource interchange .It is the standard file format for Microsoft windows and OS/2. It allows a more complex set of bit maps that can be handled by DIB

Musical Instrument digital interface is the interface standard for file transfer between a computer and a musical instrument such as digital piano. It is also used for full motion video and voice mail messaging systems. It has the advantage of ready availability of MIDI device controller boards for personal computers.

RIFF Musical Instrument digital interface A MIDI format within a RIFF envelop provides a more complex interface.

Palette File Format is an interface that allows defining a palette of 1 to 256 colors in a representation as RGB values.

Rich text format allows embedding graphics and other file formats within a document. This format is used by the products such as lotus notus. This format is also the basic for the use of OLE.

Waveform Audio file Format is a digital file representation of digital audio.

Windows Metafile Format is the vector graphic format used by Microsoft windows as an interchange format.

Multimedia Movie Format is a format used for digital video animation.

Apple's Movie Format is defined as the standard for file exchange by quick time enabled systems.

Digital Video command set is the set if digital video commands simulating VCR controls.

Digital Video Media control Interface is a Microsoft's high level control interface for VCR controls including play, rewind, record and so on.

Vendor Independent Messaging is developed by a consortium of venders providing a standard format for cross product messages.

Apple's Audio Interchange File Format is an apple's standard file format for compressed audio and voice data.

SDTS GIS standard isthe spatial data transfer standard is designed to provide a common storage format for geographic and cartographic data.

1.4.6 VIDEO PROCESSING STANDARDS

INTELS DVI:

Dvi- Digital Video interface standard is to provide a processor independent specification for a video interface. That video interface should accommodate most compression algorithms for fast multimedia displays.

APPLE QUICK TIME

Quick time standard is developed by Apple Computer. It refers to both the extensions to the MAC OS and to the compression/decompression functionality of the environment. It is designed to be the graphics standard for time based graphic data types.

Microsoft AVI: Audio Video interleave standard . It offers low-cost,low-resolution video processing for the average desktop user. It is a layered product. It allows users to set parameter such as windows size,frame rate, quality and compression algorithm through a number of dialog boxes. AVI compatible hardware allows enhancing performance through hardware accelerated compression algorithm such as DVI and MPEG. AVI supports several compression algorithms.

MULTIMEDIA SOFTWARE

1.5.1 Overview of Multimedia Software Tools

The basic tool set for building a multimedia project can be divided into following categories.

- Text editing and word processing tools
- Painting and Drawing tools
- 3-D modeling and Animation tools
- Image editing tools
- Sound editing tools
- Animation, Video, and Digital Movie Tools

1.5.1.1.Text Editing and Word Processing Tools

A word processor is usually the first software tool computer users learn. Your word processor may also be your most often used tool, as you design and build a multimedia project. Keyboarding and typing skills, the easier and more efficient will be your multimedia day-to-day life. Word processor comes bundled in an "office suite" that might include spreadsheet, database, e-mail;, web browser, and presentation application. Word processor such as Word and Word perfect are powerful applications that include spell checkers, table formatters, thesauruses, and pre built templates for letters, resumes, purchase orders and other common documents.

OCR Software

With optical character recognition software, a flat-bed scanner, and your computer, you can save many hours of rekeying printed words, and get the job done faster than a roomful of typists. OCR software turns bitmapped characters into electrically recognized ASCII text. A scanner

typically used to create a bitmap. Then the software breaks the bitmap into chunks according to whether it contains text or graphics.

Painting and Drawing Tools

Painting and drawing tools, as well as 3-D modelers, are perhaps the most important items in your multimedia projects. To have greater impact to the end user the painting and drawing tools are used in the project Painting software such as Photoshop, Picture Publisher, and Fractal Design Painter is dedicated to producing crafted bitmap images. Drawing software such as CorelDraw, Freehand, Illustrator, Designer, and Canvas, is dedicated to producing vector based line art easily to paper using PostScript or another page markup system such as QuickDraw on the Macintosh.

3-D Modeling and Animation Tools

With 3-D modeling software, objects rendered in perspective appear more Realistic. You can create stunning scenes and wander through them, choosing just the right lighting and perspective for your final rendering image. Powerful modeling packages such as Macromedia's Extreme 3D, AutoDesk's 3D Studio Max, Strata Vision's 3D are available for objects such as people, furniture, buildings, airplanes, trees etc.,

Image-Editing Tools

Imaging editing tools are specialized and powerful tools for enhancing and retouching existing bitmapped images. These applications also provide many of the features and tools of painting and drawing programs and can be used to create images from scratch as well as digitized images from scanners, video frame-grabbers and digital cameras.

Sound Editing Tools

Sound editing tools for both digitized and MIDI sound let you see music as well as hear it. You can cut, copy, paste and otherwise edit segments of it with great precision. System sounds are shipped with both Macintosh and Windows systems as soon as you install the OS. Echo effects, mixing of sound etc., can be made by Sound editing Tools. Software like Creative Labs' Wave Studio is used for editing sounds to perform in greater experience.

1.5.1.7. Animation, Video, and Digital Movie Tools

Animation and digital video movies are sequences of bitmapped graphic scenes (frames) rapidly played back.

Movie making tools take advantages of Quick Time (Macintosh and Windows) and Microsoft Video for Windows (also known as AVI ,or Audio Video Interleaved, available for Windows only) technology and let you create, edit, and present digitized motion video segments, usually in a small window in your project.

Moving making tools such as **Premiere, VideoShop, and MediaStudio** Pro let you edit and assemble video clips captured from camera, tape, other digitized movie segments , scanned images, animations, and from digitized audio.

Open Source Replacements:

As the multimedia tools are costlier they are replaced by open source software. Open source software are denoting software for which the original source code is made freely available and may be redistributed and modified. The following are the open source tools available for

multimedia operations.

1.5.2.1.3D graphics and Animation:

Art of illusion replaces Autodesk MAYA

Blender replaces Autodesk MAYA

1.5.2.2.Audio Players:

Songbird replaces iTunes

CoolPlayer replaces windows media Player

Zinf replaces Windows Media Player

1.5.2.3.Audio Recorders and Editors

Audacity replaces SonarX1,Sony ACID,Adobe Audition

Frinika replaces SonarX1,Sony ACID

1.5.2.4.Multimedia Players

VLC Media Player replacesWindows Media Player

MPlayer replaces Windows Media Player

XBMC Media Center replaces Windows Media Player

MediaPortal replaces Windows Media Player

1.5.2.5.Video Editing:

Cinelerra replaces Adobe Premiere

OpenShot Video Editor replaces Adobe premiereProCS5

Avidemux replaces Adobe Premiere

Kdenlive replaces Adobe Premiere ProCS5

CineFX replaces AdobePremiereProCS5

1.5.2.6.Video file conversion

DVDx replaces Movavi video converter,Zamzar

DVD Flick replaces Movavi video converter,Zamzar

1.5.2.7.Video Player:

Miro replaces Windows Media Player.

Multimedia OS

The operating system is the shield of the computer hardware against all software components.

In multimedia the inputs audio and video from microphone, cameras and files as data and send to the destination like loudspeaker, video windows and files located at a same computer or at a remote station. On the way from source to sink, data manipulation process occurs and need many resources which are under the control of operating system. i.e. Resource management is the main function of multimedia OS. The resource management conceived single components as resources and are reserved prior to execution.

In multimedia real time processing of continuous media data is taken care by process management which must take into account the timing requirements imposed by the handling of multimedia data. Appropriate scheduling methods should be applied. The communication and synchronization between single processes must meet the restrictions of real time requirements and timing relations among different media. The main memory is available as a shared resource to single processes.

In multimedia database management should rely on file management services provided by the multimedia OS to access single file and file systems.

In multimedia systems the important issue is the integration of audio and video devices in a similar way to any other input output device. Device management is used to take care of these operations.

Multi media OS has resource management, process management, file management and device management as main functions.

Multimedia Authoring :

The process of creating multimedia application is known as multimedia authoring. During authoring you might need to organize or edit the elements of your multimedia project, create user interface and designing interactivity. This can be achieved through the use of authoring programs/tools.

Multimedia authoring tools provide the framework for organizing and editing the elements of a multimedia project. Authoring software provides an integrated environment for combining the content and functions of a project. It enables the developer to create, edit and import data.

In multimedia authoring system, multimedia elements and events are often regarded as objects. Objects exists in a hierarchical order of parent and child relationships. Each object is assigned properties and modifiers. On receiving messages object perform tasks depending on the properties and modifiers.

Some Useful Editing and Authoring Tools

Tools are used to merge multimedia elements (text, audio, graphic, animation, video) into a project. And to designed to manage individual multimedia elements and provide user interaction.

Tools for Editing text: To create and edit the text documents the tools are used.

- Microsoft Word: A word processor tool developed by Microsoft working in IA-32,X64,ARM platforms.
- Notepad: Notepad is a simple text editor for Microsoft windows and a basic text editing program which enables computer users to create documents

Tools for Editing image: To create new images and edit the images.

- Adobe Photoshop: a raster graphics editor developed and published by Adobe systems for MAC OS and windows.

Tools for Editing and Recording Audio: To record audio and make modifications inthe audio files.

- Audacity: Open source software. Record live audio through the microphone line-in and can also digitize recordings like cassette tapes and mini discs etc.

- MP3 audio editor: Used to convert any music into CD quality and can also add effects trim and process the sound track.
- Power Sound editor free: Using this software record audio using the microphone and any other sound that the sound card supports. Editing is so simple, visually edit the sound track and see the changes when edit on the screen.
- Wave Sufer: It is a sound visualization and editing tool and is open source software that is available for free. Used for research and in the transcription industry to enhance the quality of the sound file.

Tools for Video Editing: To do necessary changes in the video files.

- DVD cutter: To cut out advertisements and parts of the DVDs and video files. To save the result as a new mpeg or avi file.
- Total video converter: Extremely powerful and full featured video converter which converts any video and audio to mp4,avi,ipad,mobile,DVD and burns video to DVD,Blu-Ray etc.

Authoring Tools

- Macromedia authorware: Interpreted flow chart based graphical programming language. Authorware is used for creating interactive programs that can integrate a range of multimedia content particularly electronic educational technology(e-learning) applications. The target platforms are Microsoft windows and Mac OS.
- Macromedia Flash: multimedia software platform used for production of animations, desktop applications, mobile applications, mobile games and embedded web browser video players. Flash displays text, vector graphics and raster graphics to provide animations, video games and applications. It allows streaming of audio and video and capture mouse, keyboard, microphone and camera input. The target platforms for flash are web browsers, iOS, Android, Windows, MAC OS. It is divided into editor software and player software.
- Adobe animate, Flash builder, flash develop, power flasher FDT, flash catalyst, scale form are some of the editor software. Flash player, Adobe AIR, scale form, Gnash, Light spark are some of the player software. SWF, FLV and FLA are the file formats used and Action Script is the programming language for this tool.

VRML

Virtual reality modeling language is a standard file format for representing 3 dimensional interactive vector graphics designed particularly with the world wide web. (i.e.) used to illustrate 3D objects ,buildings ,landscapes or other items requiring 3d structure and is very similar to HTML. Used to build a sequence of visual images into web settings with which the user can interact by viewing, moving, rotating and otherwise interacting with an apparently 3D scene. To view a VRML file VRML viewer or browser is needed.

OpenGL

Open graphics library is the computer industry's standard application program interface for defining 2 D and 3D graphic images. Using open GL an application can create the same effects in any OS using any OpenGL adhering graphics adapter. It specifies a set of commands or immediately executed functions. Each command executes a drawing action or causes special effects. A list of these commands can be created for repetitive effects. Open GL comes with a

large number of built-in capabilities request able through the API. They are

- Hidden surface removal
- Transparency
- Anti aliasing
- Texture mapping
- Pixel operations
- Viewing and modeling transformations
- Atmospheric effects.

Windows and Open Source APIs

For   3D animation :Blender, Wings 3D

3D graphics: POV-Roy4

3D game development kit: Crystal Space,Ogre3d

For   Audio composition: OpenSebJ

Audio Editing: Audocity

Audio Player : cool player,Zinf,Song bird

Drum Machine: Hydrogen

MP3 ripper: CDex

Volume Normalizer: MP3Gain

For   Drawing Editor: Dia

image editor: Gimp, Pinta

vector drawing: Inkscape

digital painting: MyPaint

For   internet TVplatform: Miro

Video capture: VitrualDub

videoEditing: Jashaka,Avidemux

REVIEW QUESTIONS

2 MARKS.

1.Define Multimedia

2.What are the basic objects of multimedia

3.Expand CBT

4. What are the places in which multimedia is used

5. Define facsimile

6 What is the use of GIS

7. What is the use of OCR

8. Expand GUI

9. Expand API

10. Expand ATM

11. Expand FDDI

12. Expand HTTP

13. Expand HDTV,UDTV

14. Expand MIDI

15. Expand DVI

16. Expand VRML

17. What is OpenGL

18. Which tool is used for editing image in a multimedia

3 MARKS

1. Mention the main areas of multimedia usage?
2. Define Virtual Reality
3. What is full motion video
4. Write about text editing and word processing tools
5. Write about painting and drawing tools
6. Write about 3D modeling and animation tools
7. Write about sound editing tools
8. Mention the tools used for video editing

5MARKS

1. Write about Multimedia elements
2. Explain any five applications of multimedia
3. Draw and explain Multimedia System architecture
4. Draw and explain IMA architecture
5. Explain Network architecture for multimedia systems.
6. Write about tools for editing and recording audio information
7. Write about open source APIs

UNIT – II DEFINING OBJECTS FOR MULTIMEDIA SYSTEMS

TEXT

It is a collection of characters that makes the user understand very easily and special meaning is given. Text can be used for communication. The information what you are trying to say will be given as a text. Mostly, a text in multimedia plays a vital role

Defintion: It is a printed or written version of speech, and also it gives the main facts about the subjects.

About Fonts and Faces

Typeface: A *typeface* is a family of graphic characters that usually includes many type sizes and styles.

Font: A f*ont* is a collection of characters of a single size and style belonging to a particular typeface family. Typical font *styles* are boldface and italic. Type sizes are usually expressed in points; one point is .0138 inches or about 1/ 72 of an inch. The font's size is the distance from the top of the capital letter to the bottom of the descenders in letters such as g and y. A font's size does not exactly describe the height and width of its characters. This is because the x-height (the height of the lower case letter x) of two fonts may vary, while the height of the capital letters of those fonts may be the same. Computer fonts automatically add space below the descender to provide appropriate line spacing, or leading .Leading can be adjusted in most programs on both Macintosh and in Windows. When you type lower case letters the ascenders and descenders will be changed but, for upper case it won't.
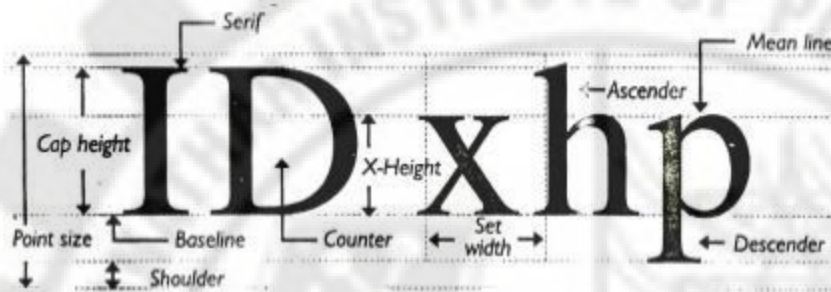
Fig 2.1. Text and its measures

Character Metrics: it is a general measurement applied to individual characters.

Kerning: It is the spacing between character pairs.

Cases: The font always will be stored in two cases Capital letters (Upper Case) and small letters (Lower Case).

Serif Vs Sans Serifs Type has been characterized as feminine, masculine, delicate, formal, capricious, witty, comic, happy, technical and newsy.

Fig2.2. Serif Vs Sanserif

Note: Serif versus Sans Serif is the simplest way to categorize a typeface; the serif is the little decoration at the end of a letter stroke.

Examples: Times, New Century School book, Bookman, and Palatino are examples of Serif fonts. Helvetica, Arial, optima, and Avant Garde are Sans serif.

On the printed page, serifs fonts are traditionally used for body text because the serifs are said to help guide the reader's eye along the line of text..Sans serif fonts on the other hand are used for headlines and bold statements.

Using Text in Multimedia

Text in multimedia helps the user to Navigate through the multimedia project. The text and the screen used for creating a multimedia project should be a related one. Clear font should be used of same sizes on the screens. Too much of text can make the screen overcrowded and unpleasant. On the other hand, if provide public-speaking support, the text will be keyed to a live presentation where the text accents the main message.

Choosing Text Fonts

Decorative fonts and legible fonts can be used in the multimedia project. Use italic and Bold faces whenever needed. Using too many fonts on the same page is called ransom-note typography. In text blocks, adjust the leading for the most pleasing line spacing. Lines too tightly packed are difficult to read.

Importance of the messages should vary with the font size

In large-size headlines, adjust the spacing between letters (kerning), big gaps between large letters can turn the title into a toothless waif. Necessary background colors are used to explore the effect of text .Use meaningful words or phrases for links and menu items.

Bold or emphasize text to highlight ideas or concepts, but do not make text look like a link or a button when it is not. At web sites, shadowed text and graphics on a plain white background add depth to a page.

Menus for Navigation

An interactive multimedia project or web site typically consists of a body of information or *content* through which a user navigates by pressing a key, clicking a mouse or pressing a touch screen. The simplest menus consist of text lists of topics. Users choose a topic, click it and go there. On the web designers typically place on every page at least a main menu of links that offers the user a handheld and mechanism for returning to the beginning.

Buttons for Interaction

In multimedia, buttons are the objects, such as blocks of text, a pretty blue triangle or a photograph, that make things happen when they are clicked. The automatic button-making tools supplied with multimedia and HTML page authoring systems are useful, but in creating the text for you, they offer little opportunity to fine tune the look of the text. Shaping sizing, bordering, high lighting the buttons know what to do with them.

Symbols and Icons

Symbols are concentrated text in the form of standalone graphic constructs. Symbols convey meaningful messages. For example the window hourglass cursor tells you to wait while computer is processing. Certainly text is more efficient than imagery and pictures for delivering a precise message to users. On the other hand pictures, icons, moving images and sounds are most easily recalled and remembered by viewers.

HTML Documents

The standard document format used for pages on the World Wide Web is called HTML.

In a HTML document typefaces, sizes, color and other properties are specified by " marking up " the text in the documents with tags.HTML doesn't provide with much flexibility to make pretty text elements but may be able to layout pleasing using block quote indents, tables, frames and horizontal rules.

Hypermedia and Hypertext

Interactive multimedia becomes *hypermedia* when its designer provides a structure of linked elements through which a user can navigate and interact. When words are keyed or indexed to other words, you have a *hypertext system*. The text in World Wide Web is Hypertext. Using hypertext systems, you can electronically search through all the text of a computer-resident book, locate references to a certain word, and then immediately view the page where the word was

found.

Using Hypertext

Hyper texts have been designed to present electronic text, images, and other elements in a database fashion. Hypertext indexing tools are available for both Macintosh and Windows..Hypertext-based projects typically require the large mass-storage capability of one or many CD-ROMs and/or dedicated gigabyte hard disks.

Hypermedia Structures

Nodes and links are the two important words in hypermedia. Nodes are text, graphics, sounds or the relational information in the knowledge base. Links are connection between the nodes. The art of hypermedia design lies in the visualization of these nodes and their links .Anchor is used for the reference from one document to another document, image, sound or file on the web. A link anchor is where the data come from; a link end is the destination node linked to the anchor. Buttons are used to navigate hypermedia structures that is contained at the nodes.
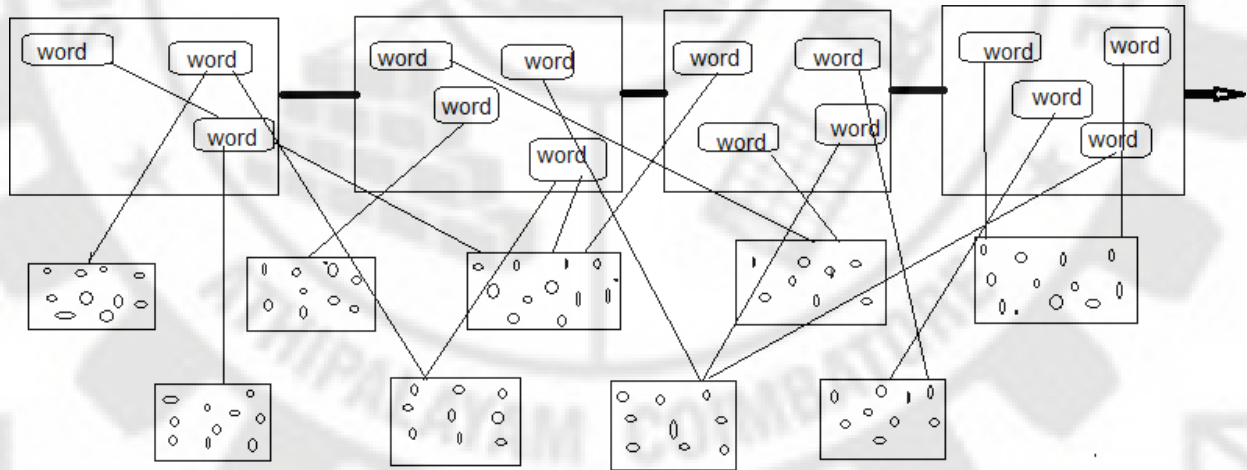
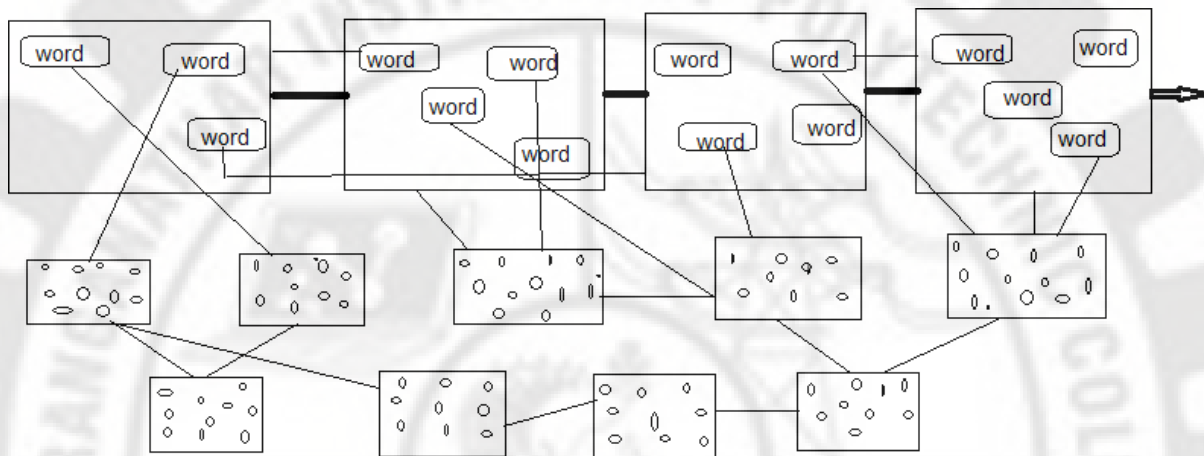**Fig 2.3. Pages of text with hot words linked to info bites only.**

Fig 2.4. Pages of text with hot words linked info bites linked to pages and to other info bites

2.1.6 Hypertext Tools:

Hyper text tools are used to form hypermedia structures. The following are some of the hyper text tools available.

Tinderbox: a personal content assistant that helps to visualize, analyze, and share the notes, plans and ideas.

Story Space – a tool for hyper writers to write complex ,interlinked narrative, both fiction and non-fiction stories.

Web squirrel: a tool to help people visualize cyberspace. It helps to create spatial maps of URLs, email addresses and other internet resources.

IMAGES

What see on a multimedia computer screen at any given time is a composite of elements: text, symbols, photograph-like bitmaps, vector-drawn graphics, three dimensional renderings, distinctive buttons to click, and windows of motion video.

Making Still Images

Still images may be small, or large, or even full screen. They may be colored, placed at random on the screen, evenly geometric or oddly shaped. Still images are generated by the computer in two ways: as *bitmaps* (or paint graphics) and as *vector-drawn* (or just plain drawn) graphics. It maps are used for photo-realistic images. Vector drawn objects are used for lines, boxes, circles, polygons, and other graphic shapes that can mathematically expressed in angles, coordinates, and distances. The appearance of both types of images depends on the display resolution and capabilities of the computer's graphics hardware and monitors. Both types of images are stored in various file formats and can be translated from one application to another or from one computer platform to another. Image files are compressed to save memory and disk space; many images formats already use compression within the file itself – e.g. GIF, JPEG, and PNG

Bitmaps

Bitmap is a simple information describing the individual dots that are the smallest elements of resolution on a computer screen or other display or printing device. One-dimensional matrix is required for monitoring (black and white); greater depth is required to describe the more than 16 million colors. These picture elements are called pels or pixels. Varying colors shades of 4-bit, 16 colors; 8-bit, 256 colors; 15-bit, 32, 768 colors; o 16-bit, 65, 536 colors; 24-bit, 16,772,216 colors are available. There are three different ways to make a bitmap:

- Make a bitmap from scratch with a paint or drawing program.
- Grab a bitmap from an active computer screen with a screen capture program, and then paste it into a paint program or your application.
- Capture a bitmap from a photo, artwork, or a television image using a scanner or video capture device that digitizes the image.

2.2.3.1Bit Images:

Binary images are encoded as a 2D array, using one bit per pixel where a 0 represents "black" and 1 represents "white". The main advantage of this representation usually suitable for images containing simple graphics, text or line .

```
11000011
10111101
01011010
01111110
01011010
01100110
10111101
11000011
```

Fig 2.5. One bit image

2.2.4.Gray Level 8 Bit Images:

Gray level(monochrome) images are also encoded as a 2D array of pixels, using 8 bit per pixel where a pixel value of 0 usually means "black" and a pixel value of 255 means "white" with intermediate values corresponding to varying shades of gray.

The total number of gray levels is larger than human visual requirements, making this format a good compromise between subjective visual quality and relatively compact representation and storage. It can also be thought ofas a collection of bit planes where each plane contains a 1 bit representation of the image at different levels of detail.
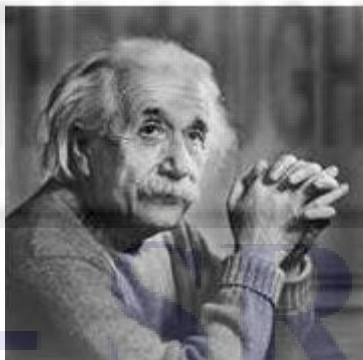
Fig2.6. Gray level 8 bit

2.2.5.8bit Color Images:

One byte for each pixel. Supports 256 out of the millions possible, acceptable color quality . The 8 bits directly describe red, green, and blue values typically with three bits for red, three bits for green and two bits for blue. Normal human eye is less sensitive to the blue component than to the red or green. So it is assigned one bit less than the others.It does not use a palette at all. The 8 bits are separated into two parts as Color map and array of index. Color map contain information about the colors in the image and array of index contain pixel value's index value.

Fig 2.7. 8 bit color image

2.2.6.Dithering

Dithering is a process whereby the color value of each pixel is changed to the closest matching color value in the target palette, using a mathematical algorithm. Depending upon the algorithm used, dithering can render a very good approximation of the original. Dithering concepts are important to understand when you are working with bitmaps that are derived from RGB information or are based upon different palettes or color lookup tables. Dithering software is usually built into image-editing programs and is also available in many multimedia authoring systems as part of the application's palette management suite of tools.

2.2.7.24bit Color Images:

Normally known as true color. It provides a method of representing and storing graphical image information in an RGB color space such that a very large number of colors, shades and hues can be displayed in an image, such as high quality photographic images or complex graphics**.**

Each pixel is represented in 24 bits (i.e.) 3 bytes. One byte for Red, one byte for Green and one byte for Blue. Each byte represent 256 colors and totally 16 million colors are represented by this type**.** The human eye can desriminate up to 10 million colors.

Fig 2.8. 24bit color images

2.2.8.Vector Drawing

Vector-drawn objects are drawn are described and drawn to the computer screen using a fraction of the memory space required to describe and store the same object in bitmap form. A *Vector* is a line that is described by the location of its two endpoints. A simple rectangle, for example, might be defined as follows:

RECT 0, 0, 200, 200

Using Cartesian coordinates, your software will draw this rectangle starting at the upper-left corner of your screen, going 200 pixels horizontally to the right, and 200 pixels downward. This rectangle would be a square, as all sides are identical lengths.

RECT 0, 0, 200, 200, RED, BLUE

The software will drawn the same square with a red boundary line and fill the square with the color blue. The user can , add other parameters to describe a fill pattern or the width of the boundary line.

2.2.9.3- D Drawing and Rendering

For a image if the pixel is represented in x,y,z axis then it is known as 3D representation. Macromedia Extreme3D or Form-Z or Carrera are used as tools for extend vector drawn graphics into 3 dimensions graphics.3D rendering is the 3D computer graphics process of automatically converting 3D wireframe models into 2D images with 3D photorealistic effects or non photorealistic rendering on a computer.

Rendering are of three types.

- Real time
- Non Real time
- Reflection and Shading models

Real time:

Rendering for interactive media such as games and simulations is calculated and displayed in real time, at rates of approximately 20 to 120 frames per second. The primary goal is to achieve an as high as possible degree of photorealism at an acceptable minimum rendering speed. The final image presented is not necessarily that of the real world, but one close enough for the human eye to tolerate.

<u>Non Real time:</u>

Non real time rendering enables the leveraging of limited processing power in order to obtain higher image quality. Rendering frames are stored on a hard disk then can be transferred to other media such as motion picture film or optical disk. The frames are then displayed sequentially at high frame rates typically 24,25 or 30 frames per second to achieve the illusion of movement. Many layers of material may be rendered separately and integrated into the final shot using compositing software.

<u>Reflection and Shading Models:</u>

Refelection/scattering and shading are used to describe the appearance of a surface.Surface shading use the technique of how light spreads across a surface. Flat shading,gouraud shading and phong shading are the different algorithms used. Refelection use the technique of how light interacts with a surface at a given point. (i.e) the relationship between the incoming and outgoing illumination at a given point.

Fig 2.9. Reflection and shading

2.2.10.Color

Color is a vital component of multimedia. Picking a right color and combination of colors for your project can involve many tries until you feel the result is right. There are several methods and models to describe color space using mathematical values

Understanding Natural Light and Color

Light comes from an atom when an electron passes from a higher to a lower energy level; each atom produces uniquely specific colors – known as Quantum theory. Color is the frequency of a light wave within the narrow band of the electromagnetic spectrum to which the human eye responds. In a rainbow light spectrum – **R**ed, **O**range, **Y**ellow, **G**reen, **B**lue, **I**ndigo, **V**iolet. Light that is infrared, or below the frequency of red light and not perceivable by the human eye, can be created and viewed by electronic diodes and sensors, and it is used for TV & VCR remote controls. Infrared light is radiated heat. Green, blue, yellow, orange, purple, pink, brown, black, gray, and white are the ten most common color-describing words used in all human languages

and cultures.

Computerized Color

Since the eye's receptors are sensitive to red, green, and blue light, by adjusting combinations of these three additive colors, the eye and brain will interpolate the combinations of colors in between. The red, green, and blue dots light up when hit by the electron beam, and the eye sees the combination of red, green, and blue (RGB) light and interpolates it.

RGB Combination	Perceived Color
Red only	Red
Green only	Green
Blue only	Blue
Red and green (blue subtracted)	Yellow
Red and blue (green subtracted)	Magenta
Green and blue (red subtracted)	Cyan
Red, green, and blue	White
None	Black

Color Palettes

Palettes are mathematical tables that define the color of a pixel displayed on the screen. On the Macintosh, these tables are called *color lookup tables* or CLUTs. In Windows the term *palettes* is used. The most common palettes are 1, 4, 8, 16, and 24 bits deep:

Color depth	Colors Available
1-bit	Black and white (or any two colors)
4-bit	16colors
8-bit	256 colors (good enough for color images)
16-bit	Thousands of colors (excellent for color images)
24-bit	More than 16 million colors (totally photo-realistic)

Color lookup table

A mechanism used to transform a range of input colors into another range of colors. It can be a hardware device built into an imaging system or a software function built into an image

processing application. The hardware color look up table will convert the logical colour numbers stored in each pixel of video memory into physical colors, normally represented as RGB triplets. The palette is simply a block of fast RAM which is addressed by the logical color and whose output is split into the red, green and blue levels which drive the actual display.

Image Processing

Image processing is a method to convert an image into digital form and perform some operations on it in order to get an enhanced image or to extract some useful information from it. (i.e) treating images as two dimensional signals while applying already set signal processing methods to them. It include the following three steps.

- Importing the image with optical scanner or by digital photography.
- Analyzing and manipulating the image which includes data compression and image enhancement and spotting patterns that are not ot human eyes like satellite photographs.
- Output is the last stage in which result can be altered image or report that is based on image analysis.

The purpose of image processing is visualization, image sharpening and restoration, image retrieval, measurement of pattern and image recognition. There are two types of image processing analog and digital. Analog techniques can be used for the hard copies like printouts and photographs. Digital processing techniques help in manipulation of the digital images by using computers.

Image Acquisition

Image acquisition is defined as the action of retrieving an image from some source so it can be pass through whatever processes need to occur afterwards. The ultimate goal of this process is to have a source of input that operates within such controlled and measured guidelines that the same image can if necessary be nearly perfectly reproduced under the same conditions. The actual hardware device can be anything from a desktop scanner to a massive optical telescope.if the hardware is not properly configured and aligned then visual artifacts can be produced that can complicate the image processing. Real time image acquisition is one form of image acquisition. This usually involves retrieving images from a source that is automatically capturing images. Real time image acquisition create a stream of files that can be automatically processed queued for later work or stitched into a single media format.

Image Enhancement:

Image enhancement refers to accentuation or sharpening of image features such as edges, boundaries or contrast to make a graphic display more useful for display and analysis. The enhancement process does not increase the inherent information content in the data. But it does increase the dynamic range of the chosen features. Image enhancement includes gray level and contrast manipulation, noise reduction, edge crispening and sharpening, filtering, interpolation ad magnification, pseudo coloring and so on. The above functions are grouped as Point operations, Spatial operations transform operations and pseudo coloring. The greatest difficulty in image enhancement is quantifying the criterion for enhancement.

Color Image Processing:

There are two types of image processing. Pseudo color image processing and full color image processing.

Pseudo color image processing:

It consists of assigning colors to grey values based on a specific criterion. Intensity slicing and color coding is one of the simplest kinds of pseudo color image processing.

- Intensity slicing: Separate independent transformation of gray level inputs to three colors.
- Color Coding: Composite the image with color content modulated by nature of transformation function.

Full Color image processing

Full color image processing approaches divided into two major categories. Approaches that process each component image individually and then form a composite processes color image from the individually processed components.

Approaches that work with color pixels directly. Pixels are views as vectors and scalar methods are extended to operate on vector fields. Color complements, color slicing color balancing are the different techniques used in the processing. Color complements are used to enhance details buried in dark regions of an image. Color slicing used to highlight a specific range of colors in an image to separate objects from surroundings. Color balancing is a process to compensate for incandescent lighting.

Histogram processing provides an automated way to perform enhancement. Histogram equalization adapting the grayscale technique to multiple components, applying gray scale techniques to different colors independently yields erroneous colors. Spread the intensities uniformly leaving the hues unchanged.

File formats

Tiff: Tagged Image File Format; supports grayscale, indexed and true color images. A single file contains a number of images with different properties. It provides a range of different compression methods and color spaces.

GIF: Graphics Interchange Format: does not support true color imaes. Allows pixels to be encoded using fewer bits.

- Use lossless color quantization
- PNG Portable Network Graphics
- Supports three different types of images
- True color with upto 3x16 bpp
- Grayscale with upto 16bpp
- Indexed with upto 256 colors
- Supports only one image per file .

JPEG: Joint Photographic Experts Group: supports images with up to 256 color components. Goal to achieve average data reduction of 1:16.Loseless compression.

SOUND

Sound is perhaps the most sensuous element of multimedia. It is meaningful "speech" in any language. It can provide the listening pleasure of music, the startling accent of special effects, or the ambience of a mood-setting background.

The power of Sound

When something vibrates in the air by moving back and forth it creates waves of pressure. These waves spread like the ripples from a pebble tossed in a still pool. And when they reach your eardrums, you experience the changes of pressure, or vibrations, as sound. *Acoustics* is the branch of physics that studies sound. Sound pressure levels are measured in decibels (db).

Digital Audio

You can digitize sound from a microphone, a synthesizer, existing tape recording, live audio and television broadcasts, popular CDs etc. Digital audio data is the actual representation of sound, stored in the form of samples. Samples represent the amplitude (or loudness) of sound at a discrete point in time. Quality of digital recording depends on the sampling rate(or frequency) that is the number of samples taken per second. The three sampling frequencies most often used in multimedia are CD-quality 14.0kHz, 22.05 kHz and 11.025 kHz. The number of bits used to describe the amplitude of sound wave when sampled, determines the sample size (either 8-bits or 16-bits). 8-bit sampling size provides 256 bits to describe dynamic range of amplitude. 16-bit sampling size provides over 65 thousand bits for dynamic range, but significantly increases space requirements The figure shows, slices of analog waveforms are sampled at various frequencies, and each discrete sample is then stored either as 8 or 16 bits of data.

Sampling frequency/rate: how often the sound sample is taken

Sampling size: how much information is stored per sample

2.3.4.Making Digital Audio Files:

Crucial aspects of preparing digital audio files are:

- Balancing the need for sound quality against available RAM and hard disk resource.
- Setting appropriate recording levels to get a high-quality and clean recording.

File Size Versus Quality

Two types of recording 1) Mono 2) Stereo.

- o Mono recordings are fine, but tend to sound a bit "flat" and uninteresting when compared with stereo recordings.
- o Stereo sound files require twice as much storage space as mono files for the same length of time.Here are the formulas for determining the size (in bytes) of a digital recording.

For **Monophonic** recording:

Sampling rates * duration of recording in seconds * (bit resolution / 8) * 1

For **Stereo** recording:

Sampling rates * duration of recording in seconds * (bit resolution / 8) * 2

E.g., for a 10 second recording at 20.05 kHz, 8-bit resolution, monophonic (good for speech):

*22050 kilohertz * 10 seconds * 8/8 * 1 = 220,500 bytes*

Or, for 10 seconds of good music quality at 44.1 kHz, 16-bit resolution, stereo:
44100 kHz * 10 * 16/8 * 2 = 1,764,000

Editing Digital Recordings

Once recording has been made, it will almost certainly need to be edited. **WaveStudio** sound editing software is useful in editing sound.

Basic Sound editing operations

- Multipletracks

Being able to edit and combine multiple tracks (for sound effects, voice overs, music etc)and then merge the tracks and export them in a final mix to a single audio file is important.

- Trimming

Removing "dead air" or blank space from the front of a recording and any unnecessary extra time off the end is your first sound editing task. Trimming even a few seconds here and there might make a big difference in your file size. Trimming is typically accomplished by dragging the mouse cursor over a graphic representation of your recording and choosing a menu command such as cut, paste, clear, erase, silence etc.

- Splicing and Assembly

Using the same tools mentioned for trimming you will probably want to remove the extraneous noises that inevitably creep into a recording. Even the most controlled studio voice -overs require touchup. Also, you may need to assemble longer recordings by cutting and pasting together many shorter ones.

- Volume Adjustment

When trying to assemeble ten different recordings into a single sound track there is a little chance that all the segments will have the same volume.

- Format Conversion

In some cases the digital audio editing software might read a format different from that by the presentation or authoring program. Most machintosh sound editing software will save files in SND and AIF formats. In windows most editing software writes .WAV files.

- Resampling and Desampling

If the sounds are recorded and edited at 16-bit sampling rates but are using lower rates and resolutions in the project it must be resample or downsample the file. This process will save considerable disk space.

- Fade-ins and Fade-outs

Most programs offers enveloping capability, this enveloping is important to smooth out the very beginning and the very end of a sound file.

- Equalization

Some programs offer digital equalization (EQ) capabilities that allow you to modify a recording's frequency content to sound brighter or darker.

- Time Stretching

More advanced programs let you alter the length of a sound file without changing its pitch. Most time stretching algorithms will severely degrade the audio quality of the file if the length is

altered more than a few percent in either direction.

- Digital Signal Processing(DSP)

some programs allow the user to process the signal effects such as reverberation, multitap delay, chorus, flange, and other special effects.Once sound effects is processed and mixed onto a track, it cannot be further edited, so always save the original so you can tweak it again if you are not happy with the results.

- Reversing Sounds

Another simple manipulation is to reverse all or portion of a digital audio recording. Sounds, particularly spoken dialog, can produce a surreal, otherworldly effect then played backward.

Making MIDI Audio

To make MIDI scores you will need sequencer software such as Microsoft Studio for windows and a sound synthesizer (typically built into the sound board on PCs but an add-on board or peripheral for the Macintosh. MIDI keyboard is also useful to simplify the creation of musical scores. The MIDI keyboard is not, however necessary for playback unless the keyboard has its own built-in synthesizer that you wish to specify for playback. Sequencer software lets you record and edit MIDI data and quantizes your score to adjust for timing inconsistencies. The sequencer software records your actions on the MIDI keyboard in real -time, and will play back exactly the notes you played on the keyboard. The software may also print a neatly penned of your score to paper. Sequencing software such as MidiSoft Studio4 for windows lets you to record, edit, and save music generated from a MIDI keyboard or instrument.

MIDI Versus Digital Audio

MIDI (Musical Instrument Digital Interface) is communication standard developed in early 1980s for electronic musical instruments and computers.It allows music and sound synthesizers from different manufactures to communicate with each other by sending messages along cables connected to the devices. MIDI provides a protocol for passing detailed descriptions of musical scores, such as the notes, sequences of notes, and what the instrument will play these notes. MIDI data are not digitized sounds; they are shorthand representations of music stored in numeric form. A sequencer software and sound synthesizer is required in order to create MIDI scores. Working with MIDI requires knowledge of music theory. MIDI is analogous to structure or vector graphics, while digitized audio is analogous to bit mapped images. MIDI is device dependent while digitized audio is device independent.

Multimedia System Sounds

System sounds are assigned to various system events such as startup and warnings among others. MAC provides several system sound options such as glass, Indigo and laugh.

In windows available system sounds include start, wav, chimes.wav and chord.wav

Multimedia sounds are either digitally recorded audio or MIDI music.

Adding Sound to Your Multimedia Project

Whether working on a Macintosh or in Windows, follow certain steps to bring an audio recording in to a multimedia project. Here is a brief overview of the process:

1. The type of sound, whether background music, special sound effects, or spoken dialog, must be decided. Decide where these audio events will occur in the flow of the project.

2. Decide where and when the user want to use either digital audio or MIDI data

3. Acquire source material by creating it from scratch or purchasing it.

4. Edit the sounds to fit to the project.

Test the sounds to be sure that are timed properly with the project's images. This may involve repeating steps 1 thru 4 until everything is sync.

2.3.8.1.Audio Recording

Record the sound material to cassette tape is the first step in the digitized process. Noise reduction circuits and metal tapes are used to remove hiss at a sampling rate of 22.05kHz.Digital audio tapes are based on 44.1 kHz, 16 bit record and playback capacity.

Keeping Tracks of Your Sound

It is important to maintain a good database, keeping track of the original material just in case the user need to revert to it when the disk drive crashes. Give the name of the file such that it should have some clues about the content since when searching for it will be easy to find out.

Audio CDs

CD ROM s are used for storing audio files. There are many standards , new technology, high capacity CD ROMs are available in the market.

The following are the different standards in Audio CD's

Red Book Standard

It is known as CD-DA(digital Audio) .Contains number of tracks with each song in one track.Each track is divided into number of sectors. Each sector is 1/75 second length and 2352 bytes storage capacity.

Yellow book Mode 2

It is used for compressed audio. It contain information about song heading,name of the singer, track number and created date etc.

CD-XA(CD-Extended Architecture)

It is a modification of CD-ROM that defines two new types of sectors that enable it to read and display data, graphics ,video, audio at the same time.

Sound for Your Mobile

Mobile phones are used to take photos, record videos, listen music and play games. They are part of multimedia. The following are the some audio standards used in the mobile phone.

AAC: Advance Audio Coding having very small files with compressed data are in this fromat. Ring tones are belong to this format.

MP3: To store and playmusic files. Media player software is required to play this file format.

OGG: It is a free open container format maintained by the xiph. Org foundation.

<u>AMR:</u> (Adaptive Multirate): It is an audio compression format optimized for speech coding.

<u>WAV:</u> Waveform Audio File format is a Microsoft and IBM audio file format standard for storing an audio bit stream on PCs

<u>WMA:</u> Windows Media Audio is the name of a series of audio codecs and their corresponding audio coding formats developed by Microsoft.

Sound for the Internet:

Depending on the browser different sound formats are available in the internet. The following are the some sound formats used in the internet.

<u>WAV:</u> waveform audio file format is a Microsoft and IBM audio file format standard for storing an audio bitstream on PCs and on web browsers.

<u>MP3 format</u>: it is a format from MPEG to store music files. As this is having best compression and best quality used in all browsers.

<u>Windows Media Format</u>: Windows Media Audio is the name of a series of audio codecs and their corresponding audio coding formats developed by Microsoft for windows operating system.Additional hardwares are required when this format files are used in other than Microsoft.

<u>MIDI format</u>: It is a protocol designed for recording and playing back music on digital synthesizers that is supported by many makes of personal computer sound cards.

ANIMATION

A way of making a movie by using a series of drawings, computer graphics or photograph of objects(such as puppets or models) that are slightly different from one another and that when views quickly one after another create the appearance of movement.

Animation makes static presentations come alive and adds visual impact to the multimedia project. Many multimedia applications for both Macintosh and Windows provide animation tools, but the programmer should first understand the principles of how the eye interprets the changes it sees as motion.

The Power of the Motion

Visual effects such as Wipes, Fades, Zooms and Dissolves can be used for primitive animation. Animation is more than wipes, fades and zooms. Animation is an object actually moving across into or out of the screen, spinning globe of our earth, a car driving along a line-art highway; a bug crawling out from under a stack of papers, with a screaming voice from the speaker telling " Shoot it now!".

Principles of Animation

Animation is possible because of a biological phenomenon known as persistence of vision. It makes possible for a series of images that are changed very slightly and very rapidly one after the other to seemingly blend together into a visual illusion of movement. To just change lightly the location or shape of an object rapidly enough, the eye will perceive the changes as motion. Television video builds 30 entire frames or pictures every second; the speed with which each frame is replaced by the next one makes the images appear to blend smoothly into movement. Movies on film are typically shot at a shutter rate if 24 frames per second but using projection tricks, the flicker rate is increased to 48 times per second, and the human eye thus sees a motion

picture.

Animation by Computer

Using appropriate software and techniques , animate the visual images in many ways. The simplest animation by 2D , more complicated by 2 ½D and most realistic animations by 3D.

2D animation creates movement in a two dimensional artistic space. It requires both creativity and technological skills. 2D animation focuses on creating characters, storyboards and backgrounds in two dimensional environments. (i.e.) the figures can move up or down, left and right. It uses bitmap and vector graphics to create and animated images and is created using computers and software programs such as adobe photoshop, flash , after effects and Encore.

In 2 ½ -D animation an illusion of depth is added to an image through shadowing and highlighting, but the image itself still rests on the flat x axis and y axis in two dimensions. Embossing, shadowing, beveling and high lighting provides a sense of depth by raising an image or cutting it into a background. Adobe Illustrator, Photoshop, fireworks and After Effects.

In 3D animation software created a virtual realm in three dimensions and changes (motion) are calculated along all three axes(x, y, and z), allowing an image or object that itself is created with a front, back, sides, top and bottom to move towards or away from the viewer or in this virtual space of light sources and points of view, allowing the viewer to wander around and get a look at all the object's parts from all angles. Such animations are typically rendered frame by frame by high end 3D animations programs such as Auto Desk's Maya.

Animation Techniques

Animation is an illusion of movement created by sequentially playing still image frames at the rate of 15-20 frames per second. The eye retains the image long enough to allow the brain to connect the frames in a continuous sequence creating the illusion of movement. Colors and background can be changed from frame to frame so that there is a perception of a moving object. There are many ways to achieve varying levels of animation.

When create an animation, organize its execution into a series of logical steps. First, gather up in the mind, about all the activities the designer wish to provide in the animation; If it is complicated the designer may wish to create a written script with a list of activities and required objects. Choose the animation tool best suited for the job. Then build and tweak the sequences; experiment with lighting effects. Allow plenty of time for this phase when the designer are experimenting and testing. Finally, post-process the animation, doing any special renderings and adding sound effects.

The ways of achieving varying levels of animation by the following.

- Toggling between image frames
- Rotating through several image frames
- Delta frame animation
- Palette animation.

   Toggling between image frames: create simple animation by changing images at display time. The simple way is to toggle between two different images. A timer can be used to toggle between the images at specific intervals to ensure that the user can see the change. The timer measures intervals in increments of milliseconds. Icons and metafiles can also be used as images for animation frames.

Rotating through several image frames : Playing several image frames in a loop to create a rotation effect is another approach to animation. The animation contains several frames displayed in a loop. Since the animation consists of individual frames , the playback can be paused and resumed at any time. The application increments the frame numbers to keep track of the current frame in the animation. The animation can be controlled by a timer if one could rely on the computation time to achieve a reasonable playback.

Delta Frame animation: An initial frame is displayed and successive frames are based on what has changed between the current image frame and the next image frame. The changesare called the delta and by displaying only the data rendering time can be reduced to produce a smoother animation.

The process as follows

- Select the first frame in the sequence and store it as a bitmap, such as a windows DIB format.
- Compare the bitmaps of consecutive frames .Due to the nature of animation sequences the differences are often quite small compared to the size of the entire frame.
- Encode the set of changed pixels into the RLE format. The encoded format will contain information only on the pixels that change, the RLE bitmap is stored instead of the full frame.

Palette Animation:Palette animation involves drawing the object and manipulating palette colors or just manipulating palette colors without redrawing the object. Letus take a circular shape moving from the left side of the screen to the right side of the screen. The shape begin moving toward the right side with an initial color of red. As it moves it is redrawn on a regular basis with a different palette entry so that its color changes each time it is redrawn.

In some cases the object does not move. Only its color changes. For example, a wheel can be drawn with different color segments. The palette entries are changed one at a time at regular intervals so that the segment colors change on a regular basis. These palette entries can be cycled in a such a manner as to create the illusion of movement.

Animation Using OpenGL:

The designer need a C/C++ compiler or Visual C/C++ Compiler. The first thing to do when starting a new openGL project is to dynamically link with openGL. For Windows OS add opengl32.lib to the linker input, for Linux OS Include –IGL in the compiler options and for OS X add –framework openGL to the compiler options.

Before start drawing things the designer need to initialize openGL. This is done by creating an *openGL context* which is essentially a state machine that stores all data related to the rendering of the application. When the application closes the *openGL context* is destroyed and everything is cleaned up.

2.4.5.1.A sample program for creating openGL context

```
# include <Libraryheaders>

 int main

        {

               createWindow(title, width, height);
```

```
                createOpenGLContext(settings);
                while(windowOpen)
                {
                        while(event=newEvent())
                                handleEvent(event);
                        updateScene();
                        drawGraphics();
                        presentGraphics();
                }
                return 0;
        }
```

When rendering a frame, the results will be stored in an off screen buffer known as the *back buffer* to make sure the user only sees the final result. The *presentGraphics* () call will copy the result from the *back buffer* to the visible window buffer the *front buffer*. Every application that makes use of real time graphics will have a program flow that comes down to this whether it uses a library or native code.

Libraries

We need the following sets of libraries in programming OpenGL:

- Core OpenGL(GL): It consists of hundreds of functions, which begin with a prefix "gl" (e.g., glColor, glVertex, glTranslate, glRotate). The Core OpenGL models an object via a set of geometric primitives, such as point, line, and polygon.
- OpenGL Utility Library(GLU): built on-top of the core OpenGL to provide important utilities and more building models (such as qradric surfaces). GLU functions start with a prefix "glu" (e.g., gluLookAt, gluPerspective).
- OpenGL Utilities Toolkit(GLUT): provides support to interact with the Operating System (such as creating a window, handling key and mouse inputs); and more building models (such as sphere and torus). GLUT functions start with a prefix of "glut" (e.g., glutCreatewindow, glutMouseFunc). GLUT is not a full-featured toolkit so large applications requiring sophisticated user interfaces are better off using native window system toolkits. GLUT is simple, easy, and small. Alternative of GLUT includes SDL, SFML,GLFW.
- SFML : SFML is a cross platform C++ multimedia library that provides access to graphics, input, audio , networking and the system. It was designed to be used withits own set of drawing functions.
- SDL : SDL is also a cross platform multimedia library targeted at C. it supports more exotic platforms and most importantly offers more control over the creation of the openGL context than SFML
- GLFW: GLFW is a C library specifically designed for use with OpenGL. It offers the most control over the OpenGL context creation out of these three libraries.
- OpenGL Extension Wrangler Library(GLEW):GLEW is a cross-platform open-source

C/C++ extension loading library. GLEW provides efficient run-time mechanisms for determining which OpenGL extensions are supported on the target platform.

Each of the software package consists of:

1. A *header* file: "gl.h" for core OpenGL, "glu.h" for GLU, and "glut.h" (or "freeglut.h") for GLUT, typically kept under "include\GL" directory.
2. A *static library*: for example, in Win32, "libopengl32.a" for core OpenGL, "libglu32.a" for GLU, "libglut32.a" (or "libfreeglut.a" or "glut32.lib") for GLUT, typically kept under "lib" directory.
3. An optional *shared library*: for example, "glut32.dll" (for "freeglut.dll") for GLUT under Win32, typically kept under "bin" or "c:\windows\system32".

It is important to locate the *directory path* and the *actual filename* of these header files and libraries in the operating platform in order to properly setup the OpenGL programming environment.

Program for simple animation using GLUT

The main purpose of this program is to present the basic elements used in an animation loop in openGL with GLUT.

```
#include <glut.h>

GLfloat gfPosX = 0.0;
GLfloat gfDeltaX = .0001;

void Draw() {
        glClear(GL_COLOR_BUFFER_BIT);
        glColor3f(1.0, 1.0, 1.0);
        glBegin(GL_LINES);
                glVertex3f(gfPosX, 0.25, 0.0);
                glVertex3f(1.0 - gfPosX, 0.75,0.0);
        glEnd();
        glFlush();
        gfPosX += gfDeltaX;
        if (gfPosX >= 1.0 || gfPosX <= 0.0) {
                gfDeltaX = -gfDeltaX;
        }
        glutPostRedisplay();
}

void Initialize() {
        glClearColor(0.0, 0.0, 0.0, 0.0);
        glMatrixMode(GL_PROJECTION);
        glLoadIdentity();
        glOrtho(0.0, 1.0, 0.0, 1.0, -1.0, 1.0);
}
```

```
int main(int iArgc, char** cppArgv) {
        glutInit(&iArgc, cppArgv);
        glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
        glutInitWindowSize(250, 250);
        glutInitWindowPosition(200, 200);
        glutCreateWindow("XoaX.net");
        Initialize();
        glutDisplayFunc(Draw);
        glutMainLoop();
        return 0;
}
```

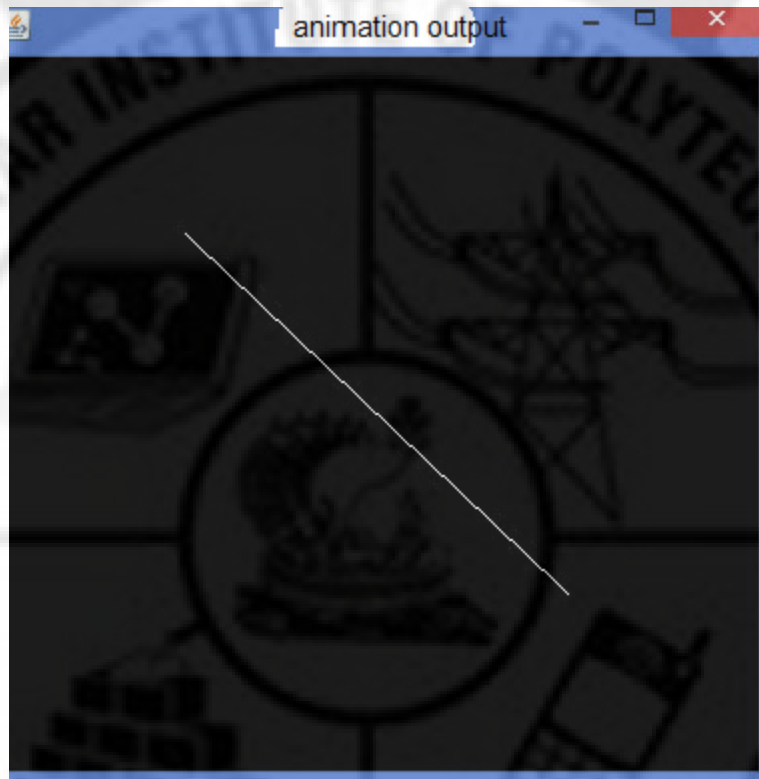**Fig 2.10. Image in the starting stage**

Fig 2.11 Image in the toggling stage

The x coordinates of the endpoints alternate between the 0 and 1 in opposite directions. The variables gfPosX is used as the x position of the lower endpoint, and (1-gfPosX) as the x position of the upper endpoint, The value of the gfPosx is changed by the value of gfDeltaX at each frame. The value of gfDeltaX changes sign whenever gfPosX reaches 0 or 1 by the "if" statement that the designer added. this keeps gfPOSX and , by extension the x coordinates of the endpoints from leaving the range[0,1].

The animation is created via an implied loop. The loop is created by redisplay event. By calling glutDisplayFunc() with our Draw() function as the argument, set Draw() to be called every time the window needs to be redisplayed. For example, Draw() is originally called when the window is drawn for the first time. since this sends a redisplay message to the message queue. when this message is handled ,Draw() is called which in turn, posts a redisplay message at the end of the function when glutPostRedisplay() is called. This completes the loop.

The animation may much slower or faster depending on the speed of the computer. The value of gfDeltaX may be changed to alter the speed of the animation to get a reasonable looking result.

IDEO

Carefully planned well executed video clips can make a dramatic difference in multimedia project.

Using Video

Digital video has supplanted analog video as a method of choice for making and delivering video for multimedia use. A digital camcorder directly connected to a computer workstation using

FireWire(IEEE 1394) cables eliminates the image degrading during analog to digital conversion step typically performed by video capture cards bringing the power of non linear video editing and production to everyday users.

How Video Works and is Displayed

When light reflected from an object passes through a video camera lens that light is converted into an electronic signal by a special sensor called a charge coupled device. Top quality broadcast cameras and even camcorders may have as many as three CCDs (one for each color of red, green and blue) to enhance the resolution of the camera. The output of the CCD is processed by the camera into a signal containing three channels of color information and synchronization pulses. There are several video standards for managing CCD output, each deals with the amount of separation between the components of the signal. If the separation of the color information found in the signal is more, then the quality of the image will be higher. If each channel of color signal output is called RGB, which is the preferred method of high quality and professional video work.

Camcorder combines both camera and tape recorder in a single device. One or more channels of sound may also be recorded on the videotape. The video signal is written to tape by a spinning recording head that changes the local magnetic properties of the tape's surface in a series of long diagonal stripes. Because the head is canted or tiled at a slight angle compared with the path of the tape it follows a helical path which is called **helical scan recording.**

In digital systems, the video signal from the camera is first digitized as angle frame, and the data is compressed before it is written to the tape in one of the several proprietary and competing formats.

Colored phosphors on the CRT screen glowed red, green, or blue when they were energized by the electron beam. Because the intensity of the beam varied as it moved across the screen some colors glowed brighter than others. Finely tuned magnets around the picture tube aimed the electrons precisely onto the phosphor screen while the intensity of the beam was varied according to the video signal. Flat screen displays are all digital using either liquid crystal display or plasma technologies are becoming increasingly popular and supplanting CRTs.

Analog Video

NTSC: National Television Standard Committee standard a single frame of video was made up of 525 horizontal scan lines drawn on to the inside face of a phosphor coated picture tube every 1/30th of a second by a fast moving electron beam. The electron beam actually made two passes as it drew a single video frame-first it laid down all the odd numbered lines and then all the even numbered lines. Each of these passes (60 per second) painted a field and the two fields were then combined to create a single frame at a rate of 30 frames per second. Thie process of building a single frame from two fields was called interlacing, a technique that helps to prevent flicker on television screens. Computer monitors used a different progressive scan technology and drew the lines of an entire frame in a single pass, without interlacing them and without flicker.

PAL: Phase Alternate Line system was used in the United Kingdom, Western Europe, Australia, South Africa, China and South America. The screen resolution is 625 horizontal lines with a scan rate of 25 frames per second. The even and odd lines were interlaced, each field taking 1/50 of a second to draw.

SECAM: Sequential Color and Memory system was used in France, Eastern Europe , the former USSR and few other countries. Although it is a 625 line,50Hz system it differed greatly from both the NTSC and PAL color system in its basic technology and broadcast method.

Digital Video

ATSC DTV : Advanced Television systems Committee standard for digital Television mostly used in the united states, Mexico and Canada. It includes two primary high definition video formats 1080i and 720p. It also includes standard definition formats, although initially only HDTV services were launched in the digital format. ATSC can carry multiple channels of information on a single stream, and it is common for there to be a single high definition signal and several standard definition signals carried on a single NTSC channel allocation. More significantly for multimedia producers, this emerging standard allowed for transmission of data to computers and for new ATV interactive services.

HDTV high definition Television provides high resolution in a 16:9 aspect ratio. There is a contention between the broadcast andcomputer industries about whether to use interlacing or progressive scan technologies. The broadcast industry has promulgated an ultra high resolution ,1920x1080 interlaced format to become the cornerstone of a new generation of high end entertainment centers but the computer industry would like to settle on a 1280x720 progressive scan system for HDTV.While the 1920x1080 format provides more pixels than the 1280x720 standard the refresh rates are quite different. The higher resolution interlaced format delivers only half the picture every 1/60 of a second, and because of the interlacing , on highly detailed images there is a great deal of screen flicker at 30hz. Both formats have been included in the HDTV standard by the ATSC.

DVB: digital video Broadcasting is used mostly in Europe where the standards define the physical layer and data link layer of a distribution system.

ISDB: Integrated Services Digital Broadcasting is used in Japan to allow radio and television stations to convert to digital format.

Setting up a production environment for making digital video, however does require hardware that meets minimum spexifications for processing speed, data transfer and storage.

To setting up your production environment

- Computer with FireWire connecting cables
- Fast processors
- Plenty of RAM
- Fast and big hard disk for storing digital video data streams of raw video footage from a camera at DV's fixed transfer rate of above 8 MBps and have enough free space. Then multiply that times five to allow for editing removable media such as Zip and CD_RW will not work.
- Second display to allow for more real estate for your editing software.
- Audio mixer to adjust sound output from the cam corder.
- External speakers
- Television monitor to view your project
- Nonlinear editing software.

Digital video Containers

A .exe file system tells the OS that it needs to execute this file. A .bat file tells the OS that there are one or more executable commands that need to be run one after the other. Video containers or wrappers are file systems designed to interface between the OS and the video data.

AVI: Audio Video Interleaved is a multimedia container format introduced by misrosoft. File can contain both audio and video data in a file container that allows synchronous audio with video play back.

MOV:MPEG4 video container file format used in Apple's quick time program.

MKV: Matroska multimedia container format . Container include Video. Audio and features such as alternate audio tracks multilingual subtitles and chapter points as well as rich metadata including cover art, ratings , descriptions and more.

MPEG: Movie Picture Experts Group is a working group of authorities that was formed by ISO and IEC to set standards for audio and video compression and transmission.

FLV: flash audio-container file format used to deliver digital video content over the internet using Adobe

MP4: MPEG4 video file contain not only video but also audio and subtitles.

MTS or TS: Transport Stream is a standard digital container format for transmission and storage of audio , video and program and system information protocol data.It is used in broadcast systems such as Digital video broadcasting, ATSC and IPTV.

MXF: Material Exchange format which supports a number of different streams of coded "essence" encoded in any of a variety of video and audio compression formats together with a metadata wrapper which describes the material contained within the MXF file.

WMV: Window Media Video is the name of a series of video codecs and their corresponding video coding formats developed by MicroSoft.

VOB: Video Object contain digital video, digital audio , subtitles , DVD menus and navigation contents multiplexed together into a stream form.

R3D: Red Code RAW –proprietary file format that efficiently encodes measurements from a camera's digital sensor in a way that maximizes post production capabilities.

DNG-Digital Negative is patented open non free lossless raw image format written by adobe used for digital photography.

JPG OR JPEG: Joint Photographic Expert Group is a commonly used method of lossy compression for digital images, particularly for those images produced by digital photography.

TIFF: Tagged Image File Format by Adobe. Common format for exchanging raster graphical (bitmaps) images between application programs including those used for scanner images.

TARGA: True Vision TGA i.e. raster graphics file format.

DPX: Digital Picture Exchange by the SMPTE. Modification of the Kodak Cineon format bitmap file format used to store a single frame of a motion picture or video data stream.

EXR: open EXR bit map file. It is an open source HDR(high dynamic range imaging) image file format created by the Industrial Light & Magic Visual Effects company.

2.5.6.CODEC

Codec it is defined as short for compressor/decompressor. A codec is any technology for compressing and decompressing a digital media file, such as video or song. It can be divided into two parts encode and decode. The encoder performs the compression (encoding) function and decoder performs the decompression(decoding) function. Codecs can be implemented in software, hardware or a combination of both.

To install codecs automatically

- Click start and then click All Programs
- Click Windows Media Player
- Clikck now playing and then click More Options
- On the Player Tab select the Download Codecs automatically check box and then click ok.
  .

Video Format Converters:

Video files are normally in the AVI,MPEG,MOV,DAT,MP4 formats. The video file formats are depends on the recording media and the software in the media. Most users will at some point need to change the format of a video file for example to transfer a movie or a clip to a different file type for

- Viewing in a mobile device
- Uploading to the Internet
- Compressing to save hard drive space.

To convert video file format from one to another, different video format converter softwares are used.

To change a video format using movavi video converter just download the program for the OS and follow the simple steps below.

- Add a file to the program. Just click Add media and select add video
- Choose a new format
- Start the conversion.

To Convert WMV to MP4

- Download the WMV to MP4 converter. First download and run the installation file.
- Add WMV Files to the program. Hit the Add media button, choose Add video and add the files for which you want to change the format
- Select an output format
- Convert your files.

To convert and upload video clips to You Tube follow the five quick steps below.

- Download Movavi video converter
- Launch the Program and Add Videos for Conversion
- Select a You Tube preset
- Convert Your Movie.
- Start Uploading Video to You Tube

Obtaining the Video Clip

Video clips are short clips of video, usually part of a longer recording. The term is also more loosely used to mean any short video less than the length of a traditional television program. The video clips are obtained by any one of the following methods.

- To capture films using video camera
- Create Video clips from already existing video by VCD cutter /DVD cutter software tools.
- By continuously play graphic images
- By adding movements to cartoon diagrams.
- From television

Shooting and Editing Video

To add full screen , full motion video to a multimedia project specialized hardware and software are needed. The following steps are required to do shooting and editing video.

- Story Boarding
- Shooting Platform
- Lighting
- Chroma Keys
- Composition

Story Boarding:

A graphic organizer in the form of illustrations or images displayed in sequence for the purpose of pre-visualizing a motion picture , animation , motion graphic or interactive media sequence is known as story boarding. In video story boarding contains shooting drawings showing camera and scene, shooting angles, lighting, action, special effects and how objects move through from start to finish. It is just like a flow diagram showing where to add video in an application in a detailed manner.

Shooting Platform:

Using a tripod or even placing the camera on a stable platform such as rolled –up sweater on the hood of a car can improve the shot.

Using a rolling office chair and sitting facing the back with the camera balanced on the chair back makes a convenient stable dolly. High resolution and storage capacity digital cameras for getting best video stills.

Lighting

The greatest difference between professional camcorders and consumer camcorders is their ability to perform at low light levels. Using a simple floodlight kit or even just being sure that daylight illuminates the room can improve the image.As in photography , good lighting techniques separate amateurs .

Chroma keys

A useful tool easily implemented in most digital video editing applications is blue screen, green screen , ultimate or chroma key editing.Blue screen is a popular from professional in video shoot technique for making multimedia titles because expensive sets are not required. Incredible

backgrounds can be generated using 3D modeling and graphic software and one or more actors, vehicles or other objects can be neatly layered onto that background. Applications such as Videoshop, Premiere. Final Cut-Pro and iMovie provide this capability.

Composition

When shooting video for playback from CDROM or the web in a small computer window it is best to avoid wide panoramic shots. Use close ups and medium shots head and shoulders or even tighter. Depending upon the compression algorithm used consider the amount of motion in the shot. The more the screen changes from frame to frame the more the delta information needs to be transferred from the computer's memory to the screen and lower the playback speed will be. Keep the camera still instead of panning and zooming. Let the subject add the motion to the shot walking ,turning and talking.

REVIEW QUESTIONS.

2MARKS

1. Define Font
2. Define Typeface
3. Define Ascender and Descender
4. Define leading and tracking
5. List out some font style
6. Give examples for Serif font
7. Give examples for San serif font
8. Define hypermedia
9. What is bitmap
10. How many colors can be obtained in 24 bit images
11. What is dithering
12. What is 3D drawing
13. What is rendering
14. What is reflection
15. What is shading
16. what is meant by power of sound
17. what do you mean by digitized sound
18. What is trimming
19. What are the HTML tags used to add sound
20. What is Red book
21. List some mobile supported sound formats
22. What is animation
23. Mention few libraries for OpenGL usage
24. What you mean container format
25. Expand CODEC
26. Give example for video format converter
27. Give example for video cutting software tools
28. What is Story board
29. What is Blue screen

30. What is Chroma keys

3MARKS

1. What is kerning

2. Draw type face

3. What is color look up table

4. Define Image Enhancement

5. What is Image Acquisition

6, What is known as Image processing

7. How to make MIDI audio

8. How to add sound to a multimedia project

9. What are the different standards in audio CD's

10. How to install CODECS

11. How to upload video in youtube

12. How to convert WMV to MP4

5MARKS

1. What are the factors to be noted when using text in multimedia

2. Write about hypermedia structures

3. Mention the types of rendering

4. Explain the basic sound editing operations

5. What are the different sounds available in your mobile

6. What are the different sounds available in your internet

7. Explain animation by computer

8. Explain different animation techniques

9. Write about libraries in open GL

10. How to create a small animation using GLUT (10 marks)

11. Mention the different analog video standards

12. Mention the different digital video standards

13. Explain about different digital video containers

14. How to do shooting and editing of video.(10marks)

UNIT III.MULTIMEDIA DATA AND STANDARDS

DATA COMPRESSION

Data compression and Need for Data Compression

Compression is the way of making files to take up less space. In multimedia systems, in order to manage large multimedia data objects efficiently, these data objects need to be compressed to reduce the file size for storage of these objects. Compression tries to eliminate redundancies in the pattern of data. For example, if a black pixel is followed by 20 white pixels, there is no need to store all 20 white pixels. A coding mechanism can be used so that only the count of the white pixels is stored. Once such redundancies are removed, the data object requires less time for transmission over a network. This in turn significantly reduces storage and transmission costs. The process of reducing the volume of data by applying a compression technique is called compression. The resulting data is called compressed data. The reverse process of reproducing the original data from compressed data is called decompression. The resulting data is calledλ decompressed data.

Data Compression

- Reduces the size of data. ƒ
- Reduces storage space and hence storage cost.
- Reduces time to retrieve and transmit data

General Data Compression schemes

Compression techniques can be categorized based on following consideration:

- Non Lossy or lossy
- Symmetrical or asymmetrical
- Software or hardware

a. Lossless or lossy
   If the decompressed data is the same as the original data, it is referred to as lossless compression, otherwise the compression is lossy.
b. Symmetrical or asymmetrical
   In symmetrical compression the time required to compress and to decompress are roughly the same. In asymmetrical compression, the time taken for compression is usually much longer than decompression.
c. Software or hardware

   A compression technique may be implemented either in hardware or software. As compared to software codecs (coder and decoder), hardware codecs offer better quality and performance.

Compression Standards

Compression and decompression techniques are utilized for a number of applications, such as facsimile system, printer systems, document storage and retrieval systems, video teleconferencing systems, and electronic multimedia messaging systems. When information is compressed, the redundancies are removed. Sometimes removing redundancies is not sufficient to reduce the size of the data object to manageable levels. In such cases, some real information is also removed. The primary criterion is that removal of the real information should not affect the quality of the result. In the case of video, compression causes some information to be lost. Some information at a delete level is considered not essential for a reasonable reproduction of the scene. This type of compression is called lossy compression. Audio compression, on the other hand, is not lossy. It is called Non Lossy compression.

a) Non Lossy Compression Standards

- Packpits encoding (Run-length encoding)
- CCITT Group 3 I D
- CCITT Group 3 2D
- CCITT Group 4
- Lempe l-Ziv and Welch algorithm LZW.

b) Lossy compression Standards

- Joint Photographic Experts Group (JPEG)
- Moving Picture Experts Group (MPEG)
- Intel DVI
- CCITT H.261 (P * 24) Video Coding Algorithm
- Fractals.

Non Lossy Compression for Images

In Non Lossy compression, data is not altered or lost in the process of compression or decompression. Decompression generates an exact replica of the original object. Text compression is a good example of lossless compression. The repetitive nature of text, sound and graphic images allows replacement of repeated strings of characters or bits by codes. Non Lossy compression techniques are good for text data and for repetitive data in images like binary images and gray-scale images.

Lossy Compression for Photographs and video

Lossy compression is that some loss would occur while compressing information objects. Lossy compression is used for compressing audio, gray-scale or color images, and video objects in which absolute data accuracy is not necessary. The idea behind the lossy compression is that, the human eye fills in the missing information in the case of video. But, an important consideration

is how much information can be lost so that the result should not affect. For example, in a grayscale image, if several bits are missing, the information is still perceived in an acceptable manner as the eye fills in the gaps in the shading gradient. Lossy compression is applicable in medical screening systems, video tele-conferencing, and multimedia electronic messaging systems. Lossy compressions techniques can be used alone or in combination with other compression methods in a multimedia object consisting of audio, color images, and video as well as other specialized data types.

Difference between Hardware and Software Compression

- Hardware compression is more expensive compared to software compression.
- Hardware compression requires specialized hardware, while software compression does not.
- Hardware compression is much faster compared to software compression.
- Software compression adds more load to the host, while hardware compression does not.
- Hardware compression often has little, or no configurable options, while you have a lot of options with software compression.
- Software compression is better, compared to hardware compression, in terms of long term storage.

COMPRESSION SCHEMES AND STANDARDS(ONLY CONCEPTS)

Binary Image compression

Binary Image Compression is a scheme by which a binary image containing black and white pixel is generated when a document is scanned in a binary mode. The schemes are used primarily for documents that do not contain any continuous-tone information or where the continuous-tone information can be captured in a black and white mode to serve the desired purpose.The schemes are applicable in office/business documents, handwritten text, line graphics, engineering drawings, and so on. Let us view the scanning process. A scanner scans a document as sequential scan lines, starting from the top of the page. A scan line is a complete line of pixels, of height equal to one pixel, running across the page. It scans the first line of pixels (Scan Line), then scans second "line, and works its way up to the last scan line of the page. Each scan line is scanned from left to right of the page generating black and white pixels for that scan line.This uncompressed image consists of a single bit per pixel containing black and white pixels. Binary 1 represents a black pixel, binary 0 a white pixel. Several schemes have been standardized and used to achieve various levels of compressions.

Color, Gray Scale And Still-Video Image Compression

a. Color:

Color is a part of life we take for granted. Color adds another dimension to objects. It helps in making things standout. Color adds depth to images, enhance images, and helps set objects apart from -background.

Let us review the physics of color. Visible light is a form of electromagnetic radiation or radiant energy, as are radio frequencies or x-rays. The radiant energy spectrum contains audio frequencies, radio frequencies, infrared, visible light, ultraviolet rays, x-rays and gamma rays. Radiant energy is measured in terms of frequency or wavelength. The relationship between the two is meters.

$$\lambda = \frac{c}{f} \text{ meters}$$

where λ - is the wavelength in meters

c is the velocity of light in meters per second.

f is frequency of the radiation in hertz.

Since all electromagnetic waves travel through space at the velocity of light i.e., 3 x 10^8 meters/second - the wavelength is calculated by

$$\lambda = \frac{3}{f} \times 10^8 \text{ meters}$$

Color Characteristics

We typically define color by its brightness, the hue and depth of color.

Luminance or Brightness

This is the measure of the brightness of the light emitted or reflected by an object; it depends on the radiant, energy of the color band.

Hue This is the color sensation produced in an observer due to the presence of certain wavelengths of color. Each wavelength represents a different hue.

Saturation This is a measure of color intensity, for example, the difference between red and pink.

Color Models Several color models have been developed to represent color mathematically.

Chromacity Model It is a three-dimensional model with two dimensions, x and y, defining the color, and the third dimension defining the luminance. It is an additive model since x and yare added to generate different colors.

RGBModel RGB means Red Green Blue. This model implements additive theory in that different intensities of red, green and blue are added to generate various colors.

HSI Model The Hue Saturation and Intensity (HSI) model represents an artist's impression of tint, shade and tone. This model has proved suitable for image processing for filtering and smoothing images.

CMYK Model The Cyan, Magenta, Yellow and Black color model is used in desktop publishing printing devices. It is a color-subtractive model and is best used in color printing devices only.

YUV Representation The NTSC developed the YUV three-dimensional color model. It contains y -Luminance Component UV -Chrominance Components.Luminance component contains the black and white or grayscale information. The chrominance component contains color information where U is red minus cyan and V is magenta minus green.

YUV Model for JPEG

The *JPEG* compression scheme uses several stages.

The first stage converts the signal from the spatial RGB domain to the YUV frequency domain by performing discrete cosine transform. This process allows separating luminance or gray-scale components from the chrominance components of the image.

Joint Photographic Experts Group Compression (Jpeg)

ISO and CCITT working committee joint together and formed Joint Photographic Experts Group. It has focused exclusively on still image compression. Another joint committee, known as the Motion Picture Experts Group (MPEG), is concerned with full motion video standards.JPEG is a compression standard for still color images and grayscale images, otherwise known as continuous tone images.JPEG has been released as an ISO standard in two parts:

Part I specifies the modes of operation, the interchange formats, and the encoder/decoder specifies for these modes along with substantial implementation guide lines .

Part 2 describes compliance tests which determine whether the implementation of an encoder or decoder conforms to the standard specification of part I to ensure interoperability of systems compliant with JPEG standards

Requirements addressed by JPEG

- The design should address image quality .
- The compression standard should be applicable to practically any kind of continuous-tone digital source image .
- It should be scalable from completely lossless to lossy ranges to adapt it.
- It should provide sequential encoding .
- It should provide for progressive encoding .
- It should also provide for hierarchical encoding .

- The compression standard should provide the option of lossless encoding so that images can be guaranteed to provide full detail at the selected resolution when decompressed.

Definitions in the JPEG Standard

The JPEG Standards have three levels of definition as follows:

- Base line system
- Extended system
- Special lossless function.

The base line system must reasonably decompress color images, maintain a high compression ratio, and handle from 4 bits/pixel to 16 bits/pixel.

The extended system covers the various encoding aspects such as variable-length encoding, progressive encoding, and the hierarchical mode of encoding.

The special lossless function is also known as predictive lossless coding. It ensures that at the resolution at which the image is no loss of any detail that was there in the original source image.

Overview of JPEG Components

JPEG Standard components are:

(i) Baseline Sequential Codec

(ii) DCT Progressive Mode

(iii) Predictive Lossless Encoding

(iv) Hierarchical Mode.

These four components describe four different levels of JPEG compression.

The baseline sequential code defines a rich compression scheme and the other three modes describe enhancements to this baseline scheme for achieving different results.

Some of the terms used in JPEG methodologies are:

Discrete Cosine Transform (DCT)

DCT is closely related to Fourier transforms. Fourier transforms are used to represent a two dimensional sound signal. DCT uses a similar concept to reduce the gray-scale level or color signal amplitudes to equations that require very few points to locate the amplitude in Y-axis X-axis is for locating frequency.

DCT Coefficients

The output amplitudes of the set of 64 orthogonal basis signals are called DCT Co-efficients.

Quantization

This is a process that attempts to determine what information can be safely discarded without a significant loss in visual fidelity. It uses OCT co-efficient and provides many-to-one mapping. The quantization process is fundamentally lossy due to its many-to-one mapping.

De Quantization This process is the reverse of quantization. Note that since quantization used a many-to-one mapping, the information lost in that mapping cannot be fully recovered .

Entropy Encoder / Decoder Entropy is defined as a measure of randomness, disorder, or chaos, as well as a measure of a system's ability to undergo spontaneous change. The entropy encoder compresses quantized DCT co-efficients more compactly based on their spatial characteristics. The baseline sequential. codec uses Huffman coding. Arithmetic coding is another type of entropy encoding

JPEG Methodology

The JPEG compression scheme is lossy, and utilizes forward discrete cosine transform (or forward DCT mathematical function), a uniform quantizer, and entropy encoding. The DCT function removes data redundancy by transforming data from a spatial domain to a frequency domain; the quantizer quantizes DCT co-efficients with weighting functions to generate quantized DCT co-efficients optimized for the human eye; and the entropy encoder minimizes the entropy of quantized DCT co-efficients. The JPEG method is a symmetric algorithm. Here, decompression is the exact reverse process of compression.

Figure below describes a typical DCT based encoder and decoder.
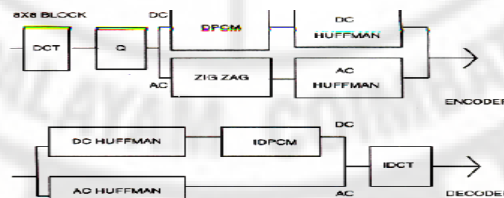
Symmetric Operation of DCT based Codec

Fig 3.1 DCT based Encoder/Decoder

Video Image Compression

The development of digital video technology has made it possible to use digital video compression for a variety of telecommunications applications. Standardization of compression algorithms for video was first initiated by CCITT for teleconferencing and video telephony . The following compression types are commonly used in Video compression:

- Spatial Redundancy Removal - Intraframe coding (JPEG)

- Spatial and Temporal Redundancy Removal - Intraframe and Interframe coding (H.261, MPEG)
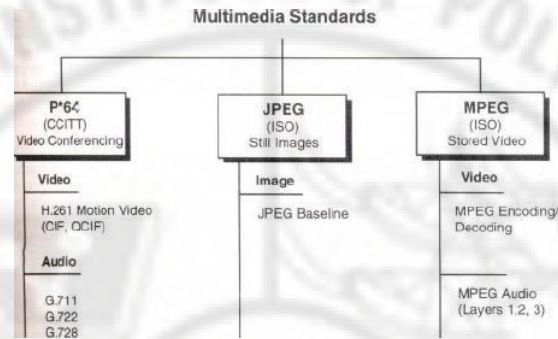
Multimedia standards for Video:

Fig 3.2 Multimedia Standards

Requirements for full-motion Video Compression

Applications using MPEG standards can be symmetric or asymmetric. Symmetric applications are applications that require essentially equal use of compression and decompression. Asymmetric applications require frequent decompression. Symmetric applications require on-line input devices such as video cameras, scanners and microphones for digitized sound. In addition to video and audio compression, this standards activity is concerned with a number of other Issues concerned with playback of video clips and sound clips. The MPEG standard has identified a number of such issues that have been addressed by the standards activity. Let us review these Issues.

- Random Access

The expectations generated for multimedia systems are the ability to play a sound or video clip from any frame with that clip, irrespective of on what kind-of media the information is stored.

- VCR paradigm

The VCR paradigm consists of the control functions typically found on a VCR such as play, fast forward, rewind, search forward and rewind search.

- Multiplexing Multiple Compressed Audio and Video Bit Streams

It is a special requirement retrieved from different storage centers on a network. It may be received from different storage centers on a network. It may have to be achieved in a smooth manner to avoid the appearance of a jumpy screen.

- Editability
- Playback Device Flexibility

Moving Picture Experts Group Compression (MPEG)

The MPEG standards consist of a number of different standards. The MPEG 2 suite of standards consist of standards for MPEG2 Video, MPEG - 2 Audio and MPEG - 2 systems. It is also defined at different levels, called profiles.

The main profile is designed to cover the largest number of applications. It supports digital video compression in the range of 2 to 15 M bits/sec. It also provides a generic solution for television

worldwide, including cable, direct broadcast satellite, fibre optic media, and optical storage media (including digital VCRs).

MPEG Coding Methodology

The above said requirements can be achieved only by incremental coding of successive frames. It is known as interframe coding. If we access information randomly by frame requires coding confined to a specific frame, then it is known as intraframe coding.

The MPEG standard addresses these two requirements by providing a balance between interframe coding and intraframe coding. The MPEG standard also provides for recursive and non-recursive temporal redundancy reduction.

The MPEG video compression standard provides two basic schemes: discrete-transform-based compression for the reduction of' spatial redundancy and block-based motion compensation for the reduction of temporal (motion) redundancy. During the initial stages of DCT compression, both the full motion MPEG and still image JPEG algorithms are essentially identical. First an image is converted to the YUVcolor space (a luminance/chrominance color space similar to that used for color television). The pixel data is then fed into a discrete cosine transform, which creates a scalar quantization (a two-dimensional array representing various frequency ranges represented in the image) of the pixel data.

Following quantization, a number of compression algorithms are applied, including run-length and Huffman encoding. For full motion video (MPEG I and 2), several more levels of block based motion-compensated techniques are applied to reduce temporal redundancy with both causal and noncausal coding to further reduce spatial redundancy.

The MPEG algorithm for spatial reduction is lossy and is defined as a hybrid which employs motion compensation, forward discrete cosine transform (DCF), a uniform quantizer, and Huffman coding. Block-based motion compensation is utilized for reducing temporal redundancy (i.e. to reduce the amount of data needed to represent each picture in a video sequence). Motion-compensated reduction is a key feature of MPEG.

MPEG Encoder

Figure 3.3 below shows the architecture of an MPEG encoder. It contains DCT quantizer, Huffman coder and Motion compensation. These represent the key modules in the encoder.
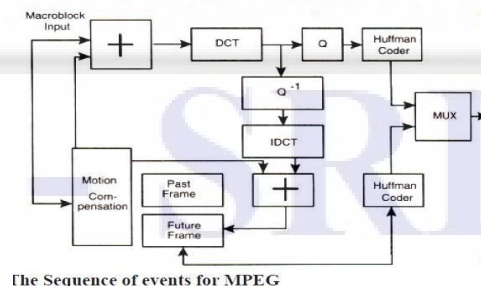
Architecture of MPEG Encoder:

The Sequence of events for MPEG

Fig 3.3 MPEG Encoder

First an image is converted to the YUV color space.The pixel data is then fed into a DCT, which creates a scalar quantization of the pixel data. Following quantization, a number of compression algorithms are applied, including run-length and Huffman encoding. For full-motion video, several more levels of motion compensation compression and coding are applied.

Audio Compression

Simple Audio Compression Methods

Traditional lossless compression methods (Huffman, LZW, etc.) usually don't work well on audio compression (the same reason as in image compression).

The following are some of the Lossy methods applied to audio compression:

- Silence Compression - detect the "silence", similar to run-length coding

- Adaptive Differential Pulse Code Modulation (ADPCM)

  e.g., in CCITT G.721 - 16 or 32 Kbits/sec.

  (a) encodes the difference between two consecutive signals,

  (b) adapts at quantization so fewer bits are used when the value is smaller.

- Linear Predictive Coding (LPC) fits signal to speech model and then transmits parameters of model. Sounds like a computer talking, 2.4 kbits/sec.

- Code Excited Linear Predictor (CELP) does LPC, but also transmits error term - audio conferencing quality at 4.8 kbits/sec.

Audio consists of analog signals of varying frequencies. The audio signals are converted to digital form and then processed, stored and transmitted. Schemes such as linear predictive coding and adaptive differential. pulse code modulation (ADPCM) are utilized for compression to achieve 40-80% compression.

Fractal Compression

Fractal image and video compression represents an entirely different coding method. In this technique, no actual pixel information is transmitted, rather only a transformation function that contains an image similar to the target image as a fixed point. The decoding process then consists of an iterative application of this function to any beginning image.

For natural images, fractal compression can achieve high compression ratios (up to 1000:1) with very good image quality. The biggest disadvantage of this coding method is the complexity of calculation and its low efficacy when applied to graphics images. In addition to the complexity of calculation, this coding technique is lossy since it uses only the similarity of blocks, not their identity.

Advantages

The quality is extremly high, higher than JPEG

It is better scaleable

Disadvantages:

The support is not as good as with JPEG.

Extra plug ins are required to watch them in a browser.

It needs more calculation power to be encoded / decoded.

Advantages and Disadvantages of CompressionSize

Reduction

File size reduction remains the single most significant benefit of image compression. Depending on what file type you're working with, you can continue to compress the image until it's at your desired size. This means the image takes up less space on the hard drive and retains the same physical size, unless you edit the image's physical size in an image editor. This file size reduction works wonderfully for the Internet, allowing webmasters to create image-rich sites without using much bandwidth or storage space.

Slow Devices

Some electronic devices, such as computers or cameras, may load large, uncompressed images slowly. CD drives, for example, can only read data at a specific rate and can't display large images in real time. Also, for some webhosts that transfer data slowly, compressed images remain necessary for a fully functional website. Other forms of storage mediums, such as hard drives, will also have difficulty loading uncompressed files quickly. Image compression allows for the faster loading of data on slower devices.

Degradation

When you compress an image, sometimes you will get image degradation, meaning the quality of the image has declined. If saving a GIF or PNG file, the data remains even though the quality of the image has declined. If you need to show a high-resolution image to someone, large or small, you will find image compression as a disadvantage.

Data Loss

With some common file types, such as JPEG, when an image shrinks in size the compression program will discard some of the photo's data permanently. To compress these images, you need to ensure you had an uncompressed backup before starting. Otherwise, you will lose the high quality of the original uncompressed image permanently.

DATA AND FILE FORMAT STANDARDS

3.3.1.Rich Text Format (RTF)

This format extends the range of information from one word processor application or DTP system to another. The key format information carried across in RTF documents are given below:

Character Set: It determines the characters that supports in a particular implementation.

Font Table: This lists all fonts used. Then, they are mapped to the fonts available in receiving application for displaying text.

Color Table: It lists the colors used in the documents. The color table then mapped for display by receiving application to the nearer set of colors available to that applications.

Document Formatting: Document margins and paragraph indents are specified here.

Section Formatting: Section breaks are specified to define separation of groups of paragraphs.

Paragraph Formatting: It specifies style sheds. It specifies control characters for specifying paragraph justification, tab positions, left, right and first indents relative to document margins, and the spacing between paragraphs.

General Formatting: It includes footnotes, annotations, bookmarks and pictures.

Character Formatting: It includes bold, italic, underline (continuous, dotted or word), strike through, shadow text, outline text, and hidden text.

Special Characters: It includes hyphens, spaces, backslashes, underscore and so on

This file format allows embedding graphics and other file formats within a document. This format is used by products such as Lotus Notus. This format is also the basis for the use of OLE.

Resource Interchange File Format (RIFF)

The **RIFF** file formats consist' of blocks of data called chunks. They are

RIFF Chunk - defines the content of the RIFF file.

List Chunk - allows to embed archival location copy right information and creating date.

Subchunk - allow additional information to a primary chunk

The first chunk in a RIFF file must be a RIFF chunk and it may contain one or more sub chunks.

TIFF File Format

TIFF is an industry-standard file format designed to represent raster image data generated by scanners, frame grabbers, and paint/ photo retouching applications.

TIFF Version 6.0 .

It offers the following formats:

(i) Grayscale, palette color, RGB full-color images and black and white.

(ii) Run-length encoding, uncompressed images and modified Huffman data compression schemes.

The additional formats are:

(i) Tiled images, compression schemes, images using CMYK, YCbCr color models.

TIFF Structure

TIFF files consists of a header. The header consists of byteordering flag, TIFF file format version number, and a pointer to a table. The pointer points to image file directory. This directory contains table of entries of various tags and their information.
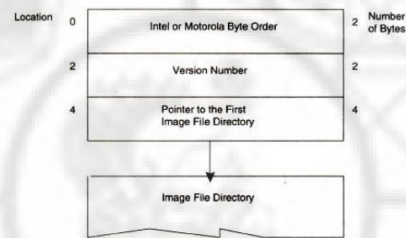
TIFF file format Header:

Fig 3.4 TIFF structure

TIFF Tags

The first two bytes of each directory entry contain a field called the Tag ID.

Tag IDs arc grouped into several categories. They are Basic, Informational, Facsimile, Document storage and Retrieval.

TIFF Classes: (Version 5.0)It has

five classes

1. Class B for binary images

2. Class F for Fax

3. Class G for gray-scale images

4. Class P for palette color images

5. Class R for RGB full-color images.

MIDI File Format

The MIDI file format follows music recording metaphor to provide the means of storing separate tracks of music for each instrument so that they can be read and synchronized when they are played.

The MIDI file format also contains chunks (i.e., blocks) of data. There are two types of chunks: (i) header chunks (ii) track chunks.

Header Chunk

It is made up of 14 bytes .The first four-character string is the identifier string, "MThd" .

The second four bytes contain the data size for the header chunk. It is set to a fixed value of six bytes The last six bytes contain data for header chunk.

Track chunk

The Track chunk is organized as follows:

- The first 4-character string is the identifier.
- The second 4 bytes contain track length.

MIDI Communication Protocol

This protocol uses 2 or more bytes messages.

The number of bytes depends on the types of message. There are two types of messages:

(i) Channel messages and (ii) System messages.

Channel Messages

A channel message can have up to three bytes in a message. The first byte is called a status byte, and other two bytes are called data bytes. The channel number, which addresses one of the 16 channels, is encoded by the lower nibble of the status byte. Each MIDI voice has a channel number; and messages are sent to the channel whose channel number matches the channel number encoded in the lower nibble of the status byte. There are two types of channel messages: voice messages and the mode messages.

Voice messages Voice messages are used to control the voice of the instrument (or device); that is, switch the notes on or off and sent key pressure messages indicating that the key is depressed, and send control messages to control effects like vibrato, sustain, and tremolo. Pitch wheel messages are used to change the pitch of all notes .

Mode messages Mode messages are used for assigning voice relationships for up to 16 channels; that *is,* to set the device to MOWO mode or POLY mode. Omny Mode on enables the device to receive voice messages on all channels.

System Messages System messages apply to the complete system rather than specific channels and do not contain any channel numbers. There are three types of system messages: common messages, real-time messages, and exclusive messages. In the following, we will see how these messages are used.

Common Messages These messages are common to the complete system. These messages provide for functions such as select a song, setting the song position pointer with number of beats, and sending a tune request to an analog synthesizer.

System Real Time Messages These messages are used for setting the system's real-time parameters. These parameters include the timing clock, starting and stopping the sequencer, ressuming the sequencer from a stopped position, and resetting the system.

System Exclusive messages These messages contain manufacturer-specific data such as identification, serial number, model number, and other information. Here, a standard file format is generated which can be moved across platforms and applications.

TWAIN

To address the problem of custom interfaces, the TWAIN working group was formed to define an open industry standard interface for input devices. They designed a standard interface called a generic TWAIN . interface. It allows applications to interface scanners, digital still cameras, video cameras.

TWAIN ARCHITECHTURE:

The Twain architecture defines a set of application programming interfaces (APls) and a protocol to acquire data from input devices. It is a layered architecture.It has application layer, the protocol layer, the acquisition layer and device layer.
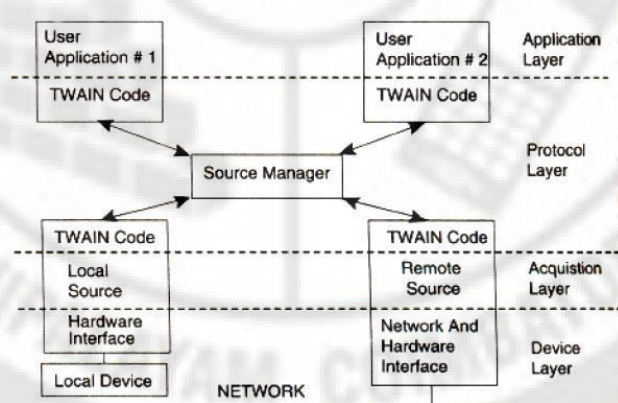

Fig 3.5 TWAIN Architecture

Application Layer: This layer sets up a logical connection with a device. The application layer interfaces with protocol layer.

Protocol Layer: This layer is responsible for communications between the application and acquisition layers. The main part of the protocol layer is the source Manager. Source manager manages all sessions between an application and the sources, and monitors data acquisition transactions. The protocol layer is a complex layer. It provides the important aspects of device and application interfacing functions.

The Acquisition Layer: It contains the virtual device driver.

It interacts directly with the device driver. This layer is also known as source.

It performs the following functions:

1.Control of the device.

2.Acquisition of data from the device.

3.Transfer of data in agreed format.

4.Provision of user interface to control the device.

The Device Layer: The device layer receives software commands and controls the device hardware.

Microsoft AVI

AVI is an acronym for Audio Video Interleave Standard. It is similar to Apple's Quick Time. It offers low-cost, low-resolution video processing for the average desktop user. It is a layered product. A VI is scalable. It allows users to set parameter such as window size, frame rate, quality and compression algorithm through a number of dialog boxes. AVI-compatible hardware allows enhancing performance through hardware-accelerated compression algorithms such as DVI and MPEG. AVI supports several compression algorithms.

Waveform Audio File Format (WAVE)

A digital file representation of digital audio. The WAVE file format is a subset of Microsoft's RIFF specification for the storage of multimedia files. A RIFF file starts out with a file header followed by a sequence of data chunks. A WAVE file is often just a RIFF file with a single WAVE chunk which consists of two sub chunks – "fmt" chunk specifying the data format and a "data" chunk containing the sample data.

Windows Metafile Format (WMF) This is a vector graphic format used by Microsoft Windows as an interchange format. WMF files actually consist of a collection of Graphics Device lnte1face (GDI) function calls, also native to the Windows environment. When a WMF file is "played" (typically using the Windows PlayMetaFile {) function) the described graphic is rendered. WMF files are ostensibly device-independent and unlimited in size.

MPEG

MPEG was developed and defined by ISO/IEC JTC1/SC 29/WG 11 to cover motion video as well as audio coding. In light of the state of the art in CD technology, the goal was a compressed stream data rate of about 1.2Mbit/s. MPEG specifies a maximum data rate of 1,856,000 bit/s, which should not be exceeded. The data rate for each audio channel can be chosen between 32 and 448 Kbit/s in increments of 16Kbit/s. This data rate enables video and audio compression of acceptable quality. Since 1993, MPEG has been an International Standard (IS).Besides the specification of video coding and audio coding, the MPEG standard provides a system definition, which describes the combination of individual data streams into a common stream.

GIF

Graphics Interchange Fonnat (GIF) was devised by UNISYS Corporation and Compuserve, initially for transmitting graphical images over phone lines via modems. The GIF standard uses the Lempel-Ziv-Welch algorithm modified slightly for image scanline packets to use the line grouping of pixels effectively. The GIF standard is limited to 8-bit (256) color images only. While this produces accept•able color, it is best suited for images with few distinctive colors

(e.g., graphics or drawing). The GIF image format has a few interesting features, notwithstanding the fact that it has been largely supplanted. The standard supports interlacing - the successive display of pixels in widely spaced rows by a four-pass display process.

In fact, GIF comes in two flavors. The original specification is GIF87a. The later version, GIF89a, supports simple animation via a Graphics Control Extension block in the data. This provides simple control over delay time, a transparency index, and so on. Software such as Corel Draw allows access to and editing of GIF images.

BMP

BitMap (BMP) is the major system standard graphics file format for Microsoft Windows, used in Microsoft Paint and other programs. It makes use of run-length encoding compression and can fairly efficiently store 24-bit bitmap images. Note, however, that BMP has m y different modes, including uncompressed 24-bit images.

JFIF

A JPEG file interchange format file is generally classified as an image file integrated with digital graphics encoding specifications also implemented into JPEG files, though the content of a JPEG file interchange format file is the compressed version of the corresponding JPEG file. The digital image data stored in a JPEG file interchange format file are digital JPEG graphics in bitmap format, and this digital graphic content is stored in the JFIF file format. Definitions corresponding to alignment specifications of simple arrays integrated into JPEG image files are stored in the associated JPEG file interchange format files. This format is used for the primary stages of digital image creation and rendering as a JPEG image archive compressed and stored in the JFIF format.

MIX

MIX is the native image format of Microsoft's Picture It! photo editing software. It is based on Microsoft Compound File format.MIX is a proprietary vector and raster image format associated with microsoft's PhotoDraw graphics software.

MULTIMEDIA DATABASES

Multimedia Storage and Retrieval

Multimedia storage is characterized by a number of considerations. They are:

(i) massive storage volumes

(ii) large object sizes

(iii) multiple related objects

(iv) temporal requirements for retrieval

Massive Data Volumes

A single multimedia document may be a combination of different media Hence indexing of documents, fi lms and tapes is more complex. Locating massive data volumes requires searching through massive storage files.

Locating and indexing systems can be understood only by a few key staff personnel. Hence it requires a major organizational eff0l1 to ensure that they are returned in proper sequence to their original storage location.

Storage Technologies

There are two major mass storage technologies used currently for storage of multimedia documents.

(i) Optical disk storage systems. (ii) High-speed magnetic storage.

Advantages of Optical disk storage systems:

    (i)   Managing a few optical disk platters in a juke box is much simpler than man;lging a large magnetic disk farm.

    (ii)   Optical disk storage is excellent storage system for off line archival of old and infrequently referenced documents for significant periods of time.

Multimedia object storage

Multimedia object storage in an optical medium serves its original purpose, only if it can be located fast and automatically. A key issue here is random keyed Access t6 various components of hypermedia database record. Optical media providcs very dense storage. Speed of retrieval is another consideration.Retrieval speed is a direct result of the storage latency, size of the data relative to display resolution, transmission media and speed, and decompression efficiency. Indexing is important for fast retrieval of information. Indexing can be at multiple levels.

Multimedia document retrieval

The simplest form of identifying a multimedia document is by storage platter identification and its relative position on the platter (file number). These objects can then be grouped using a database in folders (replicating the concept of paper storage in file folders) or within complex objects representing hypermedia documents.

The capability to access objects using identifiers stored in a database requires capability in the database to perform the required multimedia object directory functions. Another important application for sound and full motion video is the ability to clip parts of it and combine them with another set.

Indexing of sound and full-motion video is the subject of intense debate and a number of approaches have been used.

Database Management systems

Since most multimedia applications are based primarily on communications technologies, such as electronic mail, the database system must be fully distributed. A number of database storage choices are available. The choices available are:

* Extending the existing relational database management systems, (RDBMSs) to support the various objects for multimedia as binary objects.

* Extending RDBMSs beyond basis binary objects to the concepts of inheritance and classes. RDBMSs supporting these features provide extensions for object-programming front ends and/or C++ support.

* Converting to a full fledged object oriented database that supports the standard SQL language.

* Converting the database and the application to an object oriented database and using an object-oriented language, or an object-enabled SQL for development.

Multimedia applications combine numerical and textual data, graphics from GUI front-ends, CAD/CAM systems and GIS applications, still video, audio and full-motion video with recorded audio and annotated voice components. Relational databases, the dominent database paradigm, have lacked the ability to support multimedia databases. Key limitations of relational database systems for implementing multimedia applications stem from two areas: the relational data model and the relational computational model. RDBMSs have been designed to manage only tabular alphanumeric forms of data (along with some additional data types stored in binary form such as dates).

RDBMS Extensions For Multimedia

Binary Large Object (BLOB) is a data type which has been adapted by most of the leading relational databases. BLOBs are used for objects such as images or other binary data types.The relational database is extended to access these BLOBs to present the user 'with a complete' data set.Extended relational databases provide a gradual migration path to a more object-oriented environment.

Relational database tables include location information for the BLOBs which may be stored outside the database on separate image or video servers. Relational databases have the strength of rigorous set management for maintaining the integrity of the database .

Object-Oriented Databases for Multimedia

In object databases, data remains in RMS or flat files. Object databases can provide the fastest route to multimedia support. Object programming embodies the principles of reusable code and modularity. This will ease future maintenance of these databases. Object database capabilities such as message passing, extensibility, and the support of hierarchical structures, are important for multimedia systems. ODBMSs are extensible. They allow incremental changes to the database applications. Object-oriented software technology has important concepts. They are:

Extensibility: Extensibility .means that the set of operations, structures and constraints that are available to operations are not fixed, and developers can define new operations, which can then be added as needed to their application.

Encapsulation allows for the development of open systems where one part of the application does not need to know the functioning of other part. It also provides autonomy

Association: It is the ability to define a software entity in terms of its differences from another entity.

Classification: It is the ability to represent with a single software entity a number of data items that all have the same behavior and the same state attributes.

Object orientation helps to organize the software in a more, modular and re-usable manner.

Autonomy means we can interface to a variety of external programs can be built in one class of objects and the storage of the data in another class of objects.

Database Organization for Multimedia Applications

Optical disk storage technology has reduced the cost of multimedia document storage by a significant factor. Distributed architectures have opened the way for a variety of applications distributed around a network accessing the safe database in an independent manner. Data organization for multimedia systems has some key issues. They are:

(l) Data independence (2) Common distributed database architecture (3) Distributed database servers· (4) Multimedia object management

Data Independence: Flexible access to a variety of distributed databases for one or more applications requires that the data be independent from the application so that future applications can access the data without constraints related to a previous application. Important features of data independent design are:

1. Storage design is independent of specific applications.

2. Explicit data definitions are independent of application programs.

3. Users need not know data formats or physical storage structures .

4. Integrity assurance is independent of application programs.

5. Recovery is independent of application programs .

Common Distributed Database Architecture: Employment of Common Distributed database architecture is presented by the insulation of data from an application and distributed application access.

Key features of this architecture are:

1.The ability for multiple independent data structures to co-exist in the system (multiple server classes).

2.Uniform distributed access by clients.

3.Single point for recovery of each database server.

4.Convenient data re-organization to suit requirements.

5.Tunability and creation of object classes.
6.Expandibility.

Distributed database servers

 A database server is a dedicated resource on a network accessible to a number of applications, When a large number of users need to access the same resources, problem arises. This problem is solved by setting up multiple data servers that have copies of the same resources. Distributed

Data servers Distributed database servers are a dedicated resource on a network accessible to a number of applications. The database server is built for growth and enhancement, and the network provides the opportunity for the growth of applications and distributed access to the data.

Multimedia Object Management

The object management system must be capable of indexing, grouping and storing multimedia objects in distributed hierarchical optional storage systems, and accessing these objects on or keyed basis. The design of the object management system should be capable indexing objects in such a manner that there is no need to maintain multiple storage copies. Multimedia transactions are very complex transactions. We define a multimedia transaction as the sequence of events that starts when a user makes a request to display, edit, or print a hyper media document. The transaction is complete when the user releases the hypermedia document and stores back the edited versions or discards the copy in memory (including virtual memory) or local storage.

Transaction management for Multimedia Systems

It is defined as the sequence of events that starts when a user makes a request to create, render, edit, or print a hypermedia document. The transaction is complete when the user releases the hypermedia document and stores back any edited versions or discards the copy in memory or local storage.

Use of object classes provides an excellent way for managing and tracking hypermedia documents, Given that all components of a hypermedia document can be referenced within an object as attributes, we can find a solution for the three-dimensional transaction management problem also in the concept of objects.

MULTIMEDIA INFORMATION SHARING AND RETRIEVAL

Social Media Sharing

Social networking is the ultimate manifestation of user generated content, and as such, holds more potential for growth than any other form of content on the Web today. User Generated Content (UGC) and Social Networks are transforming the media ecosystem. Today's media model is collaborative, collective, customized and shared. It's a world in which the consumer is the creator, consumer and distributor of content. Today there are over a billion content creators and hundreds of millions of distributors. The proliferation of quality, affordable technology and the popularity of social networks and UGC sites have forever changed the media landscape.

Social media platforms such as YouTube, Wikipedia, Yelp, WhatsApp, and Twitter enable users to interact with each other through the generation and sharing of content. One can create and share content, as well as participate in online discussions. For example one can create a blog post and then share over social networks, and invite discussion around the content. The media is thus, "social" in the sense that it can be shared, easily disseminated and discussed online. Social Media refers not the content, but to the channels through which content is distributed and consumed. UGC is thus one of the many types of content that is shared or disseminated over social media. Social Media need not be a channel for just UGC. Content consumed and shared on social media can of course also be mainstream media, or corporate or organizational media, rather than only UGC. In this sense, social media operates as an amplifier for existing media

channels. Many mainstream media outlets, also have social media channels (e.g. Twitter streams or Facebook pages) to amplify the existing dissemination of such content.

User-Generated Media Content Sharing
Social media involves the confluence of online social networking and user-generated content. It refers in part to the platforms for content generation and consumption: Facebook, Twitter and YouTube are examples of social media. It allows for dissemination of content in a peer-to-peer rather than unidirectional manner such as is done by television, radio, newspapers and some news websites. The common thread across the social networking platforms is that they contain user-generated content (UGC).

UGC is material that a platform sources from its own end-users. Part of the crowd sourcing movement, UGC ranges from videos on YouTube to posts on Wikipedia to reviews on Yelp. All social media platforms contain UGC. However, not all UGC is contained on traditional social media platforms. Virtually all online platforms—ranging from online newspapers to online marketplaces rely to some extent on UGC. UGC is dramatically transforming the media landscape. In addition to producing unprecedented amounts of information, UGC raises a variety of new intellectual and practical questions and challenges.

User Generated Content (UGC), also known as consumer-generated media (CGM), refers to any material created and uploaded to the Internet by non-media professionals, whether it's a comment left on Amazon. com, a professional-quality video uploaded to YouTube, or a student's profile on Facebook. UGC refers to content that is created by Internet users, often through content platforms such as BlogSpot, WordPress, Twitter, Facebook, Instagram, Wikipedia, and YouTube. UGC includes blog posts, podcasts, online videos, tweets and status updates. It is currently one of the fastest growing forms of content on the Internet. UGC is fundamentally altering how audiences interact with the Internet, and how advertisers reach those audiences.Still, obstacles remain that prevent advertisers from taking advantage.

In comparison to traditional media content, UGC development and distribution is neither expensive nor technically complex. Content quality is not guaranteed through traditional media gatekeepers. Content curation (selection of content for publishing and dissemination) is not centralized, as it is with traditional or "old media". while with UGC internet access and computer and web literacy are the only prerequisites for distribution. With regards to UGC, there are many active creators and a large supply of content that can engage viewers, although of potentially lower or more diverse quality. Users are also inspired by, and build on, existing works as in the traditional media chain. Users select what does and does not work, for example, through recommending and rating, possibly leading to recognition of creators who would not be selected by traditional media publishers.

Types of User-generated Content	Prominent Platforms
Pictures	Instagram, Pinterest, Snapchat, Flickr
Personal Updates and Networking	Twitter, FourSquare, Facebook, LinkedIn
Reviews for Products and Services	Yelp, Rotten Tomatoes, ZocDoc, Amazon
Encyclopedia and Reference Sites	Wikipedia, Wikia
Videos	YouTube, Vine
Comments on News Articles	NY Times Online, WSJ Online
Crowdfunding	Crowdrise, Kickstarter, IndieGoGo
Sharing Platforms	Uber, Airbnb, Couchsurfing
Social Payments	Venmo, Square
Discussion / Question and Answer	Reddit, Quora, StackOverflow
Blogs	Tumblr, WordPress

The concept of user-generated information has spread well beyond encyclopedias. Consumers now turn to Yelp to find new restaurants, TripAdvisor to plan a vacation, Rotten Tomatoes to find a movie, 99 acres, Magic Bricks for Selling and Renting Houses and Buildings, ZocDoc to check on physicians reputations, and Amazon reviews when purchasing anything ranging from a book to a vacuum cleaner to cat food. With the click of a button, consumers can share experiences, information etc.

Media Propagation in Online Social Networks

Online Social Networks became a major source of information in the news media. When "connected" to the right persons one may find relevant information and opinions faster or is able to publish content which is not represented in the traditional media. The content consists and combines multiple types of information like video, audio, images and text. By analyzing and understanding large scale social networks, policy makers, companies and users of Online Social Networks (OSNs) could profit from each other. Social Networks evolve over time. Users are linking with new friends or follow others having similar interests.

As content usually propagates along the relations in a OSN the interesting questions are: • How far is content being propagated and how fast? • Who are the influential spreaders? Having knowledge of this process can be used to assist community detection as well as understanding human behavior in large groups. Examples of heterogeneous networks include rating networks consisting of people and objects such as songs, movies, books, etc. Such networks can be found in media appraisal and consumption platforms such as Last.fm and Flixster. Here, people may be connected to one another via friendship or acquaintance, whereas objects (songs, movies, etc.) may be linked with one another by means of similarity of their metadata. For example, two songs may be linked since both are in the same genre or by the same artist. Similarly, two movies may be directed by the same director. In addition, links may be present between people and objects owing to their rating relationship: e.g., user Sam rating a specific model of Nikon SLR Camera produces a link between the corresponding nodes. Another example of a heterogeneous network is a scientific collaboration network between authors, augmented with articles (that are the result of collaboration), and the venues they are published in. is network consists of three types of nodes—authors, articles, and venues—and links between nodes of the same type as well as between nodes of different types.

Examples of Information Propagation

Some concrete examples of propagations or information cascades in current online social networking sites. Consider Facebook, where a user Sally updates her status or writes on a friend's wall about a new show in town that she enjoyed. Information about this action is typically communicated to her friends. When some of Sally's friends comment on her update, that information is passed on to their friends and so on. In this way, information about the action taken by Sally has the potential to propagate transitively through the network. Sam posts ("tweets") in Twitter about a nifty camera he bought which he is happy about. Some of his followers on Twitter reply to his tweet while others retweet it. In a similar fashion, viewing of movies by users tends to propagate on Flixster and MovieLens, information about users joining groups or communities tends to spread through Flickr, adoption of songs and artists by listeners spreads through last.fm, and interest in research topics propagates through scientific collaboration networks.

In the business area, a famous case demonstrating information propagation leading to commercial success, is the Hotmail phenomenon . In the early 1990s, Hotmail was a relatively unknown e-mail service provider. They had a simple idea, which was appending to the end of each mail message sent by their users the text "Join the world's largest e-mail service with MSN Hotmail. http://www.hotmail.com." This had the effect of building and boosting a brand. In a mere 18 months, Hotmail became the number one e-mail provider, with 8 million users. The underlying phenomenon was that a fraction of the recipients of Hotmail messages were inspired by the appended message to try it for themselves. When they sent mail to others, a fraction of them felt a similar temptation. This phenomenon propagated transitively and soon, adoption of Hotmail became viral.

On November 16, 2011, a song from the soundtrack of a then upcoming Indian (Tamil) movie, called "Why this kolaveri di?" was released. By November 21, it was a top trend in Twitter. Within a week of its release, it had attracted 1.3 million views on YouTube and more than a million "shares" on Facebook, reaching and propagating through many non-Tamil speakers. It eventually went on to win the Gold Award from YouTube for most views (e.g., 58 million as of June 2012) and was featured in mainstream media such as Time, BBC, and CNN.

Content based Retrieval in Digital Libraries

The advance of computer technology makes it possible to include a colossal amount of information in various formats in a digital library. In addition to traditional text-based documents such as books and articles, other types of materials—including images, audio, and video—can also be easily digitized and stored. Therefore, how to retrieve and present this multimedia information effectively through the interface of a digital library is of great significance.

Currently, there are three methods of retrieving information in a digital library. The first and the easiest way is free browsing. By this means, a user browses through a collection and looks for desired information. The second method—the most popular technique used today—is textbased retrieval. Through this method, textual information (full text of text-based documents and/or metadata of multimedia documents) is indexed so that a user can search the digital library by using keywords or controlled terms. The third method is content-based retrieval, which enables a user to search multimedia information in terms of the actual content of image, audio, or video.

Some content features that have been studied so far include color, texture, size, shape, motion, and pitch.

A patron comes to a public library with a picture of a rare insect. Without expertise in entomology, the librarian won't know where to start if only a text-based information retrieval system is available. However, with the help of content-based image retrieval, the librarian can upload the digitized image of the insect to an online digital image library of insects, and the system will retrieve similar images with detailed description of this insect. Similarly, a patron has a segment of music audio, about which he or she knows nothing but wants to find out more. By using the content-based audio retrieval system, the patron can get similar audio clips with detailed information from a digital music library, and then listen to them to find an exact match. This procedure will be much easier than doing a search on a text-based music search system. It is definitely helpful if a user can search this non-textual information by styles and features.

Ideally, a content-based information retrieval system can understand the multimedia data semantically, such as its objects and categories to which it belongs. Therefore, a user is able to submit semantic queries and retrieve matched results. However, a great difficulty in the current computer technology is to extract high-level or semantic features of multimedia information.

A typical content-based information retrieval system works in this way: First, for each multimedia file in the database, certain feature information (e.g., color, motion, or pitch) is extracted, indexed, and stored. Second, when a user composes a query, the feature information of the query is calculated as vectors. Finally, the system compares the similarity between the feature vectors of the query and multimedia data, and retrieves the best matching records. If the user is not satisfied with the retrieved records, he or she can refine the search results by selecting the most relevant ones to the search query, and repeat the search with the new information.

REVIEW QUESTIONS

2 Marks

1. What is compression ?
2. What is Non-lossy compression /
3. List any four non-lossy compression standards.
4. What is lossy compression ?
5. Expand JPEG.
6. What is the use of JPEG?
7. Expand MPEG.
8. List some lossy compression standards.
9. What do you mean by Asymmetrical applications ?
10. What is binary image ?
11. List some binary image compression scheme.
12. Define DCT.
13. What is the function of Quantizer?
14. What is Entropy?
15. What do you mean by symmetrical compression?
16. What is video image?
17. What is interframe compression?
18. List some video standards.

19. Expand AVI.
20. What is dynamic range compression?
21. List some audio compression techniques.
22. What is silence compression?
23. What are fractals?
24. What are the disadvantages of fractal compression?
25. Expand RTF.
26. Expand RIFF,
27. Define chunks.
28. What are the file name extensions of RIFF?
29. What are the advantages of GIF?
30. Expand PNG.
31. Expand TIFF.
32. Expand MIDI.
33. What is MIDI.
34. What are the file name extension of JPEG?
35. Expand JFIF.
36. What are the disadvantages of AVI?
37. Give examples of bitmap images?
38. Expand WMF.
39. What is the use of TWAIN?
40. List the layers of TWAIN architecture.
41. What are the two major mass storage technology?
42. What is transmission latency?
43. What do you mean by RDBMS Extension?
44. What is BLOB?
45. What are the object oriented principles used in multimedia database?
46. What is distributed database Server?
47. What does the Multimedia object management do?
48. What is content based retrieval.
49. What are digital libraries.
50. What are Online social Networks.
51. What is a user generated content.
52. What is media propagation.

3 marks

1. What is the need for data compression.
2. What is the difference between symmetrical and asymmetrical compression.
3. Distinguish a lossy compression from Non lossy compression.
4. What are the various Lossy and Non lossy compression standards.
5. How does a hardware compression differ from a software compression.
6. Explain the various characteristics of color.
7. Explain fractal compression.
8. What are the advantages and disadvantages of fractal compression.
9. Explain RTF in detail.
10. Explain RIFF in detail.

11. Explain TIFF structure.
12. What is MIX.
13. What are the advantages of optical file system.
14. What is data independence.
15. What is common Distributed architecture.
16. What is a distributed database server.
17. What is multimedia object management.
18. What is transaction management.

10 Marks

1. (a) Write abou the need of compression.
   (b) Explain lossy compression schemes.

2. (a) Explain Non-lossy compression schemes.
   (b) Explain Binary image compression.

3. (a) Explain briefly about JPEG compression.
   (b) Explain various standards of Video.

4. (a) Write about the requirements for full-motion video compression.
   (b). Explain the various techniques for audio compression.

5. (a) Write about fractal compression.
   (b) Explain RTF and RIFF.

6. (a) Explain MIDI.
   (b) Write about any five popular file formats.

7. (a). Explain JPEG and MPEG Compression standards
   (b) Explain TWAIN architecture.

8. (a) Write about storage and retrieval methods.
   (b) Explain DBMS for multimedia.

9. (a) Explain database organization for multimedia.
   (b) Write about Transaction management of multimedia.

10. Explain Content based retrieval in digital library.

11. Explain Media Propagation in online social networks.

12. Explain User Generated Content sharing in social media.

UNIT IV

MULTMEDIA DEVICES AND MAKING MULTIMEDIA

MULTIMEDIA INPUT/OUTPUT TECHNOLOGIES

There are a number of devices used to input the multimedia data into the system as well as output devices used to playback or display the data from the system. For example keyboard, mouse, scanner, microphone and camera are the multimedia input devices. Printer, monitor, projector and speaker are the multimedia output devices.

Limitations of Traditional input devices

Keyboard is the traditional input device for entering data into a computer system. In earlier days keyboard was used only for entering numeric data. Then it was changed to alphanumeric and then it was changed to multifunction keyboard.When the Graphical User Interfaces (GUI) was introduced, the pointing device mouse became essential for selecting or moving graphical objects and menu items. Multimedia technology requires a variety of other types of data input including voice, video and images. These types of inputs require special devices such as digital pens, microphones, scanners and video cameras.

Multimedia input output devices

PEN input

In our daily life, we use paper and pen to write and draw. A digital pen is a input device that has the same paper –pen concept. Digital pen(electronic pen) is a powerful input device that allows the user to write, draw and point.

Advantages of electronic pen over mouse

- Pen input requires no training to operate.
- Pen input can perform all mouse operations such as pick, drag, drop etc.
- Palmtop computers integrated with all phones use an electronic pen to select icons.
- A pen is a more natural drawing device than a mouse.
- Writing text with electronic pen is faster than keyboard.

Working of Electronic Pen

The electronic pen is managed by a special system in Microsoft windows called pen computing system. The pen computing system consists of the following.

- Electronic pen
- Digitizer
- Pen driver
- Recognition context manager(RC manager)
- Recognizer

- Dictionary
- Display driver

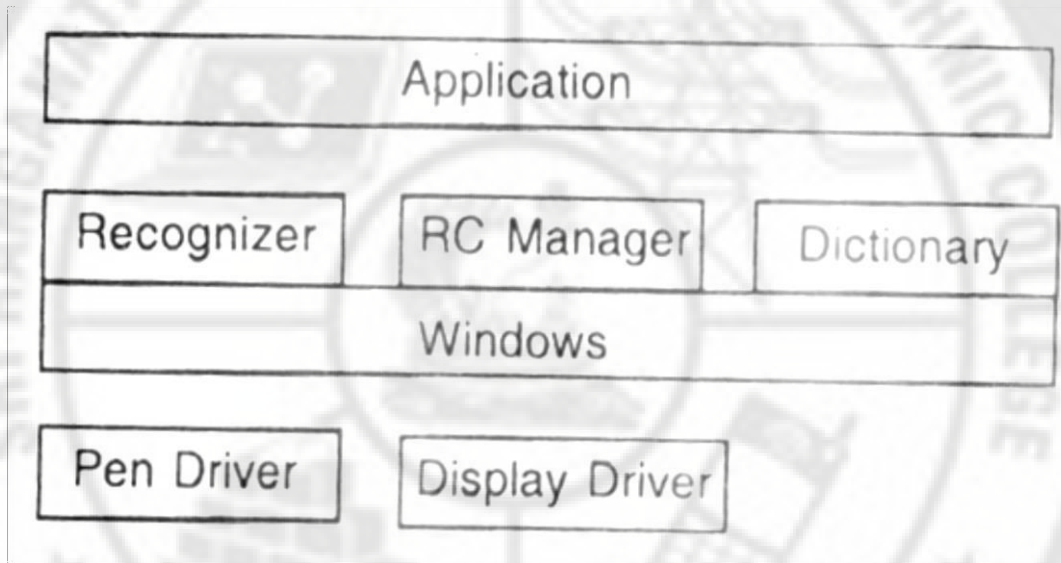The following figure 4.1 shows the windows pen computing system.

Figure 4.1 Electronic Pen

Electronic pen: The electronic pen is used to write or draw as input

Digitizer   : The digitizer generates the pen position(x,y) distance of the pen from screen surface, and pen contact with the screen.

Pen driver   : A device driver that collects all pen information and build pen packets and send to RC Manager.

RC manager : RC manager is the heart of the pen system. It works with the recognizer, dictionary and   device drivers.

Recognizer   : It recognizes the hand written characters and converts to ASCII.

Dictionary   : It receives characters from the recognizer and make them words and sentence.

Display driver : It helps the objects whether any character or symbols exist on the screen. It creates a   new cursor on the screen.

Video and image display systems

Most of the applications are windows based with menus, icons, graphics, 3D drawings and so on. High resolution display systems are required to present these objects. The performance of a display system is affected by three major factors.

- Network bandwidth
- Decompression and decoding

- Display technology

Bandwidth is measured by the amount of data transmitted per second. If the bandwidth becomes low, it is seen as a delay in the display of records or image. The compressed data must be decompressed before display. In the case of poor decompression, it causes an irritating delay for the user. The performance of the display is also affected by the display technologies includes sufficient video memory, dual buffering system, etc.

Video display technology

The earlier video standards became inadequate because of the current advanced technology and user demands for higher resolution. Various earlier and newer video standards are listed below:

Table 4.1.Video Standards

S.No	Technology	Feature
1.	MDA (Monochrome Display Adapter)	This standard was introduced in 1981 to display only text. It cannot be used for images. Its resolution is 720 x 350 pixels.
2.	CGA(Color Graphics Adapter)	This standard was introduced in 1981. It can display text in 640 x200 resolution and graphics in 640x300 resolution.
3.	MGA(Monochrome Graphics Adapter)	This standard was introduced in 1982. It can display text in 720x350 resolution and graphics in 720x338 resolution.
4.	EGA(Enhanced Graphics Adapter)	This standard was introduced in 1984. It can display text in 640x350 resolution and graphics in 640x200 resolution with 16 colors.
5.	PGA(Professional Graphics Adapter)	It was introduced in 1985, specifically to display bitmap graphics at 640x480 resolution with 256 colors.
6.	VGA(Video Graphics Array)	It was introduced in 1987. It can display text in 720x400 resolution and the RGB signals to display 256 colors in 640x480 resolution.
7.	SVGA(Super VGA)	It was introduced by Video Electronics Standard Association(VESA) in 1989. Its goal is to develop a standard for a higher resolution than VGA. Its display resolution is 1024x768 pixels.
8.	XGA(Extended Graphics Array)	XGA is VGA compatibility in addition a resolution of 1024x768 pixels in 256 colors.

CRT

The system that generates the visual output of text, graphics and video is known as display system . For video display, CRT monitor is being used for long years. Most CRT monitor manufactures attempt to support as many standards as they can with the same monitor

electronics. For most applications, VGA resolution is sufficient to display text and images in a 14 inch monitor.

Working of a CRT monitor

A Cathode Ray Tube (CRT) monitor works by illuminating millions of tiny red, blue and green phosphor dots with a beam of electrons.
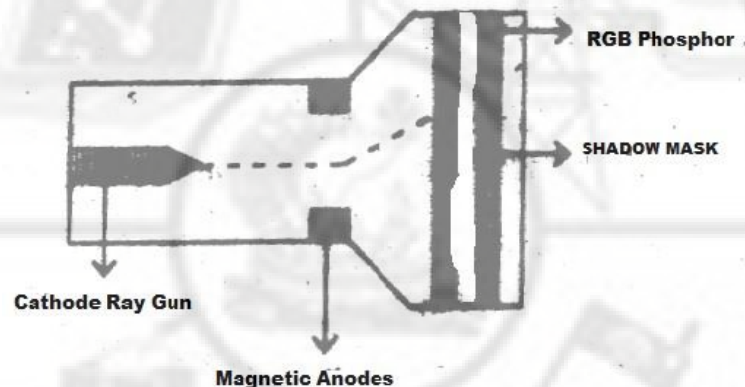

Figure 4.2 Cathode Ray Tube

The above figure shows the working principle of a CRT monitor. A cathode ray tube behind the monitor's Screen contains a filament that held in a vacuum. The filament generates negatively charged electrons when it is heated and these get attracted toward positively charged anode that is placed between the cathode and screen. This produces a beam of electrons that strike the layer of phosphor dots coating on the screen and illuminates them. To generate the correct image, the electron beam can be filtered by shadow mask.

Flat panel display system

Flat panel displays are used for notebook computers and laptop computers. It is used for both monochrome and color display. It uses LCD screen technology in two basic ways.

- Passive LCD Matrix Display
- Active LCD Matrix Display

Passive LCD Matrix Display

A passive LCD screen is organized in a matrix consisting of 640x480 pixels(640 columns and 480 rows of pixels). The address of each pixel is defined by its x and y position in the matrix. The address of the first pixel is (0,0) and the address of the last pixel is(639,479). In the passive matrix system, each column has a separate electronic driver to drive or to address but there is only one row driver to drive or address the pixel. For example to illuminate the pixels (255,198) and (340,198), column driver 255 and 340 is turned on and the row driver 198 its turned on. This

takes more time to display. To overcome the time delay the matrix is divided into the halves and each half is independently operated.

Active LCD Matrix Display

An active LCD matrix display contains 640x480 pixels same as passive LCD matrix display. It is faster than passive LCD matrix system because the number of transistors used is very high. For example there are 640x480x3=921600 transistors used for VGA and 800x600x3=1,440,000 transistors are used for SVGA display. **Active-matrix** LCDs depend on **thin film transistors** (TFT). Basically, TFTs are tiny switching transistors and capacitors. They are arranged in a matrix on a glass substrate. To address a particular pixel, the proper row is switched on, and then a charge is sent down the correct column. Since all of the other rows that the column intersects are turned off, only the capacitor at the designated pixel receives a charge. The capacitor is able to hold the charge until the next refresh cycle. And if we carefully control the amount of voltage supplied to a crystal, we can make it untwist only enough to allow some light through.

PRINT OUTPUT, IMAGE, AUDIO AND VIDEO TECHNOLOGIES

Print Out Technologies

There are various printing technologies available namely Dot matrix, inkjet, laser printer and ink jet color printer.. But, laser printing technology is the most common for multimedia systems.

Laser printing

Laser printers are the suitable printers for multimedia systems. Most of the laser printer in offices provides the resolution ranging from 300 to 600 dpi. This resolution is more than enough for office purpose. But multimedia systems require higher resolution ranging from 600 to 1200 dpi. Laser printer can print all types of documents including graphics and images.

The basic components of the laser printer are :

- Paper feed mechanism
- Corona wires
- Paper guide
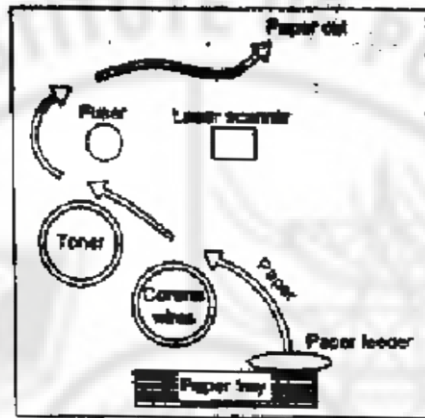- Laser assembly
- Fuser
- Toner cartridge.

Figure 4.3 Laser Printing

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

Role of Software in the printing mechanism:

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

Dye sublimation printer

Dye sublimation printer is more suitable to multimedia applications because it prints in color and in high quality. It is very useful to print photographic quality prints and so the graphic artists, advertising agencies, film industries use this printer.

Working principle

The major parts of the dye sublimation printer includes

- Thermal printing head
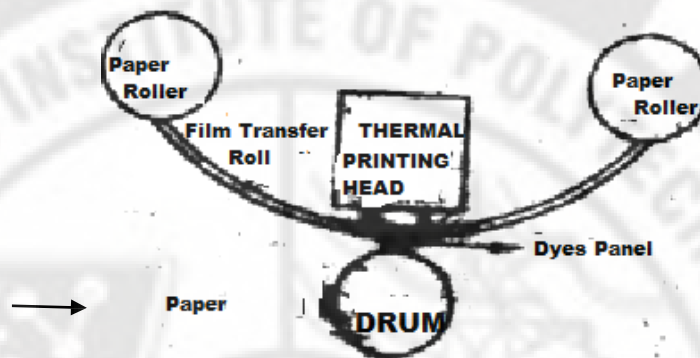- Paper rollers 2 nos
- Film transfer roll
- Drum
- Color dyes panel

Figure 4.4 Dye Sublimation Printer

The thermal printing head contains thousands of tiny heating elements. The film transfer roll contains a panel of cyan, magenta, yellow and black dyes. During printing, individual heating elements are heated in different heating levels based on the color. The dye panel is rolled under the head and cyan dye is heated first into a vapor state. This state is called sublimation. This vapor is absorbed by the paper in the drum. The paper is coated with polyester to help absorb the dye quickly. This process is then repeated for other three dyes magenta, yellow and black to create a photographic quality print

Color printing technology issues
There are some draw backs in color printing. These issues are categorized as
- Pre Printing Problems
- Post Printing Problems

Pre Printing Problems
- The color range of the printer and the monitor do not match. Printer uses the CMYK (cyan, magenta, yellow, black) color range while the monitor uses RGB(Red,Green,Blue) color range.
- Each technology has its own color range.
- Even after the devices are calibrated, the colors vary when printed.

Post Printing Problems
- Some colors cannot be dithered (Dithering is the process of adjusting to the nearest color).
- When colors like cyan and magenta are mixed, sometimes they generate a repetitive pattern called moiré pattern.
- Colors look different for different output medium. For example colors on a glass paper look very different from the same color on a paper.

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

Types of Scanners

A and B size Scanners, large form factor scanners, flat bed scanners, Rotory drum scanners and hand held scanners are the different types of scanners.

All scanners use charge-coupled devices (CCD) as their photo sensors. CCDs consists of cells arranged in a fixed array on a small square or rectangular solid state surface. Light source moves across a document. The intensity of the light reflected by the mirror charges those cells. The amount of charge is depending upon intensity of the reflected light, which depends on the pixel shade in the document.

Digital Voice and Audio

4.2.7.1.Digital Audio

Sound is made up of continuous analog sine waves that tend to repeat depending on the music or voice. The analog waveforms are converted into digital format by analog-to-digital converter (ADC) using sampling process.
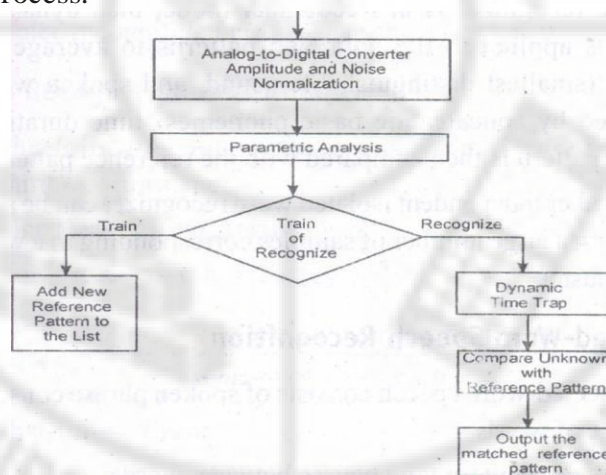

Figure 4.5 Digital Audio

Sampling process

Sampling is a process where the analog signal is sampled over time at regular intervals to obtain the amplitude of the analog signal at the sampling time.

Sampling rate

The regular interval at which the sampling occurs is called the sampling rate.

Digital Voice

Speech is analog in nature and is converted to digital form by an analog-to-digital converter (ADC). An ADC takes an input signal from a microphone and converts the amplitude of the sampled analog signal to an 8, 16 or 32 bit digital value.

The four important factors governing the ADC process are

- sampling rate
- Resolution
- linearity and conversion speed.

Sampling Rate: The rate at which the ADC takes a sample of an analog signal.

Resolution: The number of bits utilized for conversion determines the resolution of ADC.

Linearity: Linearity implies that the sampling is linear at all frequencies and that the amplitude only represents the signal.

Conversion Speed: It is a speed of ADC to convert the analog signal into Digital signals. It must be fast enough.

Voice Recognition System

Voice Recognition Systems can be classified into three types.

1. Isolated-word Speech Recognition.

2. Connected-word Speech Recognition.

3. Continuous Speech Recognition.

1. Isolated-word Speech Recognition.

It provides recognition of a single word at a time. The user must separate every word by a pause. The pause marks the end of one word and the beginning of the next word.

Stage 1: Normalization

The recognizer's first task is to carry out amplitude and noise normalization to minimize the variation in speech due to ambient noise, the speaker's voice, the speaker's distance from and position relative to the microphone, and the speaker's breath noise.

Stage2: Parametric Analysis

It is a preprocessing stage that extracts relevant time-varying sequences of speech parameters. This stage serves two purposes: (i) It extracts time-varying speech parameters. (ii) It reduces the amount of data of extracting the relevant speech parameters.

Training mode In training mode of the recognizer, the new frames are added to the reference list.

Recognizer mode If the recognizer is in Recognizer mode, then dynamic time warping is applied to the unknown patterns to average out the phoneme (smallest distinguishable sound, and spoken words are constructed by concatenating basic phonemes) time duration. The unknown pattern is then compared with the reference patterns.

A speaker independent isolated word recognizer can be achieved by grouping a large number of samples corresponding to a word into a single cluster.

Connected-Word Speech Recognition

Connected-word speech consists of spoken phrase consisting of a sequence of words. It may not contain long pauses between words. This method uses Word Spotting technique .It Recognizes words in a connected-word phrase. In this technique, Recognition is carried out by compensating for rate of speech variations by the process called dynamic time warping (this process is used to expand or compress the time duration of the word), and sliding the adjusted connected-word phrase representation in time past a stored word template for a likely match.

Continuous Speech Recognition

This system can be divided into three sections:

(i) A section consisting of digitization, amplitude normalization, time nonnalization and parametric representation.

(ii) Second section consisting of segmentation and labeling of the speech segment into a symbolic string based on a knowledge based or rule-based systems.

(iii) The final section is to match speech segments to recognize word sequences.

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Digital Camera

Digital cameras are used to capture images and stored in digitized form. They are small and easy to use. Digital camera does not use photographic films but it uses light sensitive electronic devices to capture images.

Working principle
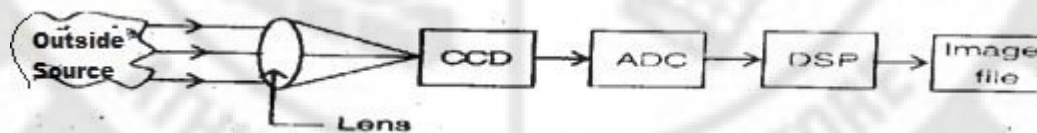The following figure shows the operation of a digital camera.

Figure 4.6 Digital Camera

The light from the focused object is passed through a lens. The lens send the signals to CCD(Charge Coupled Devices) CCD is an array of photo sensors that generates an electric current proportion to the intensity of the light. Then CCD passes the light signal to ADC. The ADC converts the analog signal to digital. Digital Signal Processor (DSP) controls the contrast and other details of the image and compress it. Then the image is stored as files such as JPG and GIF.

Advantages
- Photographic film is not necessary
- Easy to use
- High quality images
- Images require less storage space
- Images can be edited by software

Video Frame Grabber
A video frame grabber is used to capture, manipulate and enhance video images. A video frame grabber card consists of video channel multiplexer, Video ADC, Input look-up table with arithmetic logic unit, image frame buffer, compression-decompression circuitry, output color look-up table, video DAC and synchronizing circuitry.

A video channel multiplexer has multiple inputs for different video inputs. The video channel multiplexer allows the video channel to be selected under program control and switches to the control circuitry appropriate for the selected channel in a TV with multi – system inputs. Analog to Digital Converter: The ADC takes inputs from video multiplexer and converts the amplitude of a sampled analog signal to either an 8-bit digital value for monochrome or a 24 bit digital value for color.

Input lookup table: The input lookup table along with the arithmetic logic unit (ALU) allows performing image processing functions on a pixel basis and an image frame basis. The pixel image-processing functions ate histogram stretching or histogram shrinking for image brightness and contrast, and histogram sliding to brighten or darken the image. The frame-basis image-processing functions perform logical and arithmetic operations.

Image Frame Buffer Memory: The image frame buffer is organized as a l024 x 1024 x 24 storage buffer to store image for image processing and display.

Video Compression-Decompression: The video compression-decompression processor is used to compress and decompress still image data and video data.

Frame Buffer Output Lookup Table: The frame buffer data represents the pixel data and is used to index into the output look uptable. The output lookup table generates either an 8 bit pixel value for monochrome or a 24 bit pixel value for color.

SVGA Interface: This is an optional interface for the frame grabber. The frame grabber can be designed to include an SVGA frame buffer with its own output lookup table and digital-to-analog converter.

Analog Output Mixer: The output from the SVGA DAC and the output from image frame buffer DAC is mixed to generate overlay output signals. The primary components involved include the display image frame buffer and the display SVGA buffer. The display SVGA frame buffer is overlaid on the image frame buffer or live video, This allows SVGA to display live video
.

 Video and Still Image Processing
Video image processing is defined as the process of manipulating a bit map image so that the image can be enhanced, restored, distorted, or analyzed. Let us discuss about some of the terms using in video and still image processing.

a. Pixel point to point processing
In pixel point-to-point processing, operations are carried out on individual pixels one at a time.
Histogram Sliding: It is used to change the overall visible effect of brightening or darkening of the image. Histogram sliding is implemented by modifying the input look-up table values and using the input lookup table in conjunction with arithmetic logic unit.
Histogram Stretching and Shrinking: It is to increase or decrease the contrast. In histogram shrinking, the brighter pixels are made less bright and the darker pixels are made less dark.
Pixel Threshold: Setting pixel threshold levels set a limit on the bright or dark areas of a picture. Pixel threshold setting is also achieved through the input lookup table.

b.Inter- frame image processing
 Inter- frame image processing is the same as point-to-point image processing, except that the image processor operates on two images at the same time. The equation of the image operations is as follows:
Pixel output (x, y) = (Image l(x, y) Operator (Image 2(x, y)
Image Averaging: Image averaging minimizes or cancels the effects of random noise.

Image Subtraction: Image subtraction is used to determine the change from one frame to the next .for image comparisons for key frame detection or motion detection.

Logical Image Operation: Logical image processing operations are useful for comparing image frames and masking a block in an image frame.

b.Spatial Filter Processing

The rate of change of shades of gray or colors is called spatial frequency. The process of generating images with either low-spatial frequency-components or high frequency components is called spatial filter processing.

Low Pass Filter: A low pass filter causes blurring of the image and appears to cause a reduction in noise.

High Pass Filter: The high-pass filter causes edges to be emphasized. The high-pass filter attenuates low-spatial frequency components, thereby enhancing edges and sharpening the image.

Laplacian Filter: This filter sharply attenuates low-spatial-frequency components without affecting and high-spatial frequency components, thereby enhancing edges sharply.

c.Frame Processing

Frame processing operations are most commonly for geometric operations, image transformation, and image data compression and decompression Frame processing operations are very compute intensive many multiply and add operations, similar to spatial filter convolution operations.

Image scaling: Image scaling allows enlarging or shrinking the whole or part of an image.

Image rotation: Image rotation allows the image to be rotated about a center point. The operation can be used to rotate the image orthogonally to reorient the image if it was scanned incorrectly. The operation can also be used for animation.

Image translation: Image translation allows the image to be moved up and down or side to side. Again, this function can be used for animation. Tx and Ty are the horizontal and vertical coordinates. $x,$ y are the spatial coordinates of the original pixel.

Image transformation: An image contains varying degrees of brightness or colors defined by the spatial frequency. The image can be transformed from spatial domain to the frequency domain by using frequency transform.

Video Camera

Video cameras are used to capture live full-motion video. The multimedia video camera differ from commercial video camera.

A video camera works with three basic parts.

      a. Camera unit
     b. VCR unit
    c. View finder unit

The camera unit consists of lens and charge coupled devices(CCD) and motors that are used to focus, zoom and lighting. The VCR unit is located inside the camera that records the video on tapes. The view finder allows the user to see what is shooting and receives the video image.

Full Motion Video Controllers

Full motion video controllers are used to control the overall operations such as capturing video, recording video and playback the video.

Video Capture Board

A full-motion video capture board is a circuit card in the computer that consists of the following components:

(i) Video input to accept video input signals.

(ii) S- Video input to accept RS 170 input.

(iii) Video compression-decompression processor to handle different video compression-decompression algorithms for video data.

(iv) Audio compression-decompression processor to compress and decompress audio data.

(v) Analog to digital converter.

(vi) Digital to analog converter.

(vii) Audio input for stereo audio LINE IN, CD IN.
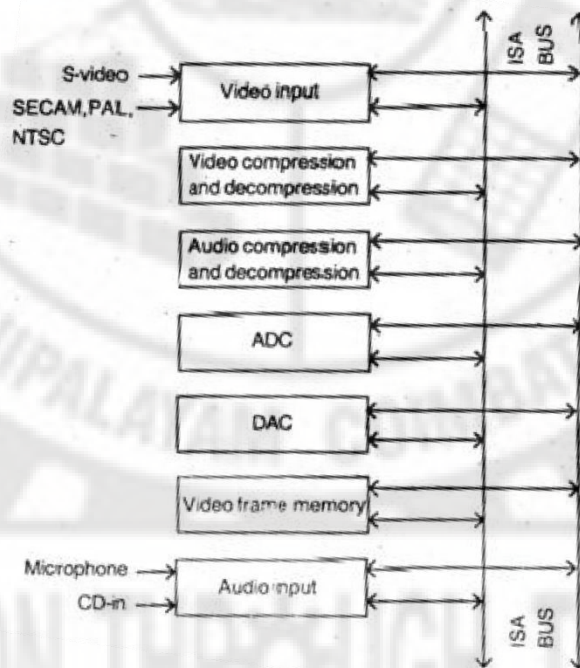
(viii) Microphone.

Figure 4.7 Video Capture Board

A video capture board can handle a variety of different audio and video input signals and convert them from analog to digital or digital to analog.

Video Channel Multiplexer: It is similar to the video grabber's video channel multiplexer.

Video Compression and Decompression: A video compression and decompression processor is used to compress and decompress video data. The video compression and decompression processor contains multiple stages for compression and decompression. The stages include forward discrete cosine transformation and inverse discrete cosine transformation, quantization and inverse quantization, ZigZag and Zero run-length encoding and decoding, and motion estimation and compensation.

Audio Compression: MPEG-2 uses adaptive pulse code modulation (ADPCM) to sample the audio signal. The method takes a difference between the actual sample value and predicted sample value. The difference is then encoded by a 4-bit value or 8-bit value depending upon the sample rate

Analog to Digital Converter: The ADC takes inputs from the video switch and converts the amplitude of a sampled analog signal to either an 8-bit or 16-bit digital value.

MAKING MULTIMEDIA

The basic stages of a multimedia project are planning and costing, design and production, testing and delivery.Knowledge of hardware and software, as well as creativity and organizational skills are essential for creating a high-quality multimedia project.

The Stages of a Multimedia Project

Most multimedia and web projects must be undertaken in stages. Here are the four basic stages in a multimedia project:

a. **Planning and costing**
   - The needs of a project are analyzed by outlining its messages and objectives.
   - A plan that outlines the required multimedia expertise is prepared.
   - A graphic template, the structure, and navigational system are developed.
   - A time estimate and a budget are prepared.
   - A short prototype or proof-of-concept is prepared.
b. **Design and production:**
   - The planned tasks are performed to create a finished product.
   - The product is revised, based on the continuous feedback received from the client.
c. **Testing**
   The program is tested to ensure that it meets the objectives of the project, works on the proposed delivery platforms, and meets the client requirements.
d. **Delivering**
   The final project is packaged and delivered to the end user.

Creativity

The most precious asset to the multimedia workshop is creativity. It's what separates underwhelming multimedia from compelling, engaging, and award-winning products. There is a lot of room for taking risks in making multimedia because there are few known formulas for multimedia success. Taking inspiration from earlier experiments, developers modify and add their own creative touches for designing their own unique multimedia projects. In a multimedia project, being creative implies knowledge of hardware and software.

Organization

It's essential that an organized outline and a plan is developed that rationally details the skills, time, budget, tools, and resources needed for a project. These should be in place before starting

to render graphics, sounds, and other components. A protocol should be established for naming the files so that it can be quickly retrieved when necessary.

Communication

Many multimedia applications are developed in workgroups comprising instructional designers, writers, graphic artists, programmers, and musicians located in the same office space or building. Communication among workgroup members and with the client is essential to the efficient and accurate completion of the project. and is connected to the Internet, a combination of Skype video and voice telephone, e-mail, and the File Transfer Protocol (FTP). Hence in the workplace, use of quality equipment and software for the communications is required.

Hardware

Computer used for multimedia should have high end hardware. Hardware interprets your commands into computer activity. Hence a fast computer with lot of speed and storage is required. The components that make up the hardware of the computer includes processor, motherboard and memory. Processor is basically the heart of the computer. When you turn your computer on, it is the processor, which performs the startup operations Motherboard contains computer components like microprocessor, memory, basic input/output system (BIOS), expansion slots and interconnecting circuitry. RAM (random access memory), also called primary memory, locates the operating system, application programs, and data in current use so that the computer's processor reaches them quickly. RAM might get slow when used to its limit. Hence more memory is needed to work on multimedia. Today's personal computers come with 128 or more of RAM, System devices, Memory and storage devices, Input devices, Output devices, and Communication devices.

Memory and Storage Devices

As more memory and storage space is added to the computer, computing needs will keep pace. If there are many videos, images, audios etc then more memory is needed. If *making* multimedia, then one needs to allocate memory for storing and archiving working files used during production, original audio and video clips, edited pieces, and final mixed pieces production paperwork and correspondence, and at least one backup of the project files, with a second backup stored at another location.

Random Access Memory (RAM)

In spite of a very high processor speed, this speed is ineffective if not accompanied by sufficient RAM. A fast processor without enough RAM may waste processor cycles while it swaps needed portions of program code into and out of memory. In some cases, increasing available RAM may show more performance improvement on the system than upgrading the processor chip.

Hard Disks

Adequate storage space for your production environment can be provided by large-capacity hard disks, server-mounted on a network. As multimedia has reached consumer desktops, makers of hard disks have built smaller-profile, larger-capacity, faster, and less-expensive hard disks. As network and Internet servers drive the demand for centralized data storage requiring terabytes (one trillion bytes), hard disks are often configured into fail-proof redundant arrays offering built-in protection against crashes.

Flash Memory or Thumb Drives

These flash memory data storage devices can be integrated with USB or FireWire interfaces to store from eight megabytes to several GB of data. They are extremely portable, and, because they have fewer moving parts, are more reliable than disk drives.

CD-ROM Discs and Digital Versatile Discs (DVD)

Compact disc read-only memory (CD-ROM) and Digital Versatile Discs (DVD) players have become an integral part of the multimedia development workstation and are an important delivery vehicle for mass-produced projects. A wide variety of developer utilities, graphic backgrounds, stock photography and sounds, applications, games, reference texts, and educational software are available on this medium.

Input Devices

A great variety of input devices—from the familiar keyboard and handymouse to touchscreens and voice recognition setups—can be used for the development and delivery of a multimedia project. If the project is designed for a public kiosk, a touchscreen can be used. If the project is for a lecturing professor a remote handheld mouse can be used. Scanners enable one to use optical character recognition (OCR).Other input devices include Digital cameras, Microphones etc.

Output Devices

Presentation of the audio and visual components of the   multimedia project requires hardware that may or may not be included with the computer itself, such as speakers, amplifiers, projectors, and motion video devices. The monitor required for development of multimedia projects depends on the type of multimedia application created, as wellas the computer used. A wide variety of monitors is available for both Macintoshes and PCs. High-end, large-screen graphics monitors and LCD panels are available for both, and they are expensive. No other contemporary message medium has the visual impact of video. When it is necessary to show the material to more viewers , it should be projected   onto a large screen or even a white-painted wall. Cathode-ray tube (CRT) projectors, liquid crystal display (LCD) panels, Digital Light

Processing (DLP) projectors, and liquid crystal on silicon (LCOS) projectors, as well as (for larger projects),Grating-Light-Valve (GLV) technologies, are available.

Software

Multimedia software tells the hardware what to do. The basic tool set for building multimedia projects contains one or more authoring systems and various editing applications for text, images,s ounds, and motion video. A few additional applications are also useful for capturing images from the screen, translating file formats ,and moving files among computers. The software in the multimedia toolkit and one's skill at using it—determines what kind of multimedia work one can do and how fine and fancy one can render it. Making good multimedia means picking a successful route through the software swamp. The software in the multimedia toolkit and the ability to use it will determine the quality of the multimedia work. The basic tool set for building a multimedia project can be divided into five categories: Painting and drawing tools, 3-D Modeling and animation tools, Image editing tools, Sound editing tools, Animation Video Digital Movie tool

Text Editing and Word Processing Tools
A word processor is usually the first software tool computer users learn. Your word processor may also be your most often used tool, as you design and build a multimedia project. Keyboarding and typing skills, the easier and more efficient will be your multimedia day-to-day life. Word processor comes bundled in an "office suite" that might include spreadsheet, database, e-mail;, web browser, and presentation application. Word processor such as Word and Word perfect are powerful applications that include spell checkers, table formatters, thesauruses, and pre built templates for letters, resumes, purchase orders and other common documents.

OCR Software
With optical character recognition software, a flat-bed scanner, and your computer, you can save many hours of rekeying printed words, and get the job done faster than a roomful of typists. OCR software turns bitmapped characters into electrically recognized ASCII text. A scanner typically used to create a bitmap. Then the software breaks the bitmap into chunks according to whether it contains text or graphics.

Painting and Drawing Tools
Painting and drawing tools, as well as 3-D modelers, are perhaps the most important items in your multimedia projects. To have greater impact to the end user the painting and drawing tools are used in the project Painting software such as Photoshop, Picture Publisher, and Fractal Design Painter is dedicated to producing crafted bitmap images. Drawing software such as CorelDraw, Freehand, Illustrator, Designer, and Canvas, is dedicated to producing vector based line art easily to paper using PostScript or another page markup system such as QuickDraw on the Macintosh.
Features
1) An intuitive graphical user interface with pull down menus, status bars, palette control, and dialog boxes for quick logical selection.
2) Scalable dimensions, so you can resize, stretch, and distort both large and small bitmaps.

3) Paint tools to create geometric shapes, from squares to circles and from curves to complex polygons.

4) Ability to pour a color, pattern, or gradient into any area.

5) Zooming for magnified pixel editing.

6) Customizable pen and brush shapes and sizes.

7) Good file importing and exporting capability for images formats such as PIC, GIF, TIF, WMF, BMP etc.

Modeling and Animation Tools

With 3-D modeling software, objects rendered in perspective appear more Realistic. You can create stunning scenes and wander through them, choosing just the right lighting and perspective for your final rendering image. Powerful modeling packages such as Macromedia's Extreme 3D, AutoDesk's 3D Studio Max, Strata Vision's 3D are available for objects such as people,furniture, buildings, airplanes, trees etc.,

Features

1) Multiple windows that allow you to view your model in each dimension, from the camera's perspective, and in a rendered preview.

2) Ability to drag and drop primitive shapes into a scene.

3) Lathe and extrude features

4) Color and texture mapping

5) Ability to add realistic effects such as transparency, shadowing, and fog.

6) Ability to add spot, local, and global lights, to place them anywhere, and manipulate them from special lighting effects.

7) Unlimited cameras with focal length control.

Image-Editing Tools

Imaging editing tools are specialized and powerful tools for enhancing and retouching existing bitmapped images. These applications also provide many of the features and tools of painting and drawing programs and can be used to create images from scratch as well as digitized images from scanners, video frame-grabbers and digital cameras.

Features

1) Multiple windows provide views of more than one image at a time.

2) Direct input of images from scanners and video sources.

3) Employment of virtual memory scheme that uses hard disk spaces as RAM for images that require large amount of memory.

4) Capable of selection tools, such as rectangles, lassos, and magic wands, to select portions of a bitmap.

5) Good masking feature

6) Multiple Undo and restore features

7) Color-mapping controls for precise adjustment of color balance.

8) Tools for retouching, blurring, sharpening, lightening, darkening, smudging, and tinting.

9) Ability to resample and resize an image.

10) 24-bit color, 8- or 4-bit indexed color, 8-bit gray scale, black-and-white, and customized color palettes.

11) Ability to design in layers that can be combined, hidden, and reordered.

Sound Editing Tools

Sound editing tools for both digitized and MIDI sound let you see music as well as hear it. You can cut, copy, paste and otherwise edit segments of it with great precision. System sounds are shipped with both Macintosh and Windows systems as soon as you install the OS. Echo effects, mixing of sound etc., can be made by Sound editing Tools. Software like Creative Labs' Wave Studio is used for editing sounds to perform in greater experience.

Animation, Video, and Digital Movie Tools

Animation and digital video movies are sequences of bitmapped graphic scenes (frames) rapidly played back. Movie making tools take advantages of Quick Time (Macintosh and Windows) and Microsoft Video for Windows (also known as AVI ,or Audio Video Interleaved, available for Windows. only) technology and let you create, edit, and present digitized motion video segments, usually in a small window in your project. Movie making tools such as Premiere, Video Shop, and Media Studio Pro let you edit and assemble video clips captured from camera, tape, other digitized movie segments , scanned images, animations, and from digitized audio.

Authoring Systems

Multimedia authoring tools provide the important framework for organizing and editing the elements of your multimedia project, including graphics, sounds, animations, and video clips. Authoring tools are used for designing interactivity and the user interface, for presenting the project on screen, and for assembling diverse multimedia elements into a single, cohesive product. Authoring software provides an integrated environment for binding together the content and functions of the project, and typically includes everything you need to create, edit, and import specific types of data. With multimedia authoring software, one can make.

- Video productions
- Animations
- Games
- Interactive web sites
- Demo disks and guided tours
- Presentations
- Kiosk applications
- Interactive training
- Simulations, prototypes, and technical visualization

Making Instant Multimedia

It is not necessary to invest in a dedicated multimedia package the current software can do the job. One can save money and time by doing multimedia with tools that are familiar and already at hand, Common desktop tools have become multimedia-powerful. Some multimedia projects may be so simple that you can cram all the organizing, planning, rendering, and testing stages into a single effort, and make "instant" multimedia.

Here is an example: The topic at your weekly sales meeting is salesforce performance. You want to display your usual spreadsheet so that the group can see real names and numbers for each member of the team, but t en you want to add an animated, multicolored 3-D bar graph for visual impact. Preparing for your meeting, you annotate the cell containing the name of the most productive salesperson for the week, using sounds of applause found on the Web or a recording of your CEO saying "Good job!" or a colleague's "Wait till next week, Pete!" At the appropriate time during the meeting, you click that cell and play the file. And that's it—you have just made and used instant multimedia.

Types of Authoring Tools

These are the tools which provide the capability for creating a complete multimedia presentation, including interactive user control, are called authoring tools/p g ro rams. • Some of the examples are:

- Macromedia Flash.
- Macromedia Director
- Author ware
- Quest.

The various multimedia authoring tools can be categorized into three groups, based on the method used for sequencing or organizing multimedia elements and events:

- Card- or page-based tools
- Icon-based, event-driven multimedia and game-authoring tools
- Time-based tools
1) Card or page based tools
   In these authoring systems, elements are organized as pages of a book or a stack of cards. These tools are best used when the bulk of your content consists of elements that can be viewed individually, like the pages of a book or cards in a card file. The authoring system lets you link these pages or cards into organized sequences. You can jump, on command, to any page you wish in the structured navigation pattern. It allows you to play sound elements and launch animations and digital video. Example of Page-based authoring systems are LiveCode from Runtime Revolution(www.runrev.com) and ToolBook (www.toolbook.org)

2) Icon based, event driven tools

In these authoring system, multimedia elements and interactions cues are organized as objects in a structural framework or process. Icon based event-driven tools simplify the organization of your project and typically display flow diagrams of activities along branching paths. In complicate structures, this charting is particularly useful during development. Example , Authorware from Adobe

3) Time based tools

In these authoring systems, elements and events are organized along a timeline, with resolutions as high or higher than 1/30 second. Time based tools are best to use when you have a message with a beginning and an end. Sequentially organized graphic frames are played back at a speed that you can set. Other elements are triggered back at a given time or location in the sequence of events. The more powerful time based tools let you program jumps to any location in a sequence, thereby adding navigation and interactive control. Example, Flash Player.

MULTIMEDIA SKILLS

The Team

A typical team for developing multimedia for DVD or the Web consists of people who bring various abilities to the table. Often, individual members of multimedia production teams wear several hats: graphic designers may also do interface design, scanning, and image processing. A project manager or producer may also be the video producer or scriptwriter. Depending upon the scope and content of the project and the mix of people required for a multimedia production team may require as many as 18 discrete roles, including:

- Executive Producer
- Producer/Project Manager
- Creative Director/Multimedia Designer
- Art Director/Visual Designer
- Artist
- Interface Designer
- Game Designer
- Subject Matter Expert
- Instructional Designer/Training Specialist
- Scriptwriter
- Animator (2-D/3-D)
- Sound Producer
- Music Composer
- Video Producer
- Multimedia Programmer
- HTML Coder
- Lawyer/Media Acquisition
- Marketing Director

Project Manager

A project manager's role is at the center of the action. A project manager is responsible for the overall development and implementation of a project as well as for day-to-day operations. He/ She is responsible for

- overseeing project's timeline and resources, finances, and priorities
- Facilitating communication and documentation- "Budgets, schedules, creative sessions, time sheets, illness, invoices, team dynamics
- The project manager is the glue that holds the team together."
- A program manager has two major areas of responsibility:
- Design and Development.

The management side consists of scheduling and assigning tasks, running meetings, managing milestones – essentially overseeing all aspects of product development from beginning to end. A good project manager must completely understand the strengths and limitations of hardware and software so that he or she can make good decisions about what to do and what not to do.

Multimedia Designer(Information Designer)

A multimedia designer often wears many hats, but most importantly he or she looks at the overall content of a project, creates a structure for the content, determines the design elements required to support that structure, and decides which media are appropriate for presenting which pieces of content. They Prepare the blue print for the entire project: content, media and interaction. Graphic designers, illustrators, animators, and image processing specialists deal with the visuals. Multimedia designers need a variety of skills.

Interface Designer

The role of interface designer is to create software devices that organize the multimedia content, that lets the user to access or modify that content, and that presents the content on screen. The ease with which a user can move about within a project, effective use of windows, backgrounds, icons, and control panels – these are the result of an interface designer's work.

Writer

- They create a character, action and point of view.
- They write proposals, they script voice-overs and actors narrations
- They write text screens to deliver messages, and they develop characters designed for an interactive environment.
- Scriptwriters write dialog, narration, and voice-overs.

Video Specialist

He is responsible for an entire team of videographers, sound technicians, lighting designers, set designers, script supervisor, etc. A multimedia video specialist does much more than just shoots and edit video. He must also understand interactivity and how it will affect the video.

Audio specialist

An audio specialists working in multimedia should have a through understanding of the needs and requirements involved in producing a successful sound track.Depending upon the situations occur in the picture he has to change the background music.He is a person can show all his music talents in the multimedia project.Can be either a sound engineer or music composer.

Multimedia programmer

Someone who can implement programs that integrate media elements."A multimedia programmer is a software engineer who integrates all of the multimedia elements into a seamless whole using an authoring language or programming language. Programming tools for multimedia are typically higher level than typical programming languages, include Authoring tools (such as Authorware), HTML editors, Java applets, Flash, etc

Producer of Multimedia for the Web

Web site producer is a new occupation, but putting together a coordinated set of pages for the World Wide Web requires the same creative process, skill sets, and (often) teamwork as any kind of multimedia does. With a little effort, many of us could put up a simple web page with a few links, but this differs greatly from designing, implementing, and maintaining a complex site with many areas of content and many distinct messages. A web site should never be finished, but should remain dynamic, fluid, and alive. Unlike a DVD multimedia product replicated many times in permanent plastic, the work product at a web site is available for tweaking at any time.

REVIEW QUESTIONS

2marks/3 marks

1.List some multimedia input devices.
2. List some multimedia output devices.
3. What is the use of input devices ?
4. What is the use of multimedia output devices ?
5. Expand GUI.
6. Which are the multimedia data types ?
7. Give examples for audio hardware
8. Give examples for video hardware.
9. What is Digital pen?
10. What is bandwidth ?
11.List some video standards.
12. Expand MDA, MGA.
13. Expand CGA, VGA.
14. Expand SVGA, XGA.
15. Expand CRT.
16. Differentiate passive LCD and active LCD.
17. Compare the speed of inkjet printer and laser printer.
18. Why is laser printer suitable for multimedia ?

19. Which printer has good photographic quality ?
20. Expand CMYK.
21. What is color dithering ?
22. What is the disadvantage of hand-held scanner ?
23. Expand RGB
24. What are the advantages of hand-held scanners?
25. Differentiate flat-bed scanner and Rotary-drum scanner.
26. What is the work of ADC?
27. What is the work of DAC ?
28. What is voice recognition system ?
29. What is normalization ?
31. What is connected-word speech recognition?
32. What is the use of digital camera?
33. What is CCD ?
34. What is the function of DSP?
35. Write any two advantages of Digital camera.
36. What is the function of video frame grabber ?
37. What is the use of frame of buffer memory ?
38. What is image processing?
39. What is histogram ?
40. What is histogram stretching ?
41. What is histogram shrinking ?
42. What is image averaging ?
43. What is image subtraction ?
44. What is image scalling ?
46. What is the use of video camera ?
47. What is the use of view finder in video camera ?
48. What is story board ?
49. What is costing ?
50. What is content cost ?
51. Give examples for multimedia input hardware.
52. Give examples for multimedia output hardware.
53. What is the use of communication devices ?
54. Give examples for communication devices ?
55. What is the use of word processing tools.
56. Give examples for word processing tools.
57. What is OCR?
58. Give examples for 3-D animation tools.
60. What is the use of image editing tools ?
61. Give examples for image editing tools.
62. Give examples for audio editing tools.
63. What is authoring system ?
64. What are the responsibilities of a project manager ?
65. What is static web page?
66. What is dynamic web page?
67. Expand AJAX, CSS.
68. Expand CSS, ASP

69. What are the languages used to create dynamic web page?

70. What language is used to create static web page?

10 marks

1.(a) Explain the function of digital pen.
  (b) Write about the various video display standards.

2. (a) Explain the function of CRT.
   (b) Write about flat-panel display system.

3. (a) Explain the function of Laser printer.
   (b) Explain the function of dye sublimation printer.

4. (a) Explain the various types of scanners.
   (b) Write about the color printing issues.

5. Explain the function of Voice recognition system.

6.(a) Explain the function of Digital camera.
  (b) Explain the function of video frame grabber.

7. (a) Explain the types of video image processing.
(b) Explain the function of video camera.

8. (a) Explain the architecture of video capture board.
(b) Write about digital voice and digital audio.

9. (a) Explain the stages of multimedia project.
   (b) Write about multimedia hardware.

10. Write about the various multimedia software tools.

11. Explain the types of authoring tools.

12. Explain about the various team members of multimedia team.

13. (a) Explain how multimedia applications are produced for web.
   (b) Write about instant multimedia.

UNIT V. MULTIMEDIA DESIGN ,MULTIMEDIA FOR INTERNET

DESIGNING AND PRODUCING

5.1.1.Designing

Multimedia design is the art of integrating multiple forms of media. It is used in video games , information kiosks, web sites and many other interactive applications. The multimedia project design is divided into two as the manner in which project material is organized known as structure and a blend of its graphic elements and its navigation system known as user interface.

Designing the structure

The structure design is through

- Navigational maps
- Story Board
- Hotspots, Hyperlinks, Icons and Buttons
- Image Maps

Navigation map (site map) :A map provides with a table of contents as well as chart of the logical flow of the interactive interface. While at web sites, a site map is typically a simple hierarchical table of contents with each heading linked to a page, as a more detailed design document. The map may prove very useful to a project listing of multimedia objects and describing what happens when the user interacts. When design a multimedia product, the user should work with two types of structure. Depth structure represents the complete navigation map and describes all the links between all the components of the project. Surface structure represents the structure actually realized by a user while navigating the depth structure.

There are four fundamental organizing depth structures used in multimedia projects.

- Linear: users navigate sequentially from one frame / bite of information to another.
- Hierarchical: users navigate along the branches of a tree structure that is shaped by the natural logic of the content.
- Nonlinear: Users navigate freely through the content of the project unbound by predetermined routes.
- Composite: users may navigate freely but are occasionally constrained to linear presentations of movies or critical information and / or to data that is mostly organized in a hierarchy.
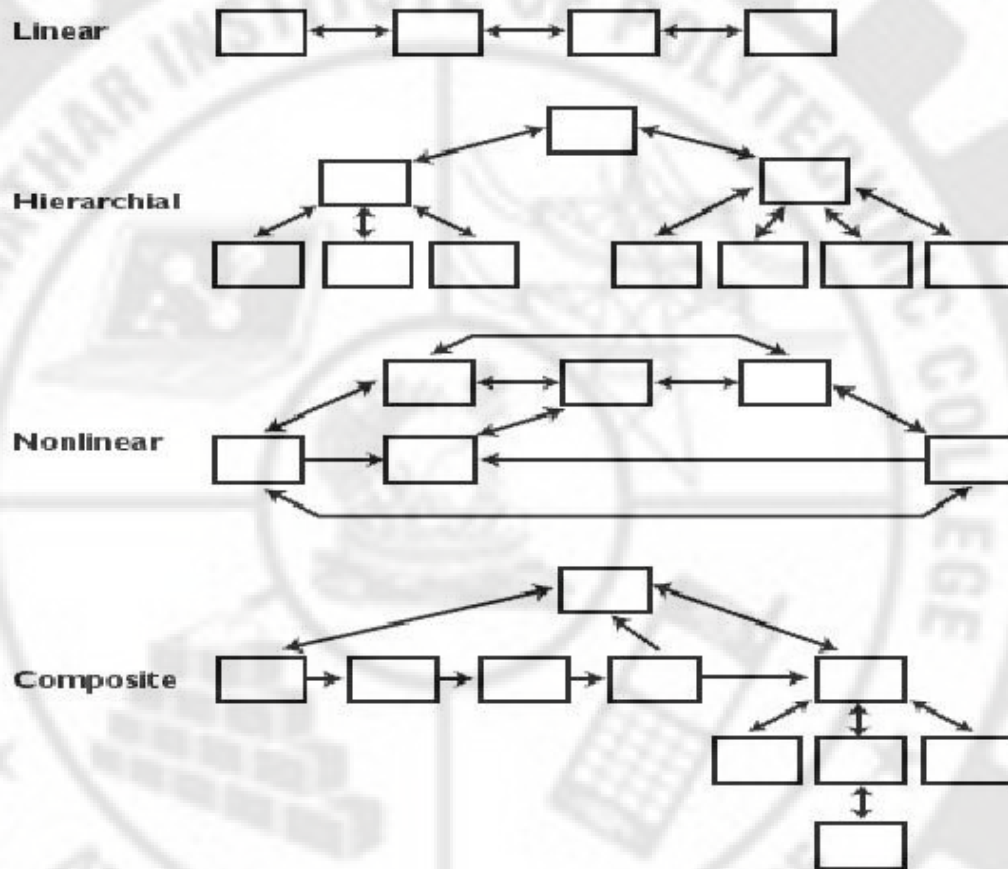
Fig 5.1. The four primary navigational structures used in multimedia

Many navigation maps are essentially non linear. in these navigational system, viewers are always free to jump to an index a glossary various menus , help or about .. sections or even to a rendering of the map itself. It is often important to give viewers the sense that free choice is available. This empowers them within the context of the subject matter.

 Story board:

Originally built for a small black and white low resolution display is organized sequentially screen by screen and each screen is sketched out with design notes and specifications before rendering. It can be something as simple as a sequence of crude stick figure drawings in frames(or cells) with accompanying notes for scene numbers , titles , onscreen dialog, voice over narration and transition effects along with a set of coordinated production notes to help organize everything in advance. It serves as road map for producers, directors , casts, crews animators , audio engineers and post production editors.
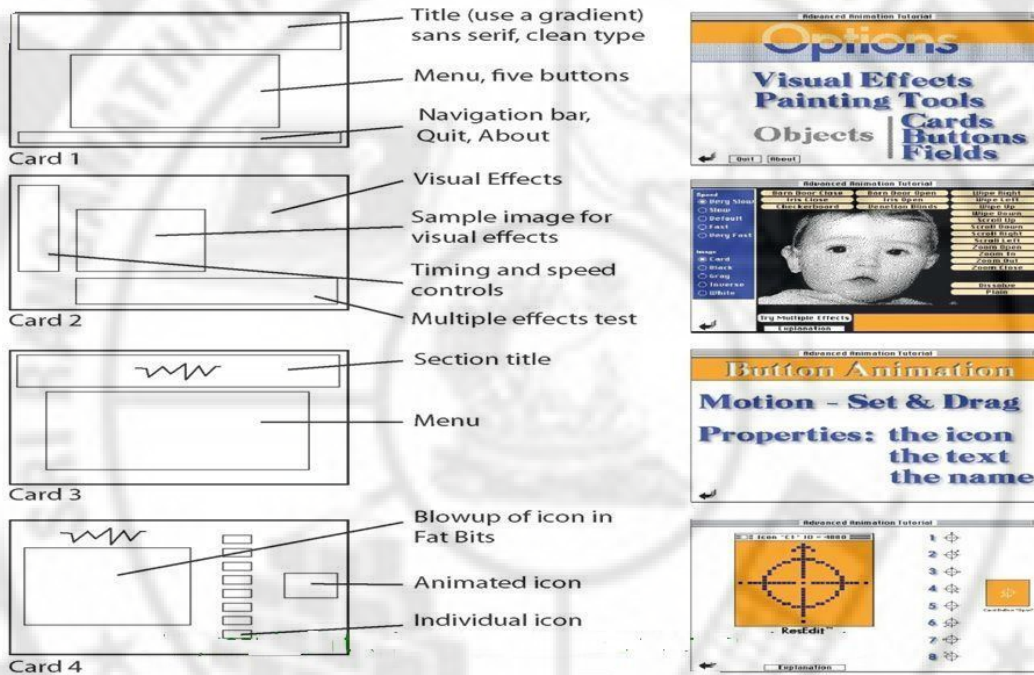
Fig 5.2. Story boards on the left with finished screens on the right

Hotspots ,Hyperlinks and Buttons: Multimedia systems allow to make any part of the screen or any object into a hotspot. When users click a hot spot at that location something happens which makes multimedia as interactive and exciting. Categories of hotspots are text, graphic, and icon. The simplest hotspots on the web are text anchors that link documents to another document.

If the hotspot connects the use to another part of the document or program or to a different program or web site it is referred to as a **hyperlink**. If the hotspot is a graphic image designed to look like a push button or toggle switch it is called a **button**. **Icons** are graphic objects designed specifically to be meaningful buttons and are usually small. Plug-ins such as flash, shockwave or Java scripts enable users to create plain or animated buttons. Small JPEG or GIF images that themselves anchor links can also serve as buttons on the web.

Image Maps: In HTML and XHTML an image map is list of coordinates relating to a specific image, created in order to hyperlink areas of the image to different destinations (as opposed to a normal image link , in which the entire area of the image links to a single destination). For Example a map of the world may have each country hyperlinked to further information about that country. The intention of an image map is to provide an easy way of

linking various parts of an image without dividing the image into separate image files.(i.e)large images that are sectioned into hot areas with associated links.

User Interface:

User interface can contain plenty of navigational power which provide access to content and tasks for users at all level. The interface should be

- Simple and user friendly.
- To contain plenty of navigational power,
- Providing access to content and tasks for users at all levels as well as a help system to provide some hand holding and reassurance.

The Mac and windows GUI are successful partly because their basic point and click style is simple , consistent and quickly mastered.

Things that work: Here are some graphical approaches that get good results;

- Neatly executed constrasts big/small, heavy/light, bright/dark, thin/thick , cheap/clear.
- Simple and Clear screens with lots of WHITE SPACE.
- Eye grabbers such as Drop caps or a single brightly colored object alone on a gray scale screen.
- shadows and deop shadows in various shades
- Gradients
- Reversed graphics to emphasize important text or images
- shaded objects and text in 2D and 3D.

Things to Avoid: Here are some mistakes want to be avoided in creation

- Clashes of color
- Busy Screen
- Using a picture with a lot of contrast in color or brightness as a background
- Trite humor in oft-repeated animations
- Clanging bells or squeaks when a button is clicked.
- Frilly pattern borders
- Cute one-liner from famous movies
- Requiring more than two button clicks to quit.
- Too many numbers
- Too many words
- Too many substantive elements presented too quickly.

Audio Interfaces : A multimedia user interface may include important sound elements that reflect the rhythm of a project. Sounds can be background music, special effects for button clicks, voice-overs effects synced to animation or they may be buried in the audio track of a video clip. The tempo and style of background music can set the "tone" of a project.

Producing:

Production is the phase when the multimedia project is actually rendered. During this the designer will contend with important and continuous organizing tasks.

Managing production so that the client is continually informed and formally approves by signing off an artwork and other elements as the designer build them. Develop a scheme that specify the number and duration of client approval cycles and then provide a mechanism for change orders when changes are requested after signoff.

Because multimedia files are large, means of transporting the project to distinct clients is particularly important. Typically both the designer and the client will have access to the internet at high bandwidth.

If the designer use the internet to deliver the multimedia to the client, be sure that he should setup rules and conventions for naming files placed at an FTP site and use codes in the subject headers of his email to describe the content of the message.

.5.1.5 Tracking

Develop a file naming convention specific to the project 's structure. Store the files in directories or folders with logical names. It may also need to set up a database with filenames as eight character codes matched to lengthier descriptive names , so the user know what the code means. Version control of the files is critically important too especially in large projects. If more than one person is working on a group of files , be sure that the user always know what version is the latest and who has the current version

Copy right

Copy right is a law to protect the content or product from others for copying. This is for books, research, novals ,musics and videoCDs and for softwares. When the product is copyright by the owner then he is having rights to do the following

- Publish the product
- Give copy of the product to others
- Remove the copyright
- Permit others to publish the product
- Permit the others to use the product
- Publish the copyright of the product on the front page of the document.

Some products don't have copyrights and they are known as public domains. The products are access by anyone and they are free of cost. Examples are Government websites, games , Education products.

Some products have partial copy rights and they are known as Fair use. It allow the user to access the initial portions of the product and not allowing the user to access fully. Examples are Online articles, Musical presentations, online advertisements.

Insert a copyright statement in the projects that clearly designates the code as intellectual property, but the code, tricks and programming techniques remain accessible for study, learning and tweaking by others.

Virtual Reality Designing and Modeling

5.1.7.1.Virtual Reality Designing

Virtual reality systems are designed to produce in the participant the cognitive effects of feeling immersed in the environment created by a computer using sensory inputs such as vision, hearing, feeling and sensation of motion. Virtual reality systems require the computer to produce rapid coordinated changes in visual effects, sound effects and sensory perceptions while at the same time accepting multimedia inputs from a variety of devices tracking the movements and actions of the participant.

The human –computer relationship is much more intense in virtual reality than in any other human interactions with a computer. Let us review some of the contemporary factors involved in virtual reality.

- **Color, Brightness and Shading**: Most plants and grass are green and flowers are multicolored. Similarly traffic lights around the world are red, yellow and green. Use color as a means of distinguishing and identifying objects although color by itself is not a very definitive means of doing so.

  Variation in brightness give a sense of the time of the day. A sudden change in brightness is identified as an edge. changes in brightness resulting from the movement of theht source give us a sense of the three dimensional rendering of an object

  Shading gives us a three dimensional sense of the geometry of an object. Shading is essential for getting a three dimensional perspective on solid objects.

- **Object Recognition**: The object geometry and changes in the geometry over time give us a perception of the object type. For the feeling of a moving river, the surface geometry depiction of the water must change at a rate that we associate with a real time river.

- **Navigation:** If a navigation is very natural and instantaneous and does not require distracting thought then the system appears very authentic to the participant

- **Motion Processing** : An object in motion has a velocity. i.e. it is moving in a specific direction at a   specific speed. As the object moves the background does not change but the object perception does. If we are on the top of the bridge we can see the front hood ornament of a car passing underneath. As the car moves away from the bridge we see less and less of the hood and eventually we can see no more than would be visible if we were standing behind it at essentially the same level.
- **Depth Perception**: Three important factors are used for depth perception: motion, pictorial clues and other sensory clues. Pictorial clues can consists of changes in shapes and sizes, changes in gradients of surfaces, changes in density of objects and field of vision and changes in brightness and light reflection from object surfaces.
- **Lag:** Lag is defined as the time between the participant action and the associated application response. For example when a participant " touches" a steam pipe , how long does it take for the electronic glove to pass on the sensation of heat.

Virtual Reality Modeling

Virtual reality is created by combining a number of components including sound and graphics into sound and visual effects Other inputs can include the sensation of heat surface texture,pain and changes in pressure. Another important aspect of virtual reality is user feedback and adapting the next set of effects on the basis of this user feedback.

A number of approaches can be used for designing concurrent operation of multiple devices and user feedback, including the following.

- **Simulation loops**: A set of objects(such as sound clips, video clips , graphics and sensory stimuli) participate in a simulation. A procedure is created and a time step allocated for each object. The simulation rate is bound to the display rate and each procedure is assigned a slot in the timeline for the simulation. this is called a loop because the main process loops around the simple logic of which object is scheduled next. It is fairly easy to add new device and associated objects.
- **Multiple Processes**: they are combination of multiple simulation loops, rendering processes, device activation processes and arbitration processes. Multiple simulation loops allow programming variety of different effects that can be combined at runtime. Separate device processes start devices on cue so that the devices are ready when information is required. The devices can be operated at their highest efficiency level by separating their actions from the simulation loop.
- **Concurrent Objects:** Multiple processes create the need for objects to communicate. Active objects may need to communicate to ensure that the proper sequence of effects is being generated. Objects send messages to each other and respond to messages from other objects. This allows multiple processes to be synchronized. Each process and even their sub processes can be encapsulated in objects so that they can be operated independently.

- **Navigation :**The navigation through virtual reality applications must be designed to allow for multiple paths and options. The design of the processes and the objects encapsulating them takes on a more important role when the potential variety of navigation paths is considered.

THE INTERNET AND MULTIMEDIA

The Bandwidth Bottleneck

Bandwidth is how much data expressed in bits per second send from one computer to another in a given amount of time. The faster the transmissions the less time will spend waiting for text, images, sounds and animated illustrations to upload or download from computer to computer, and more satisfaction with an internet experience.

The bottleneck at a typical user's low bandwidth modem connection is the most serious impediment to sending multimedia across the internet. At low bandwidth a page of text can take less than a second to send, but an uncompressed 640x480, 8bit /256 color image can take few minutes; an uncompressed 640x480 24bit/16million color image can take many minutes to send.

The bottleneck is cleared by the wide use of inexpensive, higher speed cable modems and wireless connections. The following options are also helpful in clearing the bottlenecks.

- Compress data as tightly as possible before transmitting
- Require users to download data only once, then store the data in a local hard disk cache.
- Design each multimedia element to be efficiently compact.
- Design alternate low bandwidth and high bandwidth navigation paths to accommodate all users.
- Implement streaming methods that allow data to be transferred and displayed incrementally as it comes in.

Internet Services

The services in the internet are E-mail, file transfer, discussion groups and news-groups, real-time chatting by text, voice and video and the ability to log into remote computers are common. Each internet service is implemented on an internet server by dedicated software known as a **Daemon.**

Daemons are agent programs that run in the background, waiting to act on requests from the outside. In case of the Internet, daemons support protocols such as HTTP for the world wide web , POP for e-mail, or the FTP for exchanging files. In the URL http://www.timestream.com/index.html ,the first few letters notify a server as to which daemon to bring into play to satisfy a request.

MIME types

To identify the nature of the data transmitted and by reference , the purpose of that data the internet uses a standard list of file extensions called MIME(Multipurpose Internet Mail Extensions) .For example with Netscape navigator can define Adobe Acrobat files(PDF) as a MIME type and select the Acrobat Reader as the player applications.

Multimedia elements are typically saved and transmitted on the internet in the appropriate MIME type format and are named with the proper extension for that type.

- Shockwave Flash animation files end in .swf
- image files end in .jpg,.jpeg,.gif,or .png
- sound files end in .au,.wav,.aif,.mp3 or another conforming format
- Quick time and other video clips end in .qt,.mov ,or .avi.

Multimedia on the Web

In the web multimedia tools, software, audio and video are available. Clients are permitted to download the elements. There are two modes of access the multimedia data from the web

- **Application based Access**: Access multimedia applications and tools from internet is known as application based access. Downloading real time data like text, picture, audio, video, necessary files for multimedia presentation, access mails and accessing multimedia authoring tools are belong to this type.
- **Browser based Access** : Access browser related software from internet is known as browser based access. Downloading server based applications , database , add-on software to increase the capacity of a browser, access programming and scripting languages for improving browser activities are belong to this type.

Web Page makers and Site Builders

For web operation separate multimedia elements are created. Different software tools are used for the multimedia on the web page. Scripting languages and Automatic Tool generator tools are used for web page making.

Scripting

Scripting codes are divided into two types. Client side scripting and server side scripting

- **Client Side Scripting**: when run the codes which are in the client computer are known as client side scripting. When a client call a server, the server send the web page to the client and the codes are run in the client machine's browser. HTML,VB script, Java script and WML script are some examples of client side scripting.
- **Server side Scripting**: when run the codes in the server are known as server side scripting. When a client call a server , the sever runs the code for the web page in the

server and send the result to the client is Server side scripting. ASP, ASP.net, JSP, PHP are some examples of server side scripting.

Automatic Tool Generator:

Instead of writing codes for web page creation tools are used for designing web pages. When tools are taken from tool box and placed on the web page the codes are auto generated. Dream Viewer, MS front page and Adobe Glove are some examples.

Plug-ins and Delivery vehicles.

Plug –ins add the power of multimedia to web browsers by allowing users to view and interact with new types of documents and images. Helper applications or players also provide multimedia power by displaying or funning files downloaded from the internet by your browser but helpers are not seamlessly integrated into the operation of the browser itself.

- **TextPlug in:** Text and document plug-ins such as the popular Adobe Acrobat Reader get you past the display limitations of HTML and web browsers where fonts are dependent on end users preferences and page layout is primitive.
- **Image Plug-in**: Most browsers will read only bitmapped JPEG,GIF and PNG image files. Browsers could not display vector images since they are designed by functions. Adobe Photo viewer is the tool used for vector images also.
- **Sound Plug-ins**: Digitized sound files in various common formats such as MP3,WAV,AIF or AU may be sent to your computer and then played either as they are being received or once they are fully downloaded. MIDI files may also be received and played when Windows media player or real time player are used.
- **Animation, Video and Presentation**: The most data intense multimedia elements to travel the internet are video streams containing both images and synchronized sound and commonly packaged as Apples Quick time , Microsoft 's video for Windows(AVI) and as MPEG files. Also data rich are the files for proprietary formats such as Keynote, MS Power Point and other presentation applications.

DESIGNING FOR THE WORLD WIDE WEB

Developing for the Web

Methods for developing and presenting the basic elements of multimedia within the constraints of HTML and the world wide web are Workspace and nibbling. These are the two important factors when creating web pages for multimedia contents.

Small Device Workspace:

Web pages look good on an 800x600 monitor in true color. Depending upon the browser and preferences set by the user the usable area of the area on the screen will always be less than the

monitor's display and is not controllable by the designer. When designing the web page for an 800 pixel wide display, by using tables and images that do not exceed 750 pixels across the page, and will have room for browsing scroll bars. when designing and making multimedia elements for the web should be called "nibbling".

Nibbling is trimming image, audio, video files in order to access them. nibbling is the final stage of creating web page for multimedia elements.

For example to the elegant bitmapped logo created in Photoshop when trim it from 24 to 8 to 4 bit color depth and resize it from 96 pixels square to 64 pixels square. Nibble the audio clip of client's theme song from 44.1kHz to 11 kHz and see if it's acceptable at an 8 bit sample size.

Factors should be considered while doing nibbling

- Bandwidth should not be changed due to nibbling.
- Remove the shadows in the text and image contents.
- Don't use more colors in the heading
- Permit the users to download image files and store it on the disk.

Text and Image for the Web

Text messages and images are the two multimedia elements mostly used when creating web pages.

Text

When texts are added to a web page it should be easily downloadable. To manage the Text information on the there are three main works.

- Making alternate Font
- Making columns of Text
- Flowing Text around Images.

Making Alternate Font:

Viewers of the web site may not be displaying the same preferred font that used to design the page because user preferences in the browser may alter the way text in the document looks and flows. To make the best of this uncertainty many developers design their documents in Times New Roman for the proportional Seriphed font, Verdana for the proportional Sansserif and Courier as the mono spaced font. These fonts readily move across platforms and are the default fonts users typically see if they do not set their own preferences. You can specify a font, and even alternate fonts using the FACE attribute of the <FONT> tag.

<FONT FACE ="Verdana, Arial, Helvetica">.

Making Columns of Text:

The most powerful feature of HTML may be found in the <TABLE> tag. <TR> and <TD> tags are used to define the row and columns in the text.

Example:

```
<Html>
      <Head>
      <Title> THE EXPLOSIOIN</Title>
      </Head>
      <Body>
            <div align ="center">
                  <H2> The Explosion</H2>
            </div>
            <table border =0 cell spacing=20>
                  <TR VALIGN= "TOP">
                  <TD WIDTH=40%>
                              text for column 1
                  </TD>
                  <TD WIDTH=40%>
                              text for column 2
                  </TD>
                  </TR>
            </table>
      </Body>
</Html>
```

Flowing Text through Image:

To "flow" text around an image using the ALIGN attribute of the <IMG> tag. Add a

<BR CLEAR =left> tag at the end of the text paragraph , so that if there is not enough text to fill the entire vertical height of the image your next paragraph will begin on a new line, left justified and below the image. To add space around your image so it doesn't right up against the text, use the horizontal space (HSPACE) and vertical space (VSPACE) attributes of the <IMG> tag.

<HTML>

<HEAD>

<TITLE>sailing</TITLE>

</HEAD>

<BODY> \<IMG SRC="gbsky.gif" ALIGN="left" HSPACE ="15" VSPACE="5">

<H2> departure</H2>

----text goes here-------

<BR CLEAR="left">

<hr>

</BODY>

</HTML>

Images

Theoretically the web can support any graphics format the client and server have in common. Practically even though web standards do not specify a graphics format user must use, all current releases of browsers recognize three image formats-GIF,PNG and JPEG without resorting to special plug ins.

GIF: Graphical Interchange Files are limited to 8 bits of color depth(256 colors). It is a simple format with built-in compression technique and no need for any plug- ins. It is not a opensoftware type.

PNG: Portable Network Graphics format is in many ways an improvement on the GIF format. Image creation programs now support the PNG format. It is a open source software , suitable for web applications and no need for any plug-ins. The drawback of this format is it wouldn't work on old browsers and download time is high compared to GIF.

JPEG: Joint Photographic Experts Group images contain 24 bits of color depth.JPEG uses a powerful but lossy compression method that produces files as much as ten times more compressed than GIF.

Clickable Buttons

To make a graphical image "clickable" so that it links to another document, simply include the image tag inside the bounding tags of an HTML anchor that points to that document's URL.

<A HREF ="documentToGoTo.html">

<IMG SRC="imageDisplayed.gif' BORDER="0">

</A>

Example:

<A Href="www.tndte.com">

<IMG src="D: /photos/Flower20.gif'>

</A>

Be sure to include the BORDER attribute in the <IMG> tag if user wish to avoid showing a default border around the button image.

Client Side Image Maps

Image maps are pictures with defined hotspots that link to other documents when a user clicks on them. Browsers added support for client side image maps so that mouse coordinates and their associated document URLs could be included in the client's own HTML document, thus avoiding the setup and communications hassles of the server side system. This is managed by the USEMAP attribute of the <IMG> tag.

To make a client side image map with USEMAP you need three things. an image, a list of coordinates designating hotspots on the image and the document URL associated with each hotspot. To program the image map into the HTML document, use the USEMAP attribute of the <IMG> tag.

<IMG src="compass.gif" hspace="5" vspace="50" border="0" usemap="#compass">

<MAP name ="compass">

<AREA shape ="circle" ccords="60,60,10" href="help.htm">

<AREA shape ="polygon" ccords="60,60,0,0,120,0" href="back.htm">

<AREA shape ="polygon" ccords="60,60,0,120,120,120" href="forward.htm">

<AREA shape ="polygon " ccords="60,60,0,0,0,120" href="navmap.htm">

</MAP>

"compass.gif "is the transparent image, the hspace="5" and vspace="50" attributes provide space between the image and the text around it and the border="0" attribute points to the <map> extension tag that contains the coordinates and URLs. A <MAP> segment may be placed anywhere in the body of the HTML document and is related to the correct image by the name ="compass" attribute of the <MAP> tag.

Sound for the Web

As the web has developed , sound become more important and plug-ins currently allow embedding of sounds into documents. Browsers have become sound capable. Netscape and Internet Explorer offer the Quick Time Plug-in for playing AIFF,MIDI ,WAV and Au formats. Streaming audio is more useful for the web where a sound file can start playing as soon as data begins coming in. Microsoft Internet Explorer offers the <BGSOUND>, <EMBED>, <OBJECT>,<PARAM>   are different tags to play an AU,WAV or MIDI sound track in a document background.

<OBJECT>

<PARAM name=SONG value="glory.WAV">

<EMBED type="music" SONG="glory.WAV" PLUGINGSPACE=www.music.com
AUTOSTART="time">

</OBJECT>

Animation for the Web

HTML makes no provision for animation, by itself delivering only a static page of text and graphics. For the text animation, Netscape 1.0 offered the <BLINK> tag, Microsoft 's Explorer

offered the <MARQUEE> tag to scroll text horizontally. For image animation<IMG> tag is used.

- **GIF89A:** It is possible to make simple animations by putting multiple images or frames into a single GIF89a file and display them with programmable delays between them. When use the <IMG> tag to embed a GIF89a multi frame image, Netscape Navigator downloads the file and stores it in the cache folder of the local hard disk. Once fully downloaded the image plays each frame quickly and smoothly. Limit animated GIFs to small images and use a more capable plug-in for animations over larger areas.

Video for the web:

Most of the multimedia products contain still and full motion video. To transfer one minute video through web it takes 50minutes for transferring through internet. So the video is compressed before being transmitted through web since compressed video file takes 1.5 minutes for transferring the same data.

The factors should be considered before video is created for the web

- To increase the bandwidth the video file should be compressed.
- Use high speed cable modem
- Convert Video files into MPEG format
- Video should be edited by trimming, cutting etc.

HTML5

HTML5 is the latest version of Hypertext Markup Language, the code that describes web pages. It's actually three kinds of code: HTML, which provides the structure; Cascading Style Sheets (CSS), which take care of presentation; and JavaScript, which makes things happen. The most interesting new HTML5 elements are: New semantic elements like <header>, <footer>, <article>, and <section>. New attributes of form elements like number, date, time, calendar, and range. New graphic elements: <svg> and <canvas>. and new multimedia elements <audio>,<embed>,<source>,<track> and <video>

Tag	Description
<audio>	Defines sound content
<embed>	Defines a container for an external (non-HTML) application
<source>	Defines multiple media resources for media elements (<video> and <audio>)
<track>	Defines text tracks for media elements (<video> and <audio>)
<video>	Defines video or movie.

Video Plug- ins and Players

Video Plug-ins are software component that adds a specific feature to an existing computer program. When a program supports plug-ins it enables customization. Adobe Flash Player is a plug-in that allows browsers such as Firefox to display Flash media on web pages. Flash is often used for animations, videos and games. When visit a web page that uses Flash and the plug -in is missing follow the steps below to install the latest Flash player Plug-in.

- Go to Adobe's Flash Player download page and download the flash installer.

- When the download has finished close Firefox. Click the Firefox menu then click Exit.
- Open the flash installer file which is downloaded and follow the instructions.

Another prominent media players, Quick time has become quite famous for its ease of use and the functionality that it provides. Quick Time is a media player that was created by Apple and allows users to play back audio and video. In case there are any videos on a web page that have been embedded with the QuickTime format the program can be used accordingly in order to run those videos.

Netflix uses Silver light to stream TV episodes and movies to PC and MAC in Standard Definition and HD streams that play back smoothly on any device. Silver light Deep zoom is the fastest , smoothest, zooming technology on the web, bringing the highest resolution images and frame rates with the lowest load times to users.

MULTIMEDIA COMMUNICATION AND APPLICATIONS.

5.4.1.Study of Multimedia Networking

Fundamentally multimedia network communication and (traditional) computer network communication are similar. Since they both deal with data communication. Challenges in multimedia network communications arise because multimedia data (audio, video etc) are known as continuous data. They have the following characteristics.

- Voluminous: They demand high data rates, possible dozens or hundreds of Mbps.
- Real-Time and Interactive: They demand low delay and synchronization between audio and video for "lip sync". In addition, applications such as videoconferencing and interactive multimedia require two- way traffic.
- Sometimes Burst: Data rates fluctuate drastically- for example in video on-demand, no traffic most of the time burst to high volume.

Quality of Data Transmission

QoS for multimedia data transmission depends on many parameters. Some of the most important are

- **Data rate**: A meaure of transmission speed often in kilobits per second or megabits per second
- **Latency** (maximulm frame/packet delay) :Maximum time needed from transmission to reception , often measured in milliseconds .
- **Packet loss or error**: A measure (in percentage) of error rate of the packetized data transmission. Packets get lost or garbled such as over the internet. They may also be delivered late or in the wrong order. Since retransmission is often undesirable a simple error-recovery method for real-time multimedia is to replay the last packet, hoping the error is not noticeable.

Ingeneral,uncompressed audio/video the desirable packet loss is $<10^-2$. When it approaches 10% it becomes intolerable. For compressed multimedia and ordinary data, the desirable packet loss is less than 10-7 to 10-8.

- **Jitter** : A measure of smoothness of the audio/video playback.i.e. Variance of frame/packet delays.
- **SyncSkew:** A measure of multimedia data synchronization often measured in milliseconds.

Multimedia Service classes: Based on the above measures multimedia applications can be classified into following types

- **Real Time**: Two-way traffic, low latency and jitter, possibly with prioritized delivery such as voice and video telephony.
- **Priority Data :** Two-way traffic, low loss and low latency with prioritized delivery such as e-commerce applications .
- **Silver:** Moderate latency and jitter strict ordering and sync. One-way traffic such as streaming video or two-way traffic such as web surfing and internet games.
- **Best Effort**: No real-time requirement, such as downloading or transferring large files(movies)
- **Bronze:** No guarantees for transmission

Perceived QoS: In real-time multimedia, regularity is more important than latency. Temporal correctness is more important than the sound and picture quality and humans tend to focus on one subject at a time .User focus is usually at the center of the screen, and it takes tiem to refocus especially after a scene change.

Prioritized Delivery

When a high packet loss or error rate is detected in the event of network congestion, prioritized delivery of multimedia data can be used to alleviate the perceived deterioration.

- **Prioritization for types of media**: transmission algorithms can provide prioritized delivered to different media-for example, giving higher priority to audio than to video-since loss of content in audio is often more noticeable than in video.
- **Prioritization for uncompressed audio**: PCM audio bitstreams can be broken into groups of every nth sample-prioritize and send k of the total of n groups($k<=n$) and ask the receiver to interpolate the lost groups if so desired.
- **Prioritization for JPEG image:** The different scans in progressive JPEG and different resolutions of the image in Hierarchical JPEG can be given different priorities.
- **Prioritization for compressed video**: Video prioritization algorithms can set priorities to minimize playback delay and jitter by giving the highest priority to reception of I-frames and the lowest priority to B- frames. In MPEG using layered coding, the base layer can be given higher priority than the enhanced layers.

Media on Demand

The multimedia on demand system developed at our DOTE system brings an environment and its infrastructure for multimedia material production, storage, management and on demand or real time distribution applied to Diploma learning.

The communication and data process technology evolution made available the infrastructure for the development , transmission and distribution of numerous multimedia applications ranging from distance education to entertainment. The polytechnics will be able to attend a large number of students and these students can stands geographically distributed. The communication infrastructure of our system is based on the ATM network technology.

In order to offer an online multimedia course, it is necessary to create a client/server structure capable of in the server side, to store transmit and integrate all the involved media and in the client side to receive and adequately reproduce the educational material. The customer will use a browser and plug-ins for audio and video already at internet. The server side it is necessary to architect a system to hold all the course material.

The required media is divided into two parts.

- Discrete Media
- Continuous Media

In discrete Media, storage and distribution do not cause difficulties usually due to small volume of data that these media present. For the continuous media we must consider that the system intends to implement transmission in real time (i.e.) the audio and video data will be transmitted on demand. Although audio is a continuous media it imposes small transmission rates mainly when some compression technique is used.

Table 5.1. Transmission rate for compressed audio and video

Audio Quality	Specifications	Bit Rate
Voice-quality audio	1 channel, 8-bit samples / 8kHz	64 Kbps
Encoded voice	G.728 Standard, 3.4 kHz	16 Kbps
Monophonic audio	1 channel, 16-bit samples/44.1kHz	705.6Kbps
CD-quality audio	2 channel, 16-bit samples/44.1kHz	1.411Mbps
MPEG encoded	Equivalent to CD quality	384 Kbps

Table 5.2. Video signal estimated values (a) uncompressed (b) compressed (bytes).

Resolution	1 minute	1 hour

a	640 x 480	1.6 GB	97 GB
	320 x 240	400 MB	24 GB
b	640 x 480	16 MB	970 MB
	320 x 240	4 MB	240 MB

Table 3 : Bandwidth Requirements for Moving Pictures.

Standard	Bandwidth	Comp. Ratio
Motion JPEG	10-20 Mbps	7-27:1
MPEG-1	1.2-2.0 Mbps	100:1
H.261	64Kbps-2 Mbps	24:1
MPEG-2	4-60 Mbps	30-100:1

Digitized video presents great volumes of data,even in the case of pictures in movement or graphical animation.

The structure designed for the application uses LARC local network features which is based on the internet site. Integrated high-speed network with a video server, file server ,web server and clients machine interconnected, complemented by territory storage specific for videos. There are two aspects specific for video. The great volume of data necessity of real time transmission. Because the great video files volume, it is necessary to use techniques and standards for compression like JPEG,MPEG etc with great losses, eliminating spaces and temporal redundancies. The picture quality reduction usually is not perceivable and the volume of data may be drastic reduced. The video server has a Disk array allowing the content to be divided and stored in blocks of data. The block size must be chosen in order to balance the efficiency of disks and the transmission.
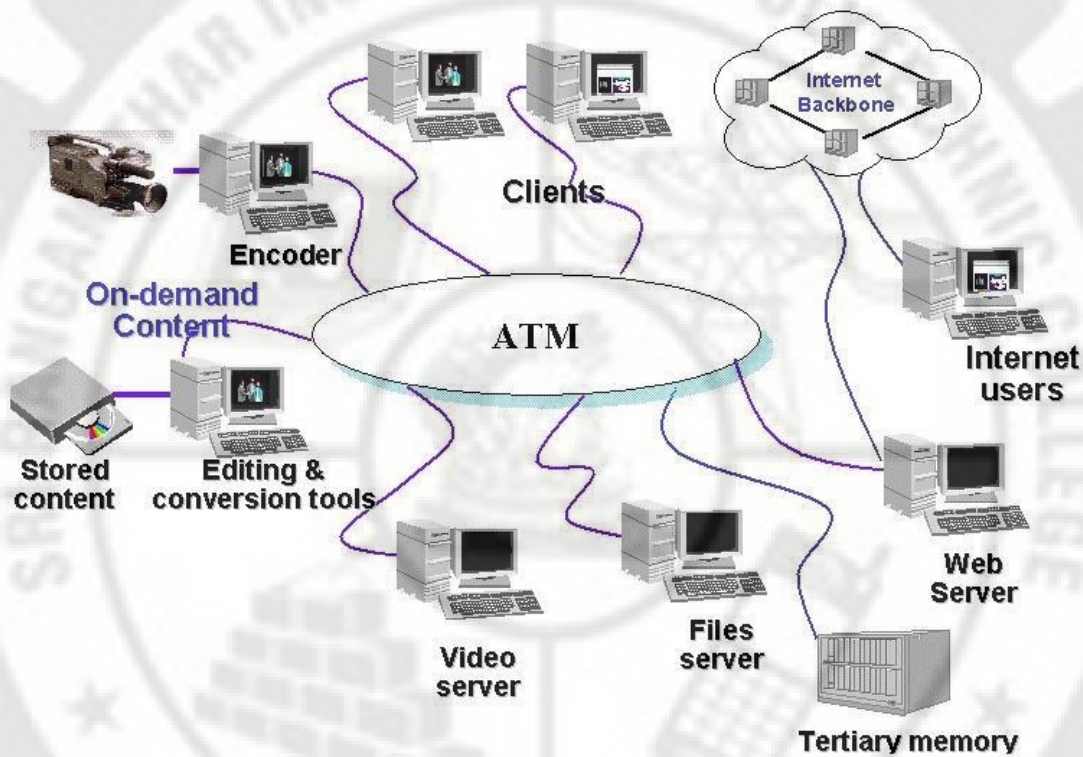
Fig 5.3 Multimedia on Demand System structure

The blocks are stored sequentially in slots. The disks read the numbered blocks and they deliver them to the respective customer through the network. This is called striping technique and it allows users have access to the same video in subsequent times.

The video server stores the most recently used videos, while the others are stored in a tertiary memory. A jukebox is used for this purpose. When a requested video is in the tertiary storage the server locates the video in the juke box place it in the video server for transmission to the customer. The structure is connected to the Internet by 2Mbps communication links. The other media type are stored in the web server.

The project intends to create a high speed network backbone linking all the Polytechnic colleges.It forecasts a central site(DOTE) that will have video servers and territory memory for storage of the educational material. Associated to this site there will be a studio for the production of the multimedia material and a video conference room. On the departments it will be implanted the site to receive data from the central studio and each college will have a video conference room.
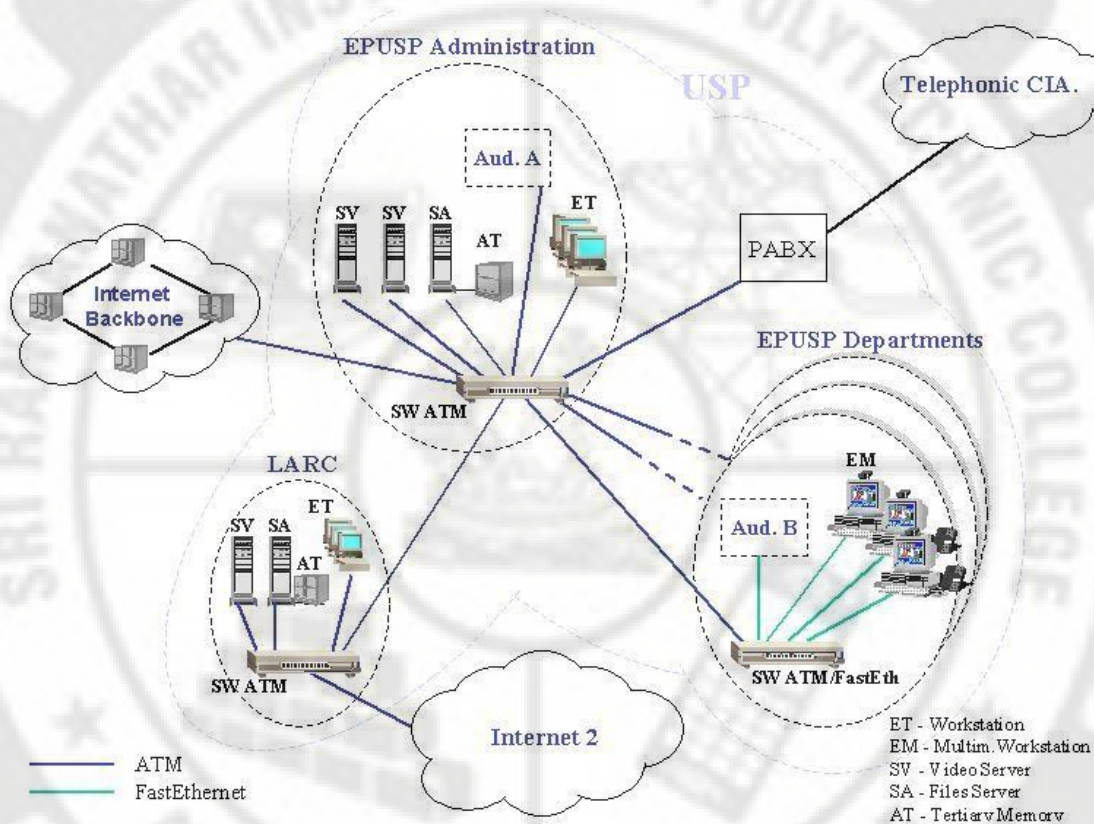
Fig 5.4. Model DOTE – e lecture/ e-content network structure

5.4.4.Multimedia Over Wireless and Mobile Networks

Because wireless data transmission incur the most data loss and distortion, error resilience and error correction become primary concerns. A few characteristics of wireless handheld devices are worth keeping in mind when designing multimedia transmission, in particular video transmission. Both the handheld size and battery life limit the processing power and memory of the device. Thus encoding and decoding must have relatively low complexity. Due to memory constraints and reasons for the use of wireless devices as well as billing procedures real time communication is likely to be required. Long delays before starting to see a video are either not possible or not acceptable. Finally wireless channels have much more interference than wired channels.

The 3G PP2 group has defined the following Qos parameters for wireless video conferencing services. The QoS parameters specified for the wireless part are more stringent th an those required for end to end transmissions. The 3G PP QoS requirements for multimedia transmission are nearly identical

- **Synchronization** : video and audio should be synchronized to within 20msecs

- **Throughput:** The minimum video bitrate to be supported is 32kbps. Video rates of 128kbps,384kbps and above should be supported as well.
- **Delay**: The maximum end to end transmission delay is defined to be 400msec.
- **Jitter:** The maximum delay jitter is 200msec.
- **Error Rate**: The video conferencing system should be able to tolerate a frame error rate of 10^{-2} or a bit error rate of 10^{-3} for circuit switched transmission.

5.4.5.Media Entertainment

Multimedia is heavily used in the entertainment industry, especially to develop special effects in movies and animations. Multimedia games are a popular pastime and are software programs available either as CD-ROMs or online. Some video games also use multimedia features. Multimedia applications that allow users to actively participate instead of just sitting by as passive recepients of information are called interactive multimedia.

Web based Applications

Web-based system applications, are Web applications with comparable capabilities to native applications. They are implemented in languages such as HTML5 and JavaScript but operate outside the Web browser sandbox, with access to the operating system on the host machine. Many modern operating systems, including Ubuntu, Google Chrome, Windows, and Firefox OS, provide runtime environment to support Web-based system applications, eroding the distinction between desktop, mobile, and Web-based software.

Features of Web-based applications

1. First, they are implemented in platform-independent Web languages and thus are portable, in contrast to native applications. In theory, the developer can write the application once and it will run on many desktop and mobile platforms.
2. Second, they have access to native functionality such as local files, camera, microphone, etc., in contrast to conventional Web applications.
3. Third, after they are installed by the user, they can work offline, also in contrast to conventional Web applications.
4. Fourth, they are easy to maintain and update by changing the Web code hosted on the developer's site, instead of requiring all users to update their local copies.
5. Fifth, even though they use runtime Web-browser libraries, they do not rely on browsers' user interfaces, which can take up valuable display space on mobile devices and make applications less responsive.

Categories of Web-Based Systems

Category	Examples
Informational	Online newspapers, manuals

Interactive	Registration forms
Transactional	Electronic shopping
Workflow-oriented	Status monitoring
Collaborative work	Distributed authoring
Online communities	Discussion groups
Web portals	Shopping malls
Web services	Enterprise applications

Examples :-

Gmail/Hotmail/Yahoo Mail -To read, compose, delete, forward and manage emails.

Zoho Writer
Ajax-based word processors may be good for collaboration, and they can offer solid basic functionality.

DropBox
Dropbox is top notch, affordable cloud storage—primarily because it's easy to use and incredibly affordable.

Jing:
When you install Jing onto your computer, you can take screenshots of whatever you see on your screen (and add graphics like arrows and things like that to them) and you'll immediately get a link you can use to share that image

PicResize:
It's important to keep the file size of the images on your site to a minimum.

Windows Live OneCare safety scanner
– to help ensure the health of your PC.

Adobe Buzzword
– online word processor, perfect for writing reports and proposals

ShrinkFile.NET

– to compress your text documents, images, PDF files and other data online

CreativePro Office

– Manage team, clients, projects, invoices and events

Picnik

– a photo editing tools

CyberTester

– to create tests/exams/assignments (consisting of single-choice, multiple-choices or keywords-based questions) and assign them to students to conduct online tests.

Advanced Stock Tracking System

– for keeping track of stocks and a search engine for the stock market

.Google Docs

– it lets you create your documents (like Word), spreadsheets, presentations and more. It also allows you to collaborate and share documents.

Avairy

– a powerful web creation tools for photo editing, logos, web templates, color palettes , audio editing and more.

Mint

– a web tool to access to your free personal financial and online management tool. It will help you to organize your financial accounts, set your budgets needs, and put up your savings.

JayCut

– a web video editing software. With a user-friendly environment, it will let you create your videos, add and edit clips, transitions, effects, audio, download, export in Youtube and more.

WobZip

– an online tool that makes you uncompressed your files on the fly. It supports different compression format such as ZIP, RAR, and more zip formats. It has also an active scanner that scan your compressed files before unzipping it.

Zamzar

-a powerful online file conversion tool. It converts various formats for documents, image, music, video, e-book, compressed files, cad formats. Just follow 4 easy steps to convert your files instantly.

Hulu

– a video/TV streaming website that lets you watch your favorite tv shows right at your computer. If you missed some of your favorites episode you can just tune in here and enjoy watching. Hulu is a US exclusive website.

TokBox

– a great online video chatting applications. For free users, you can chat up to 20 people. Just simply sign up,invite your friends and start video chatting.

ESET Online Virus Scanner

– deep scan your PC using your web browser. The good thing is that you don't need to install the software and it is always up to date.

icloud

– web operating system over the web. It is like bringing your own desktop and files running in your web browser that includes an office suite, media player, chat client, games, productivity tool, utility applications and more. Now you won't worry that you are working in a different PC.

Google Voice

– makes a huge deal in international calling communication. It delivers various features such as voicemail transcription, one number calling, sms to email, block callers, screen callers, conference call and more. Bringing your all phone into your gmail account given that you are in US and Canada.

HootSuite

– a web apps for your social networking experience. Updating and monitoring your social activities such as Twitter, Facebook, LinkedIn, WordPress and Ping.fm will be easy. It is also good for businesses that tracks statistics of their business over the web.

Challenges of Web Based Applications

There is a growing concern over the security of Web-based applications, which are rapidly being deployed over the Internet. For example, e-commerce—the leading Web-based application—is projected to have a market exceeding $1 trillion over the next several years. However, this application has already become a security nightmare for both customers and business enterprises as indicated by the recent episodes involving unauthorized access to credit card information. Other leading Web-based applications with considerable information security and privacy issues include telemedicine-based health-care services and online services or businesses involving both public and private sectors.

7 E-learning and education

E-leaning focuses on usage of technology in the field of education and learning. E-learning is a computer based educational tool or system that enables you to learn anywhere and at any time. Today e-learning is mostly delivered though the internet, although in the past it was delivered using a blend of computer-based methods like CD-ROM. Some of the most important developments in education have happened since the launch of the internet. These days learners are well versed in the use of smart phones, text messaging and using the internet. so participating in and running an online course has become a simple affair. Message boards, social media and various other means of online communication allow learners to keep them in touch and discuss course related matters, whilst providing for a sense of community. E-learning applications and processes include Web-based learning, computer-based learning, virtual classrooms and digital collaboration. Content is delivered via the Internet, intranet/extranet, audio or video tape, satellite TV, and CD-ROM. It is used by the educational Institutions to enhance and support the class room teaching and offering courses to a larger population of learners across the Globe. It can be self-paced or instructor led and includes media in the form of text, image, animation, streaming video and audio .Some of the different types of E-learning methods are:

- Computer-based Learning
- Computer-Based Training
- Computer-supported collaborative learning (CSCL)

Computer-based Learning

Computer-based learning, sometimes abbreviated to CBL, refers to the use of computers as a key component of the educational environment. While this can refer to the use of computers in a classroom, the term more broadly refers to a structured environment in which computers are used for teaching purposes.

Computer-Based Training

Computer-Based Trainings (CBTs) are self-paced learning activities accessible via a computer or handheld device. CBTs typically present content in a linear fashion, much like reading an online book or manual. For this reason they are often used to teach static processes, such as using software or completing mathematical equations. The term Computer Based Training is often used interchangeably with Web-based training (WBT) with the primary difference being the delivery method. Where CBTs are typically delivered via CDROM, WBTs are delivered via the Internet using a web browser. Assessing learning in a CBT usually comes in the form of multiple-choice questions, or other assessments that can be easily scored by a computer such as drag-and-drop, radial button, simulation or other interactive means. Assessments are easily scored and recorded via online software, providing immediate end-user feedback and completion status. Users are often able to print completion records in the form of certificates.

Computer-supported collaborative learning (CSCL)

Computer-supported collaborative learning (CSCL) is one of the most promising innovations to improve teaching and learning with the help of modern information and communication technology. Most recent developments in CSCL have been called E-Learning 2.0.It is widely agreed to distinguish collaborative learning from the traditional 'direct transfer' model in which the instructor is assumed to be the distributor of knowledge and skills.

Advantages of e-Learning to the Teacher or Institution

Some of the most outstanding advantages to the trainer or organization are:

- Reduced overall cost is the single most influential factor in adopting e-learning. The elimination of costs associated with instructor's salaries, meeting room rentals, and student travel, lodging, and meals are directly quantifiable.
- Learning times reduced, an average of 40 to 60 percent
- Increased retention and application to the job averages an increase of 25 percent over traditional methods
- Consistent delivery of content is possible with asynchronous, self-paced e-learning.
- Expert knowledge is communicated, but more importantly captured, with good e-learning and knowledge management systems.

Advantages to the Learner

Along with the increased retention, reduced learning time, and other aforementioned benefits to students, particular advantages of e-learning include:

- On-demand availability enables students to refer conveniently from home.
- Self-pacing for slow or quick learners reduces stress and increases satisfaction.
- Interactivity engages users, pushing them rather than pulling them through training.

- Confidence that refresher or quick reference materials are available reduces burden of responsibility of mastery.

Disadvantages to the Teacher or Institution
- Up-front investment required of an e-learning solution is larger due to development costs. Budgets and cash flows will need to be negotiated.
- Technology issues that play a factor include whether the existing technology infrastructure can accomplish the training goals, whether additional tech expenditures can be justified, and whether compatibility of all software and hardware can be achieved.
- Inappropriate content for e-learning may exist according to some experts, though are limited in number.
- Cultural acceptance is an issue in Institutions where student demographics and psychographics may predispose them against using computers at all, let alone for e-learning.

Disadvantages to the Learner

The ways in which e-learning may not excel over other training include:
- Technology issues of the learners are most commonly technophobia and unavailability of required technologies.
- Portability of training has become a strength of e-learning with the proliferation of network linking points, notebook computers, PDAs, and mobile phones, but still does not rival that of printed workbooks or reference material.
- Reduced social and cultural interaction can be a drawback. The impersonality, suppression of communication mechanisms such as body language, and elimination of peer-to-peer learning that are part of this potential disadvantage are lessening with advances in communication Technologies.

Cloud Computing for Multimedia Services

Cloud computing is one of the emerging IT technologies used in computation nowadays. It is a green technology which allows accessing, computing and storing the resources by offering various services across the internet without physically acquiring them. Cloud computing generally includes Infrastructure as a service(IaaS), Platform as a Service(PaaS), and Software as a Service(SaaS). Inorder to reduce the computation time and to overcome the storage space shortage issues, most of the organizations nowadays shifting to Cloud computing from the traditional process of computation.

Due to the invention of cloud computing, nowadays users can easily access the multimedia content over the internet at any time. Here the user can efficiently store the multimedia content of any type and of any size in the cloud after subscribing it with no difficulties. Not only storing the media content like Audio, Video and Image, but can process them within the cloud since the computation time for processing media data is more in complex hardware. After processing the processed data can be easily received from the cloud through a client without any need of installing complex hardware.

Multimedia cloud computing is the processing, accessing and storing of multimedia contents like audio, video and image using the services and applications available in the cloud without physically acquiring them. Currently many company's clouds like AmazonEC2, Google Music, DropBox, SkyDrive provides content management system within the cloud network. The users

of these clouds can access the multimedia content for example; the user can view a video anywhere in the world at anytime using their Computers, tablets or smartphones.

Cloud offers an environment which allows transparent access of data, storing it and processing the data in a secured manner. Transferring media contents from a local device to cloud has changed the data distribution model by its efficiency comparing with the previous less secured data distribution models. It gives more benefits by reducing the storage challenges of local client devices like computers, smartphones, tablets etc. The various cloud media services are,

A. Cloud gaming

Smart devices and computers are mainly used to play video games. But due to the power requirement and the computation speed, most of the 3D related games cannot be played in those smart devices. So to overcome this, there is a service for playing games in cloud. Using cloud any kind of video games can be played with complete satisfaction even by using low end devices.

B. Experiencing Multi-screens

Nowadays users have more expectation over multiscreens in devices. Users can access the media content of the cloud through multiple devices by supporting wide variety of video, audio codecs, aspect ratio and screen sizes for live or pay per use basis

C. Image Processing

There are various fields in which image processing is required, and most specifically in investigation and medical field. It includes techniques like segmentation, denoising, fusion, compression etc. Normally image processing software size will be more and it will reduce the computation of the local system. Nowadays inorder to overcome that, the media content i.e. images are processed in the cloud itself and the result will be received in our local client.

ADVANTAGES

Cloud media technology offers number of key benefits to its service providers as well as the users through increased implementation time, efficient data storage capacity, less computation and cost. It created a striking impact in the multimedia content processing like editing, storing, encrypting and decrypting, gaming, streaming, compressing etc.

A. Cost

Cloud media computing offers cost effective services to its service providers through efficient multiplexing of media contents like audio, video, image by providing a common infrastructure, utilizing the server, optimization, virtualization, Mobility and automatic processing. There is no need for physically acquiring a infrastructure or resource in our local system and thus reduces the cost.

B. Upgradable

Cloud media is an always connected to the cloud service provider and therefore it is upgraded and maintained without any manual interference. Software and security will be up to date always.

C. Compatibility

Cloud media allows the media content to be accessed anywhere through any smart device and it is compatible with all kinds of client service enabled computers, smartphones, cars tablets etc.

D. Consistent

Cloud media provides consistency in distributing the specific media contents to the users of other cloud within a cloud community using the streaming protocols like TCP/IP, UDP, RTP etc.

E. Green Technology

Cloud media computation uses optimized data centers for processing, distributing or sharing the media content to the users. But the traditional computation requires more energy consumption.

F. Ubiquitous

Cloud media offers the users to purchase a media content once and it can be accessed anywhere in multiscreen by providing customization ability depending upon the accessing device.

G. Storage

Cloud media technology has many bases for storing the media content in the cloud using the resources. Also it is more secure since the stored media content will be duplicated without manual interference.

Disadvantages
A. More confusion

There are more confusion among the user in choosing the type of cloud since both pay per use and free clouds are launched by some mobile companies, service providers etc. So the users face difficulty in taking a decision.

B. Inside attacks

There is a possibility for phishing and stealing of media content by the employee of the service provider itself.

C. Legal and piracy difficulties

Since the cloud media computation is very new, the legal standards are not very good.

D. Migration

Since more and more clouds are launched by the service providers, the user might think to move all his media content to some other cloud based on his change in requirements. But now the user does not have the freedom of doing that.

E. Challenges over standards

Currently many vendors (person who sells services) developing and launching their own private cloud environments based on their own conditions and security features which leads to issues in interoperability in the near future.

F. QOS

In cloud media computing, since it is a new area, the developers are concentrating more on computation speed and storage issue. Users going for unreliable networks without their knowledge to share the media content even though there are availability of more promising streaming technology and increased broadband speed.

Cloud-Assisted Media Sharing

Content sharing environments such as social networking are very dynamic in terms of the number of on-line users, storage requirement, network bandwidth, computational capability, applications and platforms, thus it is not easy for a service provider to allocate resources following the traditional client-server model. As cloud computing offers application developers and users an abstract view of services that hides much of the system details and inner workings, it is more and more popular in content-sharing applications. Media content has become the major traffic of Internet and will keep on increasing rapidly. Various innovative media applications, services, devices have emerged and people tend to consume more media contents. We are meeting a media revolution. But media processing requires great capacity and capability of computing resources. Meanwhile Cloud Computing has emerged as a prosperous technology and the Cloud Computing platform has become a fundamental facility providing various services, great computing power, massive storage and bandwidth with modest cost. The integration of Cloud Computing and media processing is therefore a natural choice. Media Cloud is the bridge to an open architecture that allows users to join their data to constitute a Cloud.

Media Cloud pursues fulfilling two goals: Content Classification Content Sharing.
Content Sharing:

ISSUE: Consider a group of friends that have just arrived from a half month travel and they all want to exchange the pictures stored in their cameras. Problem: An option would be to upload every picture and video to a social network to let others to individually select and download the pictures they like. However, viewing, selecting and downloading individual media file from the social network would be pretty tough and time consuming process.
 Solution: The goal of Content Sharing alleviates the problem of sharing large amounts of media with family and friends.

For Example, Salesforce.com is a software-as-a-service Company, which is now also offering platform-as-a service. Salesforce is a pioneer in providing a high quality on-demand CRM software (referred to as " The Sales cloud " by Salesforce). Salesforce is a classic manifestation of two (SaaS and PaaS) out of the three major components Of Cloud computing. Build Media Cloud application in the SalesForce.com by loging into free developer's edition namely developersforce.com Build an interface for login, registration, search and documents for accessing the files as per the authorization to access it. Media Cloud provides an easy to manage, cost-effective solution for bringing Cloud Computing paradigm to content sharing among federated networks. The cost-effectiveness is achieved by sharing resources that could be underused in other cases. Media Cloud encourages cooperation among networks facilitating media classification, management and sharing. Distributed search and content delivery over the cloud are among the most important features of Media Cloud.

Challenges In Building Scalable Digital Media Systems
Building a scalable digital media system from scratch that supports a large number of users and stores huge amount of media content is not a trivial task. The following list provides an overview of the common technical challenges associated with building scalable digital media systems.

Ingestion

• The system must allow end users to quickly and securely upload media objects while still providing a compelling user experience.

• Metadata of the media objects needs to be ingested and synchronized if media objects are modified or re-ingested.

• The ingestion workflow that defines the communication among all involved components needs to be managed.

Storage • Virtually unlimited storage for the media content and the storage must be reliable, globally accessible, and cost effective[3].

Processing

• Scalable computing resources are required for media processing, such as document format conversion, image processing, and media transcoding.

• The media processing workflow needs to be managed.

Serving

• The system must allow end users to quickly and securely download media content while still providing a good user experience.

• The serving workflow needs to be managed.

Media Applications

• The system supports the integration of media metadata with application specific domain data. It also allows for the development of scalable media applications, such as asset management, and content sharing, on top of this data.

End User Experiences

• The system provides compelling user experiences for multiple clients such as browsers, mobile devices, and desktop applications.

Cloud Platform is able to address each of the challenges described above. The proposed system architecture is generally applicable to any media type. The system can be built using the Google Cloud Platform:

System Components

Frontend and Media Applications Running on Google App Engine

• Authenticates and authorizes users and coordinate access to Google Cloud Storage.

• Implements the user interface for browser clients, and/or exposes APIs using Google Cloud Endpoints to mobile and desktop clients.

• Plays the role of system controller and is responsible for managing workflows for media ingestion, serving, and processing.

• Scalable media applications are powered by App Engine, with built-in load-balancing and auto-scaling.

Google Datastore

• Stores media content metadata and application data model. Google Cloud SQL

• Stores media content metadata and application data model, as an alternative to Google Datastore. App Engine Task Queue

• Integrates App Engine application with media processing software running on Google Compute Engine.

Image Services

• Provides dynamic image processing services for App Engine applications, such as thumbnail generation, resizing, and cropping.

Google Cloud Storage

• Provides scalable and highly available storage for media content. The storage can be accessed by using RESTful APIs and/or signed URLs.
 • Leverages Google network for the following advantages:
 (1) to allow for fast and secure content ingestion into and serving from the storage and
 (2) for edge caching capability for public content which lowers the serving costs.

Media Processing Server
 • Executes media processing on Google Compute Engine.

REVIEW QUESTIONS
2MARKS
1. What is user interface
2. What is hotspot
3. List the stages of designing multimedia product
4. What is storyboard
5. What is Icon
6. Expand MIME
7. What is copyright
8. Define Virtual Reality
9. What are the inputs of virtual reality systems
10. Define bandwidth
11. Define plug-ins
12. Give examples for text plug-ins
13. What is nibbling
14. What is GIF
15. What is PNG
16. What is JPEG
17. What is the use of GIF89a.
18. Give example for automatic tool generator
19. Mention MIME type image file extension

3MARKS
1. where the image maps are used
2. Define production
3. what is copyright
4. When you have a copyright of a product what can you do
5. How to avoid bandwidth bottleneck
6. Define Daemon
7. What are the two modes of access the multimedia data from the web
8. What is client side scripting
9. What is server side scripting
10. Write about clickable buttons
11. Write about client side image maps
12. What are the factors to be considered before video is created for the web
13. Give a short note about HTML5
14. Give short note about Discrete media
15. Give short note about Continuous media

5MARKS

1. Explain Navigation map
2. Explain story board
3. What are the factors involved in virtual reality
4. Write about different virtual reality modeling
5. Explain different plug-ins
6. How a text element is used for the web(10marks)
7. How to flow text through image for the web
8. What are the parameters used for deciding quality of data transmission
9. Draw and explain multimedia demand system architecture(10marks)
10. Write about multimedia over wireless and mobile networks
11. Mention the features of web based applications
12. What are the categories present in web based systems
13. Explain about e-learning
14. Explain cloud computing for multimedia services