Uttar Pradesh Rajarshi Tandon Open University

Master of Computer Science

MCS-114

Multimedia Technology

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Block

1

Introduction to Multimedia and Its Components

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UNIT-1
INTRODUCTION TO MULTIMEDIA

Structure

1.0 INTRODUCTION

People who use the term “multimedia” often seems to have different, even opposite opinions. A PC vendor wants us to think of a multimedia like a sound-powered PC, a DVD-ROM drive, and perhaps the superiority of the multimedia microprocessors enabled to understand the additional multimedia instructions.

The consumer entertainment product provider may think of multimedia as interactive cable TV with hundreds of digital channels or similar to high-speed Internet connection cable television. A student in computer science reading this book probably has an application-centric view of multimedia, which consists of applications that use different modes in their favor, including text, images, graphics, animation, video, audio, and most probable some interactivity.

The popular notion of "convergence" is the one who lives in the university campus, as well as culture in general. In this scenario, PCs, DVDs, games, digital television, integrated web browsing, wireless connectivity, etc., converge on technology, presumably to come in the near future to a versatile multimedia product. While hardware can actually involve these devices, the already exciting multimedia is part of some of the most interesting ongoing projects in computer science.

The convergence in this field is, in fact, a convergence of areas that have in the past been separated, but now find much to share in this new application area. Graphics, visualization, HCI, computing, data compression, graphics theory, networks, database systems, all have important contributions to make in

multimedia right now. In this unit, focus is on understanding the multimedia bases. This chapter discusses multimedia elements, Media file, I/O functions, file formats are important features of multimedia, and multimedia protocols are also needed for interaction analysis.

1.1 OBJECTIVES

After the end of this unit, you will be able to:

- ✓ visualize the concepts and scopes of multimedia;
- ✓ understand creational steps of multimedia applications.
- ✓ differentiate various multimedia file format.
- ✓ understand the fundamental Multimedia protocols.

1.2 MEANING AND SCOPE OF MULTIMEDIA

The word “multimedia” comes from the Latin word “multus” which means many and “media” states to the mode of communication as magazines, television, radio, internet and the newspapers that spread to a large number of people [1].

- Media in computer storage: CD, Hard Disk, USB, DVD, floppy – storage media.
- Media in the newspaper, radio, press and TV context - mass media.
- Media in HCI context: image, audio, text, video, CG – interaction media.
- Media in communications: network, cables, satellite – transmission media.

➔***Example***: A music video and sound should be used together as one without another would lose its significance.

Multimedia provides important information interactively with the use of images, graphics, animation, video and audio. For this reason, it is gaining popularity as a powerful educational tool. There are several multimedia programs used in the education field. CDs and DVDs are used to store information in various media formats.

➔***Example:*** A Power point presentation involving text and graphics is a multimedia presentation.

The use of the term "multimedia" is different from person to person. Multimedia refers to various information, such as image, video, text, audio, animation, and graphics in a variety of application backgrounds. According to a computer vendor, the multimedia is a PC with video display, DVD-ROM drive,

sound capability, and various microprocessors to recognize further instructions. An interactive consumer marketing sees multimedia as synergic cable television with a number of channels of knowledge and entertainment. In terms of calculation, the basic multimedia attributes are:

- **Distributed**: The information carried is remote, pre-created and stored or created in real-time which are distributed over networks.
- **Digitized**: All media are signified in digital format.
- **Integrated**: The media are presented in an arranged way, but can be manipulated independently.
- **Interactive**: There is possibility to alter or manipulate the information received, and send personal information, in a non-trivial way without any start, stop and fast forward.

Multimedia applications are undergoing important transitions with the increase in time. The opportunity of multimedia in various fields can be described as follows:

1. Multimedia is used for e-learning purpose.
2. Multimedia is used for advertisement.
3. Corporate Presentations
4. **Information Kiosks**

In an information kiosk, information is accessed through a touch screen and displayed on a monitor. It can be used to provide important information such as trains at a train station. Shopping kiosks provide customers with a shopping mall experience. Kiosks can also be used to provide statistical data for market research.

5. **Entertainment**

   Multimedia is significantly used in the entertainment industry, to create exceptional effects in animations and movies.

The other uses of multimedia can be seen in following places:

- Video conferencing
- World Wide Web
- Digital video editing
- interactive TV
- Hypermedia courseware
- Video-on-demand
- Virtual-reality

1.2.1 Features of Multimedia

- **Media presentations** can be personally viewed on the stage, transmitted, projected or reproduced by a media player. A broadcast can be a live or recorded multimedia presentation. Recordings and transmissions can be digital or analog electronic media technologies. Digital multimedia that is online can be transmitted or downloaded. It can be on demand or live.

- **Multimedia games and simulations** can be used in a physical environment. There may be more users, special effects on an online network or locally with an offline computer. Interactivity is made possible by combining multiple forms of multimedia content, but depending on which media content you have, it can vary. Online media content is increasingly oriented towards objects and data. It allows applications with the ultimate user innovation for collaboration and personalization in various forms of content over time.

*Did you know***?**

Global positioning system (GPS) is popular multimedia device used for mapping routes and directions while driving, travelling or hiking.

Check Your Progress 1

Identify five novel applications of multimedia. Why do you think they are novel?

Notes: a) Please write your answers in the space provided below.

b) Don't forget to check your answers with the one given at the end of this chapter.

1.3 ELEMENTS OF MULTIMEDIA

High-impact multimedia applications, such as presentations, training and messaging, require the use of moving images such as video and image animation as well as sound (video and sound superimposed on a narrator) mixed with images of graphical text documents and screens. Multimedia applications require dynamic data management, consisting of a combination of text, voice, audio components, video components, and image animation. It includes elements like mouse, music player, DVD, floppy disc etc. Integrated multimedia applications allow the user to cut sections of all or some of these components and paste them into a new document or other application, such as an animated sequence of events, to desktop publishing system or spreadsheet. The components that fall into our multimedia definition are:

1.3.1 Facsimile

Fax transmissions were the first practical means of transmitting document images to phone lines. Basic technology, now widely used, has evolved to allow for greater scanning density for a better quality fax**.**

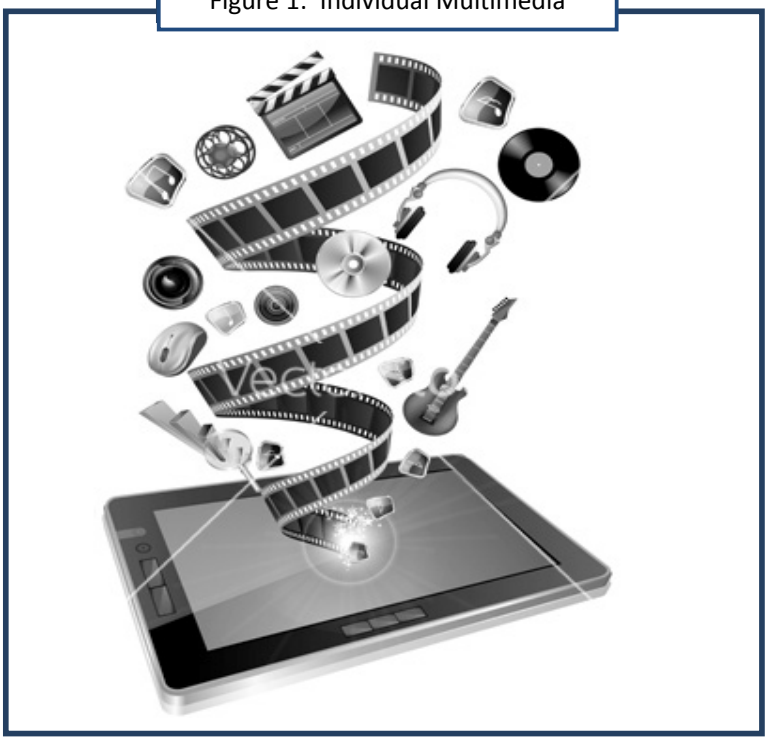
1.3.2 Document Images

Document images are used to store business documents that need to be stored for long periods or require access by a large number of people. Media access to these documents eliminates the need to make multiple copies of the original for storage or distribution.

1.3.3 Photographic Images

Photographic images are used for a wide range of applications, such as employee records for instant identification at a security counter, real estate systems with house photos in the database that contain house descriptions, medical records etc. The individual multimedia element has been given in Figure 1.

Figure 1: Individual Multimedia



Source: http://www.vectorstock.com/i/composite/33,45/tablet-multimedia-vector-743345.jpg

1.3.4 Geographic Information Systems Map (GIS)

The map created in a GIS system is wildly used for natural resources and wildlife management and urban planning. These systems store the geographic information of the map together with a database containing information about mapped items with statistical information or elements such as wildlife statistics or

floor and room details and workers in an office building.

1.3.5 Interactive Platforms

It includes interaction with the end user. You can see what media means one of the previous technologies. Because of what hardware can and cannot do, it's often a compromise between a certain amount of static graphics, audio, video, and full-text graphics. As you can imagine, textual information takes up the minimum amount of space to store.
Even if a multimedia machine has unlimited resources, you want to add a combination of these multimedia technologies. For example, although an image is worth a thousand words, it would be difficult to represent William Shakespeare's work only through the images. The same applies to audio sound. You could record the sound of bells and a biblical narrative, but sometimes you would like to have the Bible in text format, which will allow you to search for certain keywords.

1.3.6 Voice Commands and Voice Synthesis

Voice commands and voice synthesis are used for the hands-free operation of a computer program. Voice synthesis is used to present the results of an action to the user in a synthesized voice. Applications such as a patient monitoring system in an operating room will be the main beneficiaries of these features. Voice commands allow the user to direct computer operation using voice commands.

1.3.7 Audio Message

Annotated voice mail already uses audio or voice messages such as attachments to memos and documents, such as maintenance manuals.

1.3.8 Video Messages

Video messages are being used in a manner similar to annotated voice mail.

1.3.9 Holographic Images

All technologies in essence have a flat view of information. Holographic images extend the concept of virtual reality, allowing the user to "enter" a part, such as an engine, and see its action from within.

1.3.10 Fractals

Fractals began as a technology in the early 1980s, but recently they received great attention. This technology is based on synthesis and storage algorithms that describe the information

1.3.11 Animation

Animation refers to moving graphics images. The movement of someone who gives CPR makes it much easier to learn cardiopulmonary resuscitation, rather than just seeing a static image. Just as a static graphic image is a powerful form of communication, such is the case of animation.

Animation is particularly useful for illustrating concepts that involve the movement. Concepts like playing a guitar or hitting a golf ball are difficult to illustrate using a single photo or even a series of photographs and even harder to explain using the text. Animation makes it easier to represent these aspects of the media application.

1.3.12 Text

The text consists of the words that appear on the screen. It is the basic information used in multimedia. Text is the basis of word processing programs and remains the key information used in many multimedia programs. In fact, many multimedia applications rely on converting a book into a computerized form. This conversion allows the user to immediately access the text and allows you to display popup windows that allow you to define certain words. Multimedia applications also allow the user to instantly view information about a specific subject at a viewing time.

More powerful, the computerized form of a book allows the user to quickly search for information (without looking at the index or table of contents). The Windows operating environment provides the user with an almost infinite range of expression texts. As a media programmer, you can choose the type of font to display, size (or size), and color to display. When you display text in more than one format, the message that a media application tries to represent can be made more understandable. One kind of application, which many people use every day, is the Windows help engine. This application is a text-based information viewer that facilitates access to information about a particular topic.

1.3.13 Still Images

Still images refer to still images, such as those in the image. When you imagine graphic images, you probably think of "still" images, that is, images like those shown in a photo or drawing. There is no movement in these types of images. Static graphics are an important part of multimedia because humans are visually oriented. As the Chinese proverb says, "an image is worth a thousand words". Windows is also a visual environment. This makes it easier to view graphical images of a DOS environment.

Static graphics images have different formats and can be created in different ways. As you can see an unlimited number of photos or images, the types of static graphics images you can include in a media application are almost limitless.

1.3.14 Audio

Audio includes recorded sound, such as recorded lessons, dialogue, or music. Audio sound integration in a multimedia application can provide the user with information that is not possible with other communication methods. Some types of information cannot be transmitted effectively without using the sound. It's almost impossible, for example, to provide a precise description of the bear's heart or sound. Audio sound can also enhance the user's understanding of the information presented in other types of media. For example, a narration can describe what you see in an animation clip. This can improve understanding of application and lead to better understanding.

Learning experts have found that presenting information by using more than one meaning helps keep information retention. More importantly, it can also make the information more interesting to the user. Audio sound is available in several formats. Today, perhaps the most common type of audio is the red audio of the book.

This is the standard specification used to refer to compact consumer audio discs. It is an international standard and is officially known as IEC 908. This specification is called red audio book because of the color of the cover page of the publication that describes its formats. Red Book Audio can also be used in multimedia applications and is the basis for high quality sound available. Another audio format is the wave file, which can only be played on PCs running the Windows operating environment. A wave file contains the actual digital data used to play the sound and a header that provides more information on resolution and playback speed. The wave files can store any kind of sound that can be recorded with a microphone.

The latest type of audio sound that can be used is known as Digital Interface, Musical Instrument or MIDI for short. The MIDI format is actually a specification invented by musical instrument producers. Rather than being a digitized form of sounds, MIDI specification is actually a set of messages that describes what music note is playing. The MIDI specification cannot store anything except in the form of music notes. MIDI music can be created with a sequencer.

1.3.15 Video

The video refers to the recording of moving visuals, whether graphically or in video. It can include audio. Full video, such as images played on a TV, can add even more to a media application. There are currently two major ways to embed the full video into a multimedia application: Microsoft Video for Windows and Quick Time for Windows from Apple Computer. Both products have the tools to get the video from an external input (a video recorder or a camcorder) and store it on the hard drive.

1.4 CREATING MULTIMEDIA APPLICATIONS

Developing a multimedia application follows seven stages as explained below:

1. **Analysis** - what is the project proposed to do? A description of the project is made up.
2. **Design** - what is required on each screen is designed, multimedia content of each screen and the order in which they will be linked together.
3. **Implementation-** The design into a working application can be implement through multimedia or web pages.
4. **Testing** – The process to make sure that all the multimedia functions in the project are working properly.
5. **Documentation** - User Guide and Technical Guide.
6. **Evaluation** - the completed project is checked to make sure it meets all the design criteria.
7. **Maintenance** - ensuring there are no errors (bugs) and changing the design to meet the client's need, if required.

1.4.1 Stages of Multimedia Application Development

A multimedia application is developed in stages as all other programs are developed. In the development of multimedia applications, some steps must be completed before other phases and some can be combined or jumped in other phases. Below are the four main stages of the development of multimedia projects.

1.4.1.1 Planning and Costing

The idea or need is important at this stage. This idea can be further refined in outlining its messages and goals. Before you start developing your multimedia project, you need to plan what skills will be needed for writing, graphic art, music, video, and other multimedia knowledge.

It is also important to determine the time required to prepare all the elements of multimedia and make a **budget** accordingly. After making a budget, a **prototype** or proof of concept can be developed.

1.4.1.2 Designing and Producing

The subsequent stage is to accomplish each of the planned tasks and create a finished product.

1.4.1.3 Testing

Testing a project ensures that the product is free of errors. Ensuring that your multimedia application meets your project goals is a major issue besides the elimination of errors. You also need to check if the multimedia project works properly on the delivery platforms that are designed and meets the needs of customers.

1.4.1.4 Delivering

Testing a project ensures that the product is free of errors. Ensuring that your multimedia application meets your project goals is a major issue besides the elimination of errors. You also need to check if the multimedia project works properly on the delivery platforms that are designed and meets the needs of customers.

1.5 MULTIMEDIA FILE AND I/O FUNCTIONS

The media file refers to a file that consists of one or more media elements, such as images, videos, audio, etc. But if a file contains only text, it is not known as a media file. The audio file is defined as a media file. "The word I/O refers to any operation, program or device that transfers data to a computer or vice versa. In addition, it includes data transfer to or from a peripheral device. Each of the transfer acts as input of a device and acts as output and another. For example: if a user enters the keyboard, scanf () is used as an input function to take the input and to display the output on the monitor printf () is used as an output function. The types of multimedia are shown in Figure 2.

This section describes the functions, macros, messages, and structures associated with multimedia file input and output. The following functions are used with multimedia file I/O.

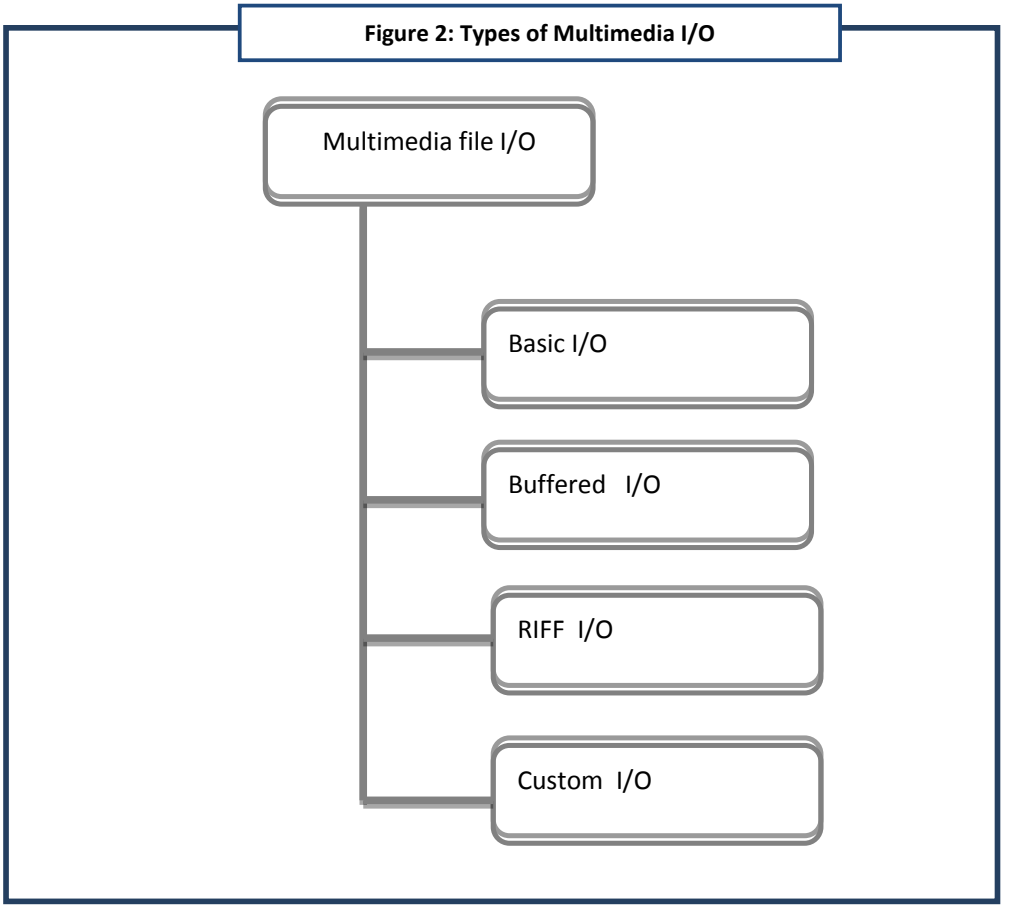
IOProc–The IOProc function accesses a single storage system, such as the file or database. The mmioInstallIOProc function is used to install or remove this callback feature. IOProc acts as a placeholder for the name of the function defined by the application. The actual name must be exported by including it in an **EXPORTS** statement in the application form definition file. The C ++ syntax is shown below.

Parameters: *Lpmmioinfo* Pointer of a MMIOINFO structure contains open file information. The I/O procedure must keep the lDiskOffset element in this structure to indicate that the file is moved to the next reading or writing position. The I/O procedure can use the adwInfo member to store the status information. The

I/O procedure must not modify other members of the MMIOINFO structure. The procedure is given below.

```
LRESULT CALLBACK IOProc(
 LPSTR  lpmmioinfo,
    UINT   wMsg,
 LPARAM lParam1,
LPARAM lParam2 );
```

Figure 2: Types of Multimedia I/O



Source: http://www.vectorstock.com/i/composite/33,45/tablet-multimedia-vector-743345.jpg

wMsg

It is indicating the requested I/O operation. Messages that can be received include MMIOM_OPEN, MMIOM_CLOSE, MMIOM_READ, MMIOM_WRIT E and MMIOM_SEEK.

lParam1
Parameter for the message.
lParam2
Parameter for the message.

Return value

Returns a value that corresponds to the message specified by wMsg. If the I/O procedure does not recognize a message, it should return zero.

Remarks

The four-character code specified by the MMICINFO tree fccIOProc member associated with a file identifies an extension name for the custom storage system. When an application calls the mmioOpen function with a file name such as EJEMPLO.XYZ + ABC, it is called an E / S procedure associated with the four-character "XYZ" code to open the ABC EXAMPLE.XYZ file element.
The mmioInstallIOProc function maintains a separate list of installed I/O procedures for each Windows application. Therefore, different applications can use the same I/O procedure identifier for different non-conflict I/O procedures.
If an application calls mmioInstallIOProc more than once to register the same E/S procedure, you should call this function to clear the procedure once every time the procedure has been installed.
The mmioInstallIOProc function does not prevent an application from installing two different E/S procedures with the same identifier or E/S installation procedure with one of the predefined identifiers (DOS or MEM). The newly installed procedure has priority and the last installed procedure is the first one to remove. When looking for a particular I/O procedure, you first try local procedures and then global procedures.

- **mmioAdvance**- The mmioAdvance function advances the I/O buffer of a configured file. The mmioGetInfo function is used to directly access the I/O buffer. The C ++ syntax is shown below.

```
MMRESULT mmioAdvance(
    HMMIO       hmmio,
    LPMMIOINFO lpmmioinfo,
    UINT        wFlags );
```

Parameters

hmmio
File handle of a file opened by using the mmioOpen function.
Lpmmioinfo
MMIOINFO structure indicator obtained using the mmioGetInfo function. This structure is used to set the current file information and then is updated after the buffer is advanced. This parameter is optional. It can be one of the following and shown in Table 1.

Value	Meaning
MMIO_READ	Buffer is filled from the file.
MMIO_WRITE	Buffer is written to the file.

Table 1 MMIOINFO structure

Return value

It returns MMSYSERR_NOERROR, if successful or an error otherwise. Possible error values include the following. The possible errors are shown in Table 2.

Return code	Description
MMIOERR_CANNOTEXPAND	The specified memory file cannot be expanded, probably because the adwInfo member of the MMIOINFO structure was set to zero in the initial call to the mmioOpen function.
MMIOERR_CANNOTREAD	An error occurred while refilling the buffer.
MMIOERR_CANNOTWRITE	The contents of the buffer could not be written to disk.
MMIOERR_OUTOFMEMORY	There was not enough memory to expand a memory file for further writing.
MMIOERR_UNBUFFERED	The specified file is not opened for buffered I/O.

Table 2 Possible error values

Some other fuctions include mmioClose, mmioCreateChunk, mmioDescend, mmioFlush, mmioGetInfo, mmioInstallIOProc, mmioOpen, mmioRead, mmioRename, mmioSeek, mmioSendMessage and mmioSetBuffer.

1.6 MULTIMEDIA DATA STRUCTURE

There are following data structures for multimedia.

1.6.1 Point Quad Tree

The quad-tree point is an adaptation of a binary tree used to represent bidirectional point data. It shares the characteristics of all quads, but it is a real tree, as the center of a subdivision is always at one point. Often it is very effective when comparing two-dimensional data points, which generally work in O(logn). It is worth mentioning the grid points to complete them, but they have been overtaken by k-d trees as general binary search tools [2].
Dotted quads are constructed as follows. Given the next point to insert, we find the cell in which it is and add it to the tree. The new point is added so that the cell that contains it is divided into quadrants with vertical and horizontal lines that cross the point. Consequently, the cells are rectangular but not necessarily square. In these trees, each node contains one of the access points.
Because the plane division is determined by the order of insertion of the points, the height of the tree is sensitive and depends on the order of insertion. Inserting into a "bad" order can lead to a linear height tree in the number of input points (then becomes a linked list). If the set of points is static, you can perform a preload to create a balanced tree height.

1.6.2 Node Structure for a Point Quad Tree

A node in a quadtree of points is similar to a node in a binary tree, with the main difference having four pointers (one for each quadrant) instead of two ("left" and "right") as in an ordinary binary tree. In addition, a key is generally decomposed in two parts, with reference to the x and y coordinates. As a result, a node contains the following information:

- four pointers: quad[‘NW’], quad[‘NE’], quad[‘SW’], and quad[‘SE’]
- point; which in turn contains:
- key; usually expressed as x, y coordinates
- value; for example a name
- Binary Tree edition.
- Used to represent 2-D point data.
- Shares the features of quad tree.

- The point will always act as the center of a subdivision, so it is a true tree.

1.6.3 K-d tree

A k-d tree (short for k-dimensional tree) is a space-partitioning data structure for organizing points in a k-dimensional space. k-d trees are a useful data structure for several applications, such as searches involving a multidimensional search key (e.g. range searches and nearest neighbor searches). k-d trees are a special case of binary space partitioning trees..
This method leads to a balanced k-d tree, where each leaf node is approximately the same distance from the root. However, balanced trees are not necessarily optimal for all applications. Note that you do not need to select the midpoint.
In the event that no targets are selected, there is no guarantee that the tree will be balanced. To avoid encoding a complex O (n) search median algorithm or using an ordinal order O (n log n) such as Heapsort or Mergesort to order n points, a popular practice is to order a fixed number of randomly selected points use the median of those points to serve as a division plan. The description of k-d tree is shown in Table 3.

k-d tree		
Type- Multidimensional BST		
Invented- 1975		
Invented by- Jon Louis Bentley		
Time complexity in big O notation		
Algorithm	**Average**	**Worst Case**
Space	**O(n)**	**O(n)**
Search	**O(log n)**	**O(n)**
Insert	**O(log n)**	**O(n)**
Delete	**O(log n)**	**O(n)**

Table 3 k-d tree

In practice, this technique often produces very well-balanced trees.

- It is a type of binary Tree
- In space data in every node is a K-Dimensional point.
- It acts as Space partitioning structures, which organizes points in K-Dimension.
- In K-D tree a non-leaf divides tree into two portions, which is called as half spaces.

1.6.4 R-Trees

R-trees are tree data structures used for spatial access methods, i.e. for indexing multidimensional information such as geographic coordinates,

rectangles, or polygons. The R-tree was proposed by Antonin Guttman in 1984 and found a remarkable use in theoretical and applied contexts.

A common use in the real world for a tree R could be to store spatial objects like refreshment places or polygons on which maps are mapped: roads, buildings, lakes, coasts, etc. and then quickly find answers to questions like "Find all museums within 2 miles from my current location", "Retrieve all street segments within 2 miles of my position" (to view them on a navigation system) or "Search for nearest station "(even if it does not count). The uses of R-tree is shown in Table 4.

R-tree
Type- Tree Invented- Antonin Guttman Complexity search- O(logMn)
Uses
• **It is used for spatial access methods.**
• **It is used to index multi-dimensional information like square, rectangles, geographical coordinates or polygons.**

Table 4 R- tree

The R shaft can also accelerate the closest proximity search for several remote measurements, including the maximum circle distance. As with most trees, search algorithms (for example, intersection, containment, searching for near neighbors) are quite simple. The basic idea is to use limit boxes to decide whether to search within a substructure or not. This way, most tree nodes are not read during a search. Like B-tree, this makes R-tree suitable for large data sets and databases, where nodes can be paginated in memory when needed and need not to keep the entire tree in main memory.

1.7 MULTIMEDIA FILE FORMATS

There are following multimedia file format

1.7.1 Audio File Formats

Audio file format is a format used to store audio files on a PC. Different audio file format is shown in Table 5.

EXTENSION	FILE FORMAT	INFROMATION
.mid or .midi	MIDI file	Musical Instrument Digital Interface
.au	AU Audio file	UNIX Audio
.aiff	AIFF Audio file	Audio Interchange File Format
.wav	Windows Audio file	Wave Form
.mp3	MP3 Audio file	MPEG Audio Layer 3
.wma	Windows Media Audio file	Windows Media Audio

Table 5 Audio file format

1.7.2 Video File Formats

Video file format are of two types i.e., analog and digital. It is used to store a video file on a PC. Different video format are shown in Table 6 eg. .mpeg is extension which is used for movie files.

EXTENSION	FILE FORMAT	INFORMATION
.mpg or .mpeg	Movie file	Moving Picture Experts Group
.avi	Windows Video file	Audio Video Interleave
.asf	Windows Media file	Advanced Streaming Format
.wmv	Windows Media Video file	Windows Media Video

Table 6 Video file format

1.7.3 Image File Formats

Image file format is used to store image files on a PC. Image file formats are shown in Table7.

EXTENSION	FILE FORMAT	INFORMATION
.gif	GIF	Graphic Interchange Format
.png	PNG	Portable Network Graphics
.jpg	JPEG	Joint Photographic Experts Group
.tif	TIFF	Tagged Image File Format
n/a	Raw image files	Raw image files contain data from a digital camera. The files are called raw because they are not processed and therefore cannot be edited or printed.

Table 7 Image file format

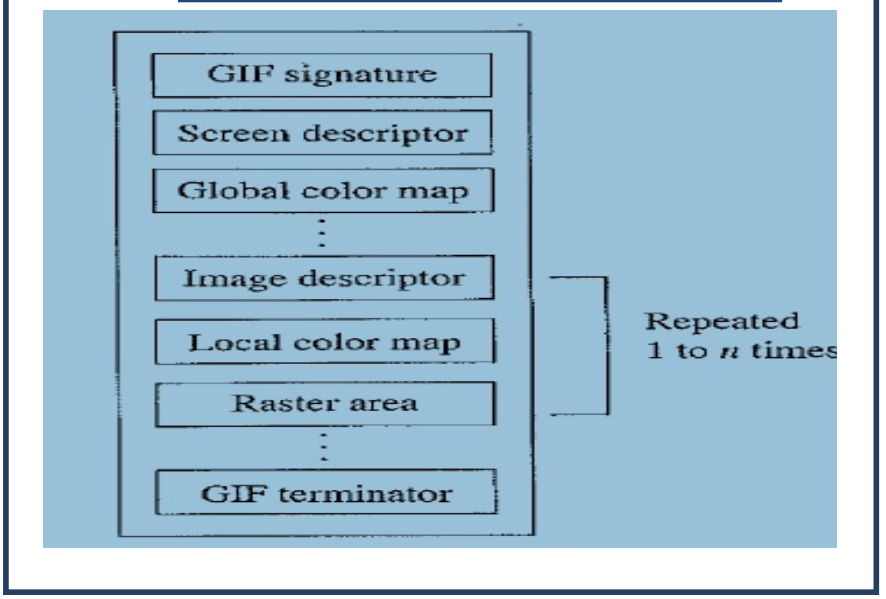
1.7.3.1 GIF

Graphics Interchange Format (GIF) is designed by UNISYS Corporation and Compuserve, initially for the transmission of graphics images to modem-based telephone lines. The GIF standard uses slightly modified image packets for pixel lines to effectively group Lempel-Ziv-Welch algorithm.

The GIF standard is limited to 8-bit color images (256). While this produces an acceptable color, it is more suitable for images with less distinctive colors (eg Graphics or Drawings). The GIF image format has some interesting features, though it has been largely supplanted. The standard supports interlacing: the

subsequent display of pixels in much spaced rows through a four-step display process. In fact, GIF comes in two flavors. The GIF descriptor is shown in Figure 3.

Figure 3: Gif Descriptor



Source:*Book on "Fundamentals of multimedia" by Ze-Nian Li and Mark S. Drew*

The original specification is GIF87a. The next version, GIF89a, supports simple animations via a graphic control extension block in the data. This provides a simple control over the delay time, a transparency index, and so on. Software like Corel Draw allows access and edits GIF images.

It is worth examining the file format for GIF87 more in detail, since many of these formats seem to be, but have become much more complex than this "simple" standard. The signature has 6 bytes, the screen descriptor is a set of 7-byte indicators.

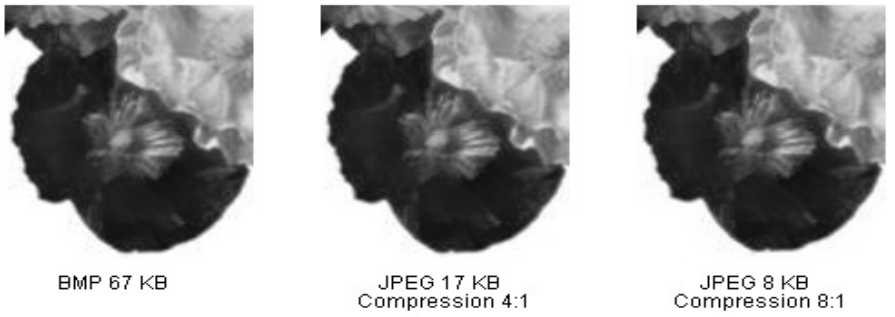
A GIF87 file can contain more than one image definition, usually adapted to different parts of the screen. Therefore, each image can contain its own color search table, a local color map, to map 8 bits to 24 bit RGB values. However, you do not need to, and instead you can define a global color map to replace the place of a local table if it is not included. The screen decelerator includes a set of attributes belonging to each image in the file.

1.7.3.2 JPEG

The most important current standard for image compression is JPEG [6]. This standard was created by a Working Group of the International Standardization Organization (ISO), which was then called the Joint Photo Experts Group and then receives this name. We will study IPEG in a good deal, but here we can cite some outstanding features of this compression standard. The

human vision system has some specific limitations that IPEG uses to achieve high compression rates. The brain system cannot see extremely thin details. If many changes occur in a few pixels, reference is made to that segment of image that has a high spatial frequency, that is, a large variation in space (x, y). This limitation is even more noticeable for color vision than for grayscale (black and white). Thus, color information in IPEG is deciphered (partly discarded or on average), and small blocks of an image are represented in the spatial frequency domain (u, v) rather than (x, y). That is, the rate of changes in x and y is evaluated from low to high, and a new "image" is created by grouping the coefficients or weights of these velocities. The weights that correspond to slow changes are preferred, using a simple trick: the values are divided into a large, truncated whole. In this way, the small values are reduced to zero. Next, a scheme is applied to efficiently represent zeros and the image is compressed to a large extent. The BMP image is of 67 KB and image in JPEG format of 17 KB with compression of 4:1 is shown in Figure 4. The right most image is in JPEG format of 8 KB and compressed as ratio of 8:1.

Figure 4: BMP and Two JPEG Images



Source: http://i.msdn.microsoft.com/dynimg/IC153188.gif

Since it effectively delays much information through the split and truncation phase, this compression scheme is "with loss" (even if there is a lossless mode). In addition, since it is easy to allow the user to choose which denominator to use and therefore how to discard it, JPEG allows the user to set a desired compression ratio or split ratio (input divided by output).

1.7.3.3 PNG

An interesting development derived from the popularity of the Internet is the effort towards the more independent image format system. One of these formats is Portable Network Graphics (PNG). This standard is intended to replace the GIF standard and extends it significantly.

The motivation for a new standard was partially patent UNISYS and Compuserve in the LZW compression method. (It is interesting to note that the patent only covers compression without decompression, which is why UNIX gunz IP utility

1.7.3.6 Graphics Animation Files

Some dominant forms are intended for the storage of graphic animations (ie,or graphic illustrations) in contrast to the video (ie, series of images). The difference is animations are considerably less required than video files. Furthermore, Animation file formats can be used to store video information. FLC is an important animation format or moving image file; was originally created from Animation Pro. Another format, FLI, is similar to FLC. GL produces better moving images in motion. GL animations can also handle larger files. Many previous formats are used for animation, such as DL and Amiga IFF, as well as alternatives like Apple Quicktime. And, of course, there are also GIF89 animated files.

1.7.3.7 Windows WMF

Windows MetaFile (WMF) is the native vector file format for the Microsoft Windows operating environment. WMF files actually constitute a collection of call-to-speech (GDl) features of the graphical device, even native to the Windows environment. When you play "aWMFfile" (typically uses the Windows PlayMet aFile() function), the image described will be displayed. WMF files are apparently independent of the device and are unlimited in size.

1.7.3.8 Windows BMP

Bitmap (BMP) is the standard format of the main system graphic files for Microsoft Windows, used in Microsoft Paint and other programs. It uses low-end encoding compression and can efficiently store 24-bit bitmap images. Keep in mind, though, that BMP has m & Y and various modes, including 24-bit uncompressed images.

1.7.3.9 Macintosh PAINT and PleT

PAINT was originally used in the MacPaint program, initially only for monochrome bit images. PICT is used in MacDraw (a vector-based drawing program) for storing structured graphics.

1.8 MULTIMEDIA PROTOCOLS

The multimedia protocols at different OSI layers [3] [7] are

1.8.1 Transport Layer

The transport protocol, for multimedia transfer, is able to maintain the features and protocols of the functional, multicasting, semi-reliability, NAK-based error recovery mechanism and rate control.

Transmission protocol, such as TCP and UDP, which uses multimedia protocols technology, allows you to analyze emerging transport protocols such as RTP, XTP protocols and protocols that are suitable for multimedia. The Internet protocol stack includes two types of transport protocols.

1.8.1.1 Transmission Control Protocol (TCP)

The first implementations of video conferencing applications were implemented through the TCP protocol. TCP provides a reliable serial communication path, or a virtual circuit, between processes that swap a full duplex byte stream. It is assumed that each process resides on an Internet host identified by an IP address. Each process has a number of full-duplex logic ports through which it can be configured and used as full-duplex TCP connections.

Media applications do not always require full duplex connections for continuous media transport. An example is a TB-based LAN transmission, which requires a full duplex control connection, but a simple continuous media connection is often sufficient.

When transmitting TCP connection data, TCP must achieve reliable and sequential delivery of a byte sequence through an underlying and unreliable datagram service. To do this, TCP uses positive acknowledgments and retransmissions of waiting times when it accepts the information. Since retransmission can cause out of order and duplicate data, sequence numbering is crucial. TCP Flow Control uses a window technique where the receiving side of the connection informs the sending side of the sequence numbers that it can transmit at any given time and those it has received contiguously so far.

For multimedia, positive recognition generates considerable overall costs, as all packets are sent at a fixed rate. Negative recognition would be a better strategy. Additionally, TCP is not appropriate for real-time audio and video broadcasting because its retransmission mechanism may cause a deadline violation that will affect the continuity of continuous media broadcasts. TCP has been designed as a convenient transport protocol for non-real-time reliable applications such as file transfer where it offers the best performance.

Transmission Control Protocol: Transmission Control Protocol (TCP) is connection oriented and reliable protocol. The advantages of TCP are

- Dominate protocol for data transfer of data over the Internet.
- Streaming through firewall.
- Reliability is there.

The disadvantages of TCP are-

- Typically need larger buffer to handle data rate variation.

- Retransmission due to unreachable packets can cause further jitter or skew.
- Multicasting is not supported.
- Not fast like UDP.

1.8.1.2 User Datagram Protocol (UDP)

UDP is a simple extension of Internet Protocol Internet Protocol (IP) that supports the multiplexing of datagram exchanged between Internet host pairs. It only offers multiplexing and adding verification. UDP first level protocols must provide their own retransmission, packing, reassembling, flow control, congestion prevention, and so on.

Many multimedia applications use this protocol as it provides the transport property to some extent in real time, even though you may experience loss of PDU.

For experimental purposes, UDP over IP can be used as a simple and unreliable connection for media transport. In general, UDP is not suitable for streaming media because it does not provide the notion of connections, at least in the transport level; therefore, several service warranties cannot be provided. User Datagram Protocol: The User Datagram (UDP) protocol is an unreliable unconnected protocol.

The advantages of UDP are

- Suitable for streaming.
- Streaming will continue even if packets arrive late or broken.
- No retransmission required.

The disadvantages of UDP are

- Many network firewalls block UDP data.
- Delivery of packets is not guaranteed.
- There may be duplicate packets present.
- Congestion control is not supported.
- Cannot be played using common Stream players like QuickTime.

1.8.1.3 Real-time Transport Protocol (RTP)

Real-Time Transport Protocol/ Real-Time Transport Control Protocol: RTP/RTCP protocol is also used in multimedia.

The advantages of this protocol are

- Provide Loss detection, timing reconstruction, content identification and security.
- Real-time transmission is supported.

The disadvantages of this protocol are

- Quality of service (QoS) is not guaranteed.
- It has larger header than UDP.
- It is more complicated than UDP.
- Congestion control is not supported.

1.8.1.4 Xpress Transport Protocol (XTP)

XTP has been designed to be an efficient protocol, taking into account the low error rates and higher speeds of current networks. It is still being upgraded using the XTP module to provide a better platform for the variety of incoming applications. XTP integrates the capabilities of network and transport protocol to gain greater control over the environment in which it operates. XTP is intended to be useful in a wide range of environments, from real-time control systems to remote procedure calls on distributed operating systems and distributed database for mass data transfer. There are six types of service: connection, transaction, unrecognized grams of data, recognized datagram, synchronous flow and mass data. In XTP, the end user is represented by a context enabled within an XTP implementation.

1.8.2 Other Transport Protocols

Some other designed transport protocols which are used for multimedia transmission are:

1.8.2.1 Tenet Transport Protocols

The Tenet protocols suite for multimedia streaming media was developed by the Tenet group at the University of California at Berkeley. The transport protocols in this protocol stack are the Clean Time Message Transport Protocol (RMTP) protocol and the Media Transmission Protocol (CMTP) protocol. They run real-time Internet protocol (RTIP).

1.8.2.2 Heidelberg Transport System (HeiTS)

The Heidelberg transport system (HeiTS) is a transport system for multimedia communication. It was developed at the IBM Networking Network (ENC), Heidelberg. HeiTS provides seamless multimedia transport over networks.

Check Your Progress 2

Write a brief account on protocols used for multimedia content transmission.

Notes: a) Please write your answers in the space provided below.

b) Don't forget to check your answers with the one given at the end of this chapter.

1.8.3 Network Layer

Network Layer Requirements for Multimedia Broadcasting are a high bandwidth, multicast, resource reservation and Qos warranty, new routing protocols with support for transmission capabilities and new high capacity routers with integrated service support.

1.8.3.1 Internet Services and Protocols

Currently, the Internet is undergoing major modifications and extensions to meet the growing need for real-time multimedia application services.

There are several protocols that are changing to provide integrated services such as the best stress service, real-time service and controlled link sharing. The new service, sharing controlled links, is required by network operators. They need the ability to control bandwidth exchange on a particular link between different traffic classes. They also want to divide traffic into some classes of administration and assign each one of the minimum bandwidth in the overload condition, allowing the availability of "unused" bandwidth in other cases.

1.8.3.2 Internet Protocol (IP)

IP provides the unreliable transport of datagrams from the source host to the destination host, possibly through one or more gateways (routers) and networks in

the process. We look at some of the IP properties that are relevant to multimedia streaming requirements.

Type of service: IP includes the identification of the quality of service through the specification of the type of service (TOS). TOS specifies (1) precedence relationship and (2) services such as minimizing delay, maximizing performance, maximizing reliability, minimizing monetary cost and normal service. Any TOS claim can only be used if the network in which an IP packet is injected has a class of service that matches the particular combination of selected TOS tags.

1.8.3.3 Internet Group Management Protocol (IGMP)

The Internet Group Management Protocol (ICMP) is a protocol for managing Internet multicast groups. It is used by conferencing applications to join and leave a particular multicast group. The basic service allows a source to send datagrams to all members of a multicast group. There are no guarantees of delivery to any or all of the objectives in the group.

1.8.3.4 Resource Reservation Protocol (RSVP)

RSVP is a protocol that transfers reservations and maintains a status in intermediate nodes. It does not have a data transfer component. RSVP messages are sent as IP datagrams and the router maintains the "soft" state, which is updated through periodic message retrieval. In the absence of update messages, the routers delete the reservation after a certain timeout.

This protocol was specified by IETF to provide one of the components for integrated services on the Internet. To implement integrated services, you must implement four components: packet scheduler, aspiration routine, classifier, and booking configuration protocol.

1.8.3.5 STream Protocol Version 2 (ST-II)

ST-II provides a connection-oriented, guaranteed service for data transport based on the stream model. The connections between the sender and several receivers are setup the uni-directional connections, although also duplex connections can be setup.

ST-II is an extension of the original ST protocol. It consists of two components: the ST Control Message Protocol (SCMP), which is a reliable, connectionless transport for the protocol messages and the ST protocol itself, which is unreliable transport for the data.

Case Study ***Future of Multimedia***

There seems to be an increasing enthusiasm for the didactic and multimedia material of the Internet. The extra people learn, the more they want to learn. For example, once the web pages of your core classes are complete, instructors often decide they want pictures, then maybe some audio, then animation, and then. There are a number of advantages to using audio over the Internet. Teachers can create archived conferences or live broadcasts, allowing for asynchronous or synchronous communication. They have been experimenting with live audio streams, and they see an advantage in interaction: students can call (similar to a radio program) and talk to the teacher, instead of listening passively. Audio over the Internet also allows instructors to offer guest speakers from around the world at low cost. The ability to archive these presentations makes them available at convenient times for students to review, or for the first time if they miss a live presentation. The current advantages and disadvantages of online multimedia are multimedia that allows people to communicate more effectively online. I believe that with technology such as three-dimensional modeling and virtual reality, people from different places can work in groups to build projects over the Internet. I also see multimedia as a form of self-expression: it allows the creator to add personality to a website or course. Multimedia, whether in the form of video, animation or a scanned image, can demonstrate concepts or ideas that cannot be easily communicated in any other way. The future of online multimedia is at present, the video is quite primitive, but in the future users will be able to interact visually with people from all over the world. I do not see multimedia replacing human contact; rather, it will complement it by allowing people to interact in ways and places that would otherwise be impossible. According to Allyn J Radford, lead researcher at RMIT University School of Art, Design and Communication in Melbourne, Australia, "The Future of Interactive Media in Education, when separated from the problems of technology that tend to disconcert discussion and place it firmly within the reach of those who are highly technological capable to take notes, it is a communication tool. Its dimensions and capabilities will evolve and expand as the author potential becomes more widely accessible.

The authoring potential of students of all ages as part of a creative educational program that is based on achieving goals and competencies rather than time served will help educators change from teacher to facilitator and mentor. Interactive communication tools will transform our ability to adopt an educational paradigm that addresses learning as a vital, full and continuous part of life at home and in the workplace, as well as within educational institutions."

Questions:

1. How is multimedia useful in daily life?
2. Can you imagine a life without multimedia? Explain.

Source: http://www.studymode.com/essays/Future-Multimedia-60463.html

Summary

We have discussed the following points in this lesson

- Multimedia is a woven combination of text, audio, video, images and animation.
- Multimedia systems finds a wide variety of applications in different areas such as education, entertainment etc.
- The categories of multimedia are linear and non-linear.
- Network communications need (1) substantial data throughput, (2) fast date forwarding, (3) service guarantees, and (4) multicasting
- Transport protocols, to support multimedia transmission, need to have new features and provide the following function, semi-reliability, multicasting, NAK (None-Acknowledgment)-based error recovery mechanism and rate control.
- The stages for multimedia application development are Planning and costing, designing and producing, testing and delivery.
- Transport protocols, such as TCP and UDP, are used in the Internet protocol stack for multimedia transmission, the new emerging transport protocols, such as RTP, XTP and other protocols are suitable for multimedia.

MODEL ANSWERS TO "CHECK YOUR PROGRESS"

Check your progress 1

Your answers may include the following

- Entertainment
- Medicine
- Education
- Industry
- Engineering
- Mathematical and scientific Industry
- Creative Industry

- Commercial

Check your progress 2

The protocols used for multimedia are

TCP, RTP, XTP

LESSON END ACTIVITIES

1. Right click the My Network Places icon in your computer and choose properties. Write the list the protocols installed in your computer and find out the use of each protocol.
2. Create the credits for an imaginary multimedia production. Include several outside organizations such as audio mixing, video production and text based dialogues.

MCQ questions

I. A video consists of a sequence of

A. Frames B. Signals

C. Packets D. Slots

II. One of the disadvantages of multimedia is:

A. cost B. adaptability

C. usability D. relativity

III. _____ refers to any type of application or presentation that involves more than one type of media, such as text, graphics, video, animation, and sound.

A. An executable file B. Desktop publishing

B. Multimedia C. Hypertext

IV. The process of planning your multimedia presentation is known as a:

A. design B. storyboard

C. development. D. layout

V. In multimedia, what does NLE stand for?

A. Non-linear editing system B. New Linear Edit

C. No-graphic Licence e code D. None of the above

VI. Multimedia is the integration of multiple forms of .....

A. Devices B. Media

C. Technologies D. All of the above

VII. What is the term for presentation that are sequential and typically do not have interactivity?

A. Linear B. Non-Linear

C. Hyperlinked D. None of the above

VIII. Which of the following is not considered digital?

A. Scanned pictures B. Audio cassette tapes

C. Web interface buttons D. Computer animations

IX. A live or recorded presentation is called a ……

A. Power-point presentation B. Announcement

C. Multimedia presentation D. Broadcast

X. What is the other name for interactive multimedia?

A. Hypertext

B. Graphic

C. Hypermedia

D. Print media

Key: 1-A 2-A 3-C 4-C 5-A 6-B 7-A 8-C –D 10-C

Terminal questions

Q1. What is interactive multimedia? Explain.

Q2. Write down some of the image formats used in multimedia?

Q3. What are the categories of JPEG formats?

Q4. How is multimedia used in Engineering?

Q5. What is animation? How it is related to multimedia?

Q6. Write a note on “Importance of multimedia in advertising”.

UNIT 2

MULTIMEDIA AUDIO

Structure

2.0 INTRODUCTION

Audio information is crucial for multimedia presentations and, in a sense, is the simplest type of multimedia data. However, some important differences between audio and image

The information cannot be ignored. For example, although it is usual and useful to occasionally release a video frame from a video transmission, to facilitate the viewing speed, we simply cannot do the same with the sound information or the whole sense will be lost from that dimension. In this chapter we introduce the basic concepts of sound in multimedia and examine the details of the compression of sound information. The digitization of the sound necessarily implies the sampling and the quantification of the signals. We begin with a discussion of exactly what sound information conforms to and then we examine the use of MIDI as an enabling technology for capturing, storing and playing digital audio. Let's look at some details of audio quantization for transmission and provide introductory information on how digital audio is treated for storage or transmission.

2.1 OBJECTIVES

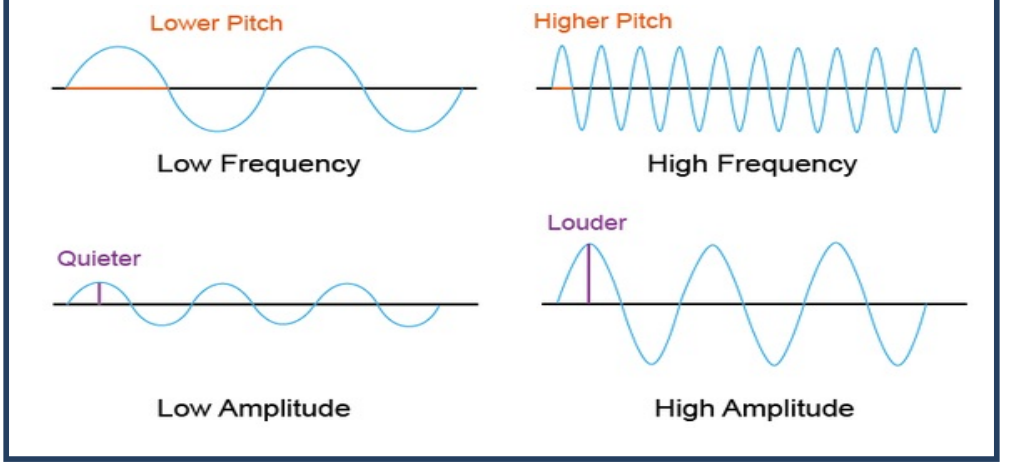
After the end of this unit, you will be able to:

- ✓ Describe multimedia system sounds
- ✓ Distinguish audio and sound
- ✓ Understand digital audio
- ✓ Prepare audio required for a multimedia system
- ✓ State the MIDI audio
- ✓ Speech synthesis and recognition concept.

2.2 DIGITAL SIGNALS

Sound is an analog signal by nature. An analog signal has no interruptions or brakes, ie continuous signals. Digital signals use special values to present information, as they are not continuous signals. A sound wave is represented as a set of values that can be paused, pitch and volume for the duration of the recording. No sound exists, for example, in space. Since sound is a pressure wave, continuous values are needed, unlike digitized ones with a finite range. However, if we want to use a digital version of sound waves, we need to form digitized representations of audio information. Although such pressure waves are longitudinal, they still have ordinary wave properties and behaviors such as reflection (reflux), refraction (angle change by entering a medium with different density) and diffraction (bending around an obstacle). This makes it possible to design "surround sound". Since sound is measurable pressure at any 3D point, we can detect it by measuring the pressure level in one position using a transducer to convert the pressure to the voltage levels. The sound is sampled in the range from 3 kHz to 8 kHz. Humans can hear the sound range from 20 hertz to 20 kilohertz. A typical sound wave is shown in Figure 1.

Figure 1: Sound Wave



Source: https://physics.tutorvista.com/waves/amplitude-of-a-wave.html

2.2.1 Power of Sound

When something vibrates in the air that moves back and forth, it creates a pressure wave. These waves extend like ripples of pebbles thrown into a puddle again and when it reaches the timpani, the change of pressure or vibration is experienced as sound. Acoustics is the branch of physics that studies sound. Sound pressure levels are measured in decibels (db); a decibel measure is actually the relationship between a benchmark chosen on a logarithmic scale and the level actually experimented [1] [3].

How Digital audio files are prepared?

Preparing digital audio files is fairly straight forward. If you have analog source materials – music or sound effects that you have recorded on analog media such as cassette tapes.

- The first step is to digitize the analog material and recording it onto a computer readable digital media.
- It is necessary to focus on two crucial aspects of preparing digital audio files:
- Balancing the need for sound quality against your available RAM and Hard disk resources.
- Setting proper recording levels to get a good, clean recording.

Remember that sampling rate determines the frequency at which samples are taken for recording. You can accelerate the other catch in the form of high content of other high-frequency sound content.

Formula for determining the size of the digital audio

Monophonic = Sampling rate * duration of recording in seconds * (bit resolution / 8) * 1

Stereo = Sampling rate * duration of recording in seconds * (bit resolution / 8) * 2

- The sampling rate is how often the samples are taken.
- The sample size is the amount of information stored. This is called as bit resolution.
- The number of channels is 2 for stereo and 1 for monophonic.
- The time span of the recording is measured in seconds.

Did You Know?

Audio resolution determines the accuracy with which a sound can be digitized.

2.3 AUDIO COMPRESSION AND DECOMPRESSION

Audio compression and decompression are the process through which the amount of data in a recorded waveform is reduced or elongated for transmission. Audio compression is a technique to reduce the size of an audio file. To use a compressed file, you need to unpack it using different software. For example: to extract the zip file, you need software like WinZip. Audio compression is used for voice or music. To talk, we have to compress a digitized 64KHz signal. For music, we have to compress a signal of 1.411 MHz. In essence, there are two types of compression techniques used in audio. It is shown in Figure 2.

- Predictive encoding.
- Perceptual encoding.

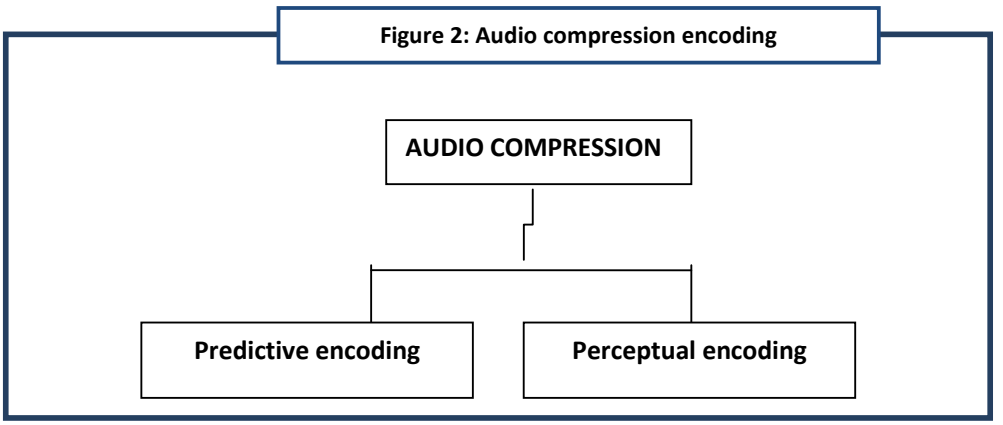


Figure 2: Audio compression encoding

Predictive encoding

- In predictive encoding, the differences between the samples are encoded instead of encoding all the sampled values.
- This type of compression is normally used for speech.
- Several standards have been defined such as GSM (13 kbps), G. 729 (8 kbps), and G.723.3 (6.4 or 5.3 kbps).

Perceptual encoding

- Perceptual encoding scheme is used to create a CD-quality audio that requires a transmission bandwidth of 1.411 Mbps.
- Perceptual encoding is based on the science of psychoacoustics, a study of how people perceive sound.
- MP3 (MPEG audio layer 3), a part of MPEG standard uses this perceptual encoding.

- The key property of perceptual coding is that some sounds may mask other sounds. For example, imagine sending a live concert and suddenly someone starts to hit a hammer against a plate. You will no longer be able to hear the flute. His sound was masked by the hammer.
- Perceptual coding uses some errors in the human hearing system to encode a signal so that it looks the same to a human listener, though it looks very different on an oscilloscope.
- Such a technique described above is called frequency masking: the ability of a strong sound in a frequency band to hide a softer sound in another frequency band that would be audible in the absence of a loud sound.
- Masking can also be done based on time. For example: Even if the hammer does not hit a metal plate, the flute will not be audible for a short period of time because the ears reduce the gain when they begin and take a time to re-launch.
- Therefore, a loud sound can tripping the ears for a short period of time even after the sound stops. This effect is called temporal masking.

Companding: Companding is a combination of two words i.e., "Compressing" and "Expanding". Thus as the name indicates it is a technique of compressing and then decompressing (or expanding) an analog or digital signal using compander.

Keep the following things in mind:

- The sample size is the amount of information stored and is called as bit resolution.
- The time span of the recording is measured in seconds.
- The number of channels is two for stereo and one for monophonic.

2.3.1 Editing Digital Recordings

Once a recording has been made, it will almost certainly need to be edited. The basic sound editing operations that most multimedia procedures needed are described in the paragraphs that follow

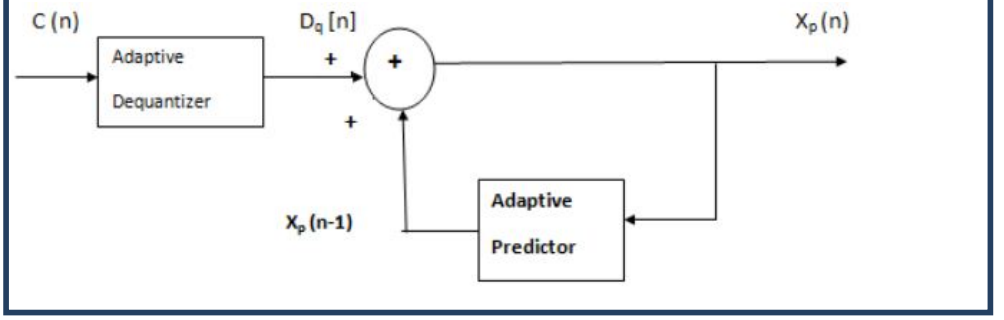
- **Multiple Tasks**: Able to edit and combine multiple tracks and then merge the tracks and export them in a final mix to a single audio file.
- **Trimming**: Removing dead air or blank space from the front of a recording and an unnecessary extra time off the end is your first sound editing task.
- **Splicing and Assembly**: Using the same tools mentioned for trimming, you will probably want to remove the extraneous noises that inevitably creep into recording.

- **Volume Adjustments**: If you are trying to assemble ten different recordings into a single track there is a little chance that all the segments have the same volume.
- **Format Conversion**: In some cases your digital audio editing software might read a format different from that read by your presentation or authoring program.
- **Re-sampling or down-sampling**: If you have recorded and edited your sounds at16 bit sampling rates but are using lower rates you must resample or down-sample the file.
- **Equalization:** Some programs offer digital equalization capabilities that allow you to modify recording frequency content so that it sounds brighter or darker.
- **Digital Signal Processing**: Some programs allow you to process the signal with reverberation, multi frame delay, and other special effects using DSP routines.
- **Reversing Sounds**: Another simple manipulation is to reverse all or a portion of a digital audio recording. Sounds can produce a surreal, other wordily effect when played backward.
- **Time Stretching**: Advanced programs let you alter the length of a sound file without changing its pitch. This feature can be very useful but watch out: most time stretching algorithms will severely degrade the audio quality.

2.4 ADPMC COMPRESSION

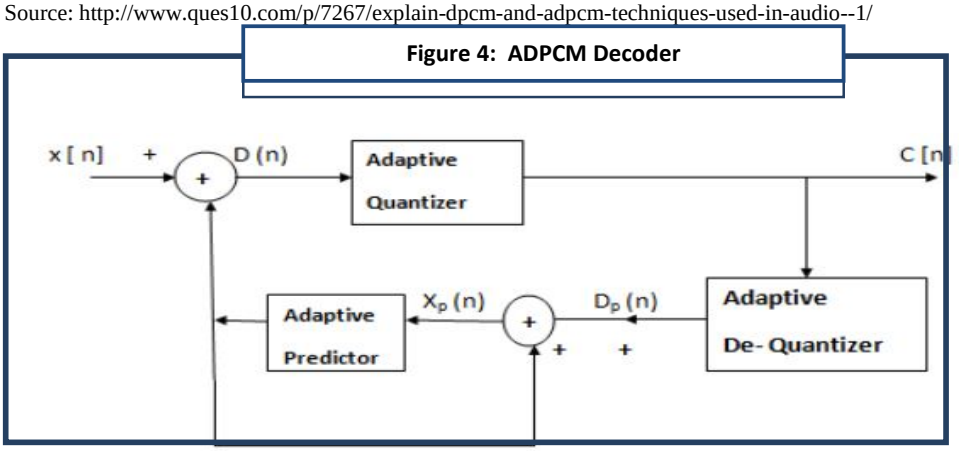
Adaptive differential Pulse Code Modulation (ADPCM) is a method for converting analog signals into binary signals. It is a variant of pulse code modulation. It was developed in the 1970s by Bell Labs for voice coding. Sound signals are sent using ADPCM techniques over optical fiber for long distance lines. This is important for organizations that configure digital lines to transmit voice and data between remote sites. The process of ADPCM encoder is shown in Figure 3. Adaptive dequantizer and adaptive predictor is shown in Figure 3.

Figure 3: ADPCM Encoder



Source: http://www.ques10.com/p/7267/explain-dpcm-and-adpcm-techniques-used-in-audio--1/

Figure 4: ADPCM Decoder



Source: http://www.ques10.com/p/7267/explain-dpcm-and-adpcm-techniques-used-in-audio--1/

The steps of ADPCM decoder is shown in Figure 4. Adaptive DPCM takes the idea of adapting the coder so that it adapts more to the input amount. Basically, two pieces make up a DPCM encoder: the quantizer and the predictor. Above, in adaptive DM, we have adapted the quantizer step size to fit the input. In DPCM, we can adaptively modify the quantizer by changing the step size as well as the decision limits in a non-uniform quantizer. We can do this in two ways: using the properties of the input signal (called adaptive length quantization) or the properties of the quantized output. Because if the quantized errors become too large, we should change the non-uniform quantizer of Lloyd-Max (this is called adaptive backward quantification). We can also adapt the predictor, once again by adapting forward or backward. In general, making prediction coefficients adaptive is called adaptive predictive coding (APC). It is interesting to see how this is done. Recall that the predictor is generally taken as a linear function of previously reconstructed quantized values. the number of previous values used is called the order of predictor.

Check Your Progress 1

Write few audio editing features.

Notes: a) Please write your answers in the space provided below.

b) Don't forget to check your answers with the one given at the end of this chapter.

2.5 MPEG AUDIO COMPRESSION

The MPEG-1 digital audio / video compression standard has been approved by the International Organization for Standardization of the International Electro-technical Commission (ISOIIEC) NlPEG Group. Common digital storage media include compact discs (CD) and compact video discs (VCDs). From the 1.5 Mbps specification,1.2 Mbps is for encoded video and 256 kbps can be used for stereo audio. This produces picture quality comparable to VHS cassettes and audio quality equal to that of the CD.

The MPEG-I standard, also known as ISOIIEC 11172 [5], has five parts: 11172-1Systems, 11172-2 Video, 11172-3 Audio, 11172-4 Conformance, and 11172-5 Software. In summary, Systems is concerned, among other things, to divide the result into bit stream packets, multiplexing and synchronizing video and audio transmissions. Compliance (or compliance) specifies the test project to verify whether a bit stream or a decoder meets the standard. The software includes a complete software implementation Audio compression is a type of compression with or without loss in which the amount of data in a recorded waveform is reduced to different degrees for transmission, respectively, with or without a certain loss of quality. The volume of high-power sounds can be reduced and silent sounds can be amplified by shrinking compression.

The process of MPEG audio compression is shown in Figure 5. Here, the input audio passes through a filter bank dividing the input into multiple frequency sub-bands. The input audio stream simultaneously passes through the psychoacoustic pattern that determines the relationship between signal energy and threshold for each sub-band. The bit or noise assignment is used to determine the total number of available code bits for quantifying the standard signal to minimize quantization noise audibility. Finally, the last block takes the representation of quantized samples and shapes these data and information in a coded bit-stream

.

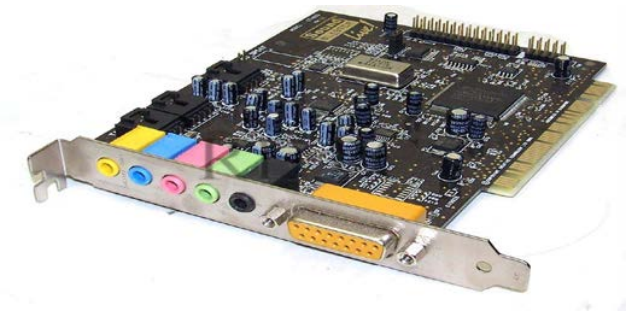
Figure 6: Audio Synthesizer

Source: http://audiocrawl.co/tag/synthesizer

2.8 FM SYNTHESIS

The FM synthesis consists of two main components, namely the modulator and the oscillator. FM synthesis techniques use a periodic signal (the modulator) to modulate the frequency of another signal (the carrier). If the modulation signal is in the audible range, the result will be a significant change in the signal of the carrier signal. Each FM voice requires a minimum of two signal generators. These generators are commonly referred to as "operators", and different FM synthesis implementations have varying degrees of control over operator parameters. The sound blaster card is shown in Figure 7.

Figure 7: Sound Blaster Live CT4830 PCI Sound Card



Source:https://www.amazon.com/SOUND-CARD-CT4830-BLASTER-LIVE/dp/B00B86UDDE

Sound blaster card: The Sound Blaster model is designed to provide the best audio experience, and is also flexible to allow you to tune in exactly the way you like your audio.

It has various versions such as:

1. First generation (8-bit) - Sound Blaster 1.0, CT1310, CT1320A, CT1320B.
2. Second generation (16-bit) - Sound Blaster Pro, CT1330.

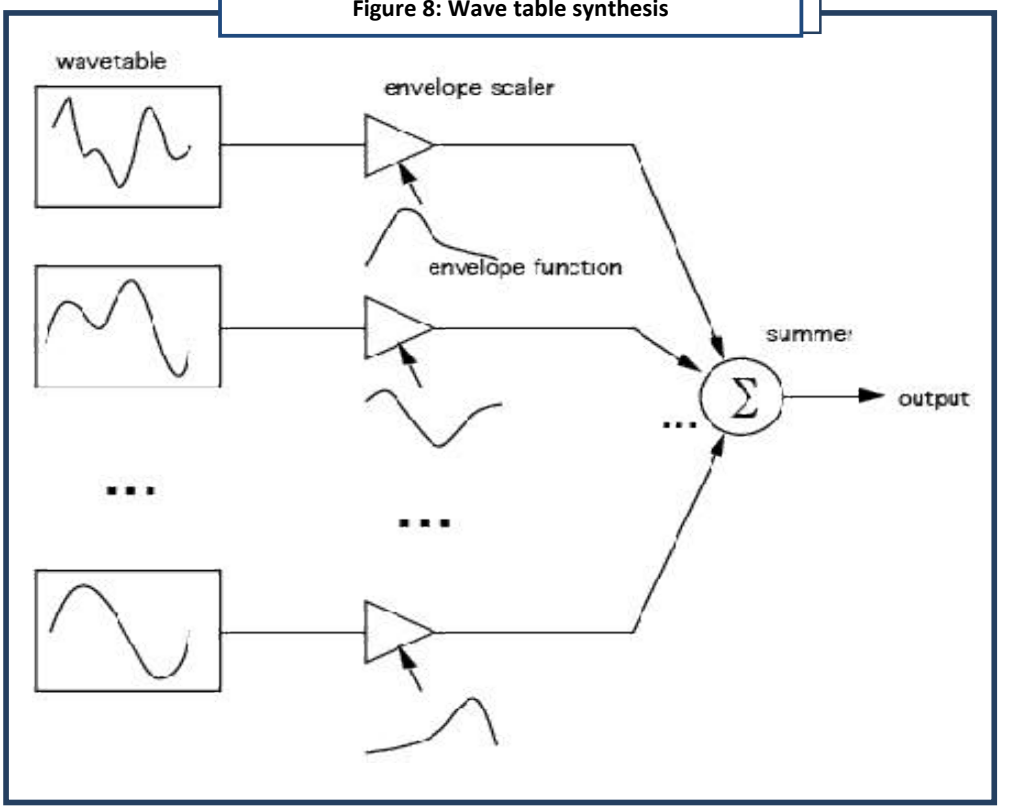
3. Third generation (16- bit ISA cards) - Sound Blaster 16.
4. Fourth generation (16- bit, Dynamic sampled based synthesis) - Sound Blaster AWE32.
5. Fifth generation (Multi- Channel Sounds) - Ensoniq AudioPCI-based cards
6. Sixth generation (Sound Core 3D cards) - Sound Blaster Recon3D.

Special effect processors on sound cards: A special effect processor is a computer program which is able to modify the signal coming from a digital audio source in real time.

2.9 WAVE TABLE SYNTHESIS

Wavetable synthesis is a technique used in certain digital music synthesizers to produce natural tone-like sounds. The sound of an existing instrument is sampled and parsed into a sequence of circular tables of samples or wavetables, each having one period or cycle per table." The wave table synthesis is shown in Figure 8.

Figure 8: Wave table synthesis



Source: https://www.music.mcgill.ca/~gary/307/week4/wavetables.html

2.10 MIDI FUNCTIONS

MIDI, which dates back to the early 1980s, is an acronym that means a musical instrument. The MIDI communication protocol uses multi-byte messages. There are two types of messages:

(i) Channel messages

(ii) System messages

The channel message have three bytes. The first byte is called a status byte, and the other two bytes are called data bytes.MIDI messages can be classified into two types, channel messages and system messages.

2.10.1 Channel Messages

A channel message can have up to 3 bytes; the first is the state byte (the operating code, so to speak), and has its most significant bit set to 1. The four bits of low order identify which of the 16 possible channels this message belongs to, with the remaining three bits that contain the message. For a byte of data, the most significant bit is set to zero.

2.10.2 Voice Messages

This type of channel message controls an entry, or sends information specifying which note to play, deactivate and key press. Voice messages are also used to specify the effects of the controller such as support, vibration, tremolo and pitch keys. For the note and the note, speed is the speed at which the key is reproduced.

Typically, the synthesizer responds at a higher speed making the note stronger or brighter. Note that the synthesizer also attempts to play the note as the actual instrument while playing the note. Pressure messages can be used to change the sound of notes during playback. The channel pressure message is a force measurement for the keys of a specific channel (instrument) and has an identical effect on all the notes played on that channel. The other press message, called Keypress, specifies how many volume keys you play together will be different for each note in an agreement. The pressure is also called after / ouch.
The other kinds of messages are:

2.10.3 Channel Mode Messages

Channel mode messages are a special case of ControlEdit the message and then all the mode messages have a B code (then the message is "& HBn" o 101lnnnn). However, the channel mode message has its first data byte in 121 at 127 (and H79-7F). Channel mode messages determine how a tool processes MIDI voice messages. Some examples include responding to all messages, responding only to the correct channel, not answering at all, or switching to local instrument

control. Remember that the state byte is "& HBn", where n is the channel. Local control Off means the keyboard must be disconnected from the synthesizer (and another external device will be used to control the sound). All off is a handy command, especially if, as it happens, an error is generated, so a note is stopped inadvertently. Omlli means that devices respond to messages from all channels. The usual mode is OMNI OFF: Pay attention only to your messages and not respond to any messages, regardless of the channel you are in. Poli means that a device will reproduce several notes at a time if you request it. The usual mode is POLYON.

In POLY OFF - mono mode - the argument representing the number of monophonic channels can have a zero value, in which case the number of voices that the receiver can play is predetermined; or you can set a specific number of channels. However, the exact meaning of OMNI ON / OFF and Mono / Poly combination depends on the specific combination, with four options. Just say that the usual combination is ONINI OFF, POLY ON. Channel mode messages form a special case of the Control.

2.10.4 System Messages

System messages have no channel number and are meant for commands that are not channel-specific, such as timing signals for synchronization, positioning information in prerecorded MIDI sequences, and detailed setup information for the destination device. Opcodes for all system messages start with "&HF." System messages are divided into three classifications, according to their use.

2.10.5 System Common Messages

The messages determine what is to be played upon receipt of a "start" real-lime message (see below).

2.10.6 System Real-Time Messages

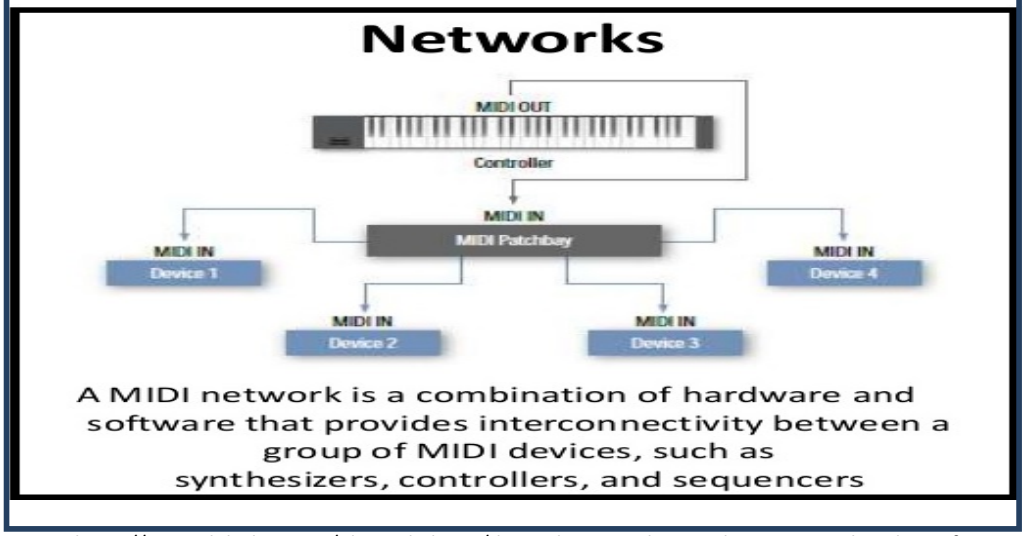
These messages are related to synchronization.

2.10.7 System Exclusive Message

It includes the latest system message, unique system messages, so that manufacturers can extend the IvIIDI standard. After the initial code, you can enter a sequence of specific messages that apply to your product. It is assumed that an exclusive system message terminates with a termination byte "& HF7". However, the terminator is optional and the data stream can be terminated simply by sending the status byte of the next message.

MIDI stands for Digital Interface Musical Instrument. It is a protocol designed to record and play music in digital synthesizers compatible with many personal computer sound cards. The main function of MIDI is to send notes and data controls to and from the keyboard, modules, and samplers to create sounds.

Figure 9: MIDI Functions



Source: https://www.slideshare.net/BhaumikBhatt4/the-midi-protocol-musical-instrument-digital-interface

2.11 SPEECH SYNTHESIS AND RECOGNITION

The synthesis of speech is the method of artificially producing human speech. A computer system used for this purpose is known as a speech machine or speech synthesizer and can be implemented in software or hardware products.

The sound consists of continuous analogous sinusoidal waves that tend to repeat according to music or voice. Analog waveforms are converted to digital format by an analog-to-digital converter (ADC) through the sampling process. The speech recognition process is shown in Figure 10.

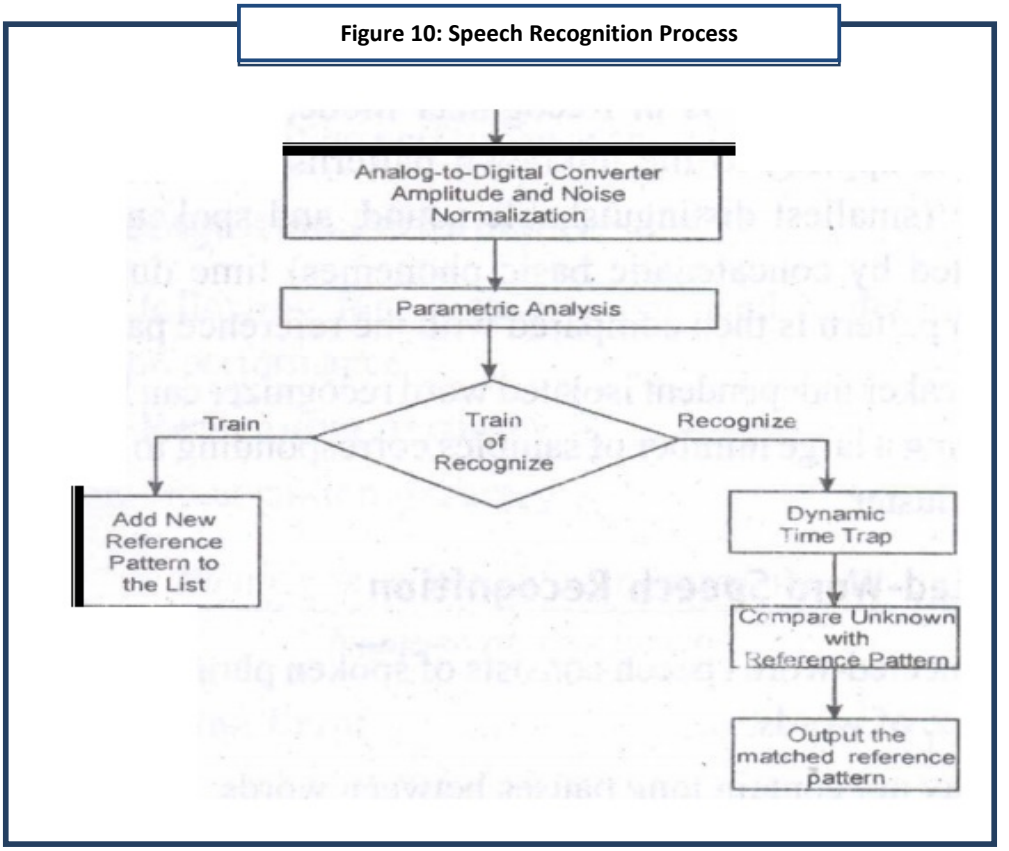
- **Sampling process**

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.

Figure 10: Speech Recognition Process

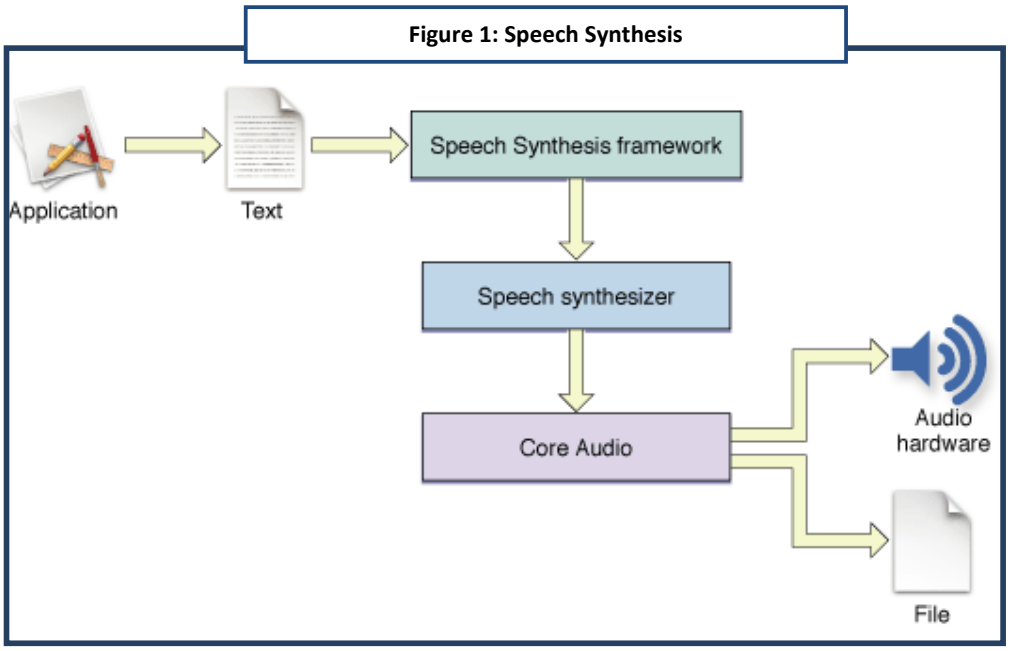


Source: https://www.researchgate.net/figure/Working-Of-Speech-Recognition-Process_fig1_281684338

- **Digital Voice**

The speech is of an analogue nature and has a digital convertible shape through 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 a digital value of 8, 16 or 32 bits. The four important factors that govern 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 represents the signal.
- **Conversion Speed:** It is a speed of ADC to convert the analog signal into Digital signals. It must be fast enough.

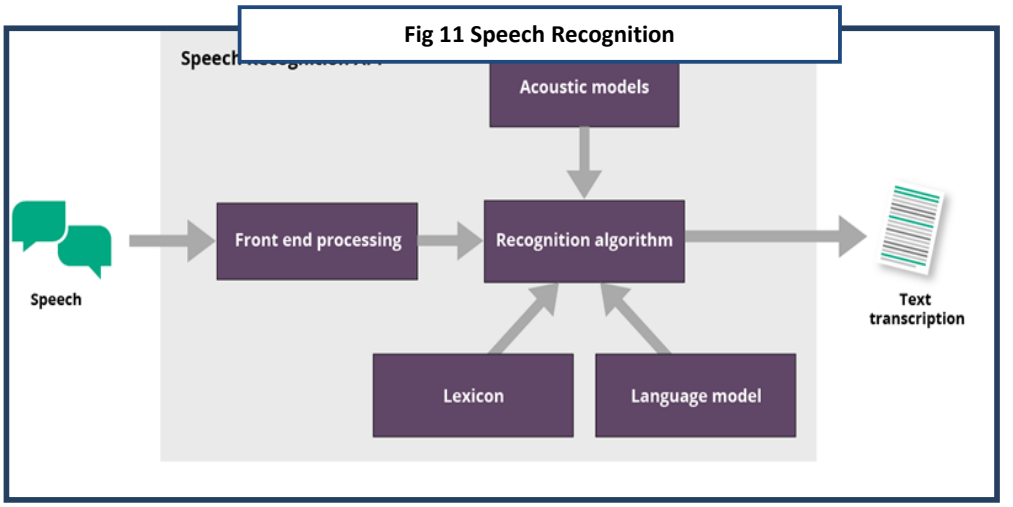


Source:https://developer.apple.com/library/content/documentation/UserExperience/Conceptual/SpeechSynthesisProgrammingGuide/SpeechOverview/SpeechOverview.html

- **Speech recognition:** is used to identify words in spoken language.

Most speech recognition algorithms depend only on the sound of the individual words, and not on their context. They attempt to recognize words, but not to understand speech. Automatic Voice Recognition (ASR) is a computational linguistics that develops methodologies and technologies that allow the recognition and translation of spoken language into computer texts. It includes knowledge and research in the areas of linguistics, information technology and electrical engineering. Some systems use SR "training" (also called "recording"), where an individual speaker reads the text or vocabulary isolated in the system. The system analyzes the person's specific voice and is used to adjust the voice recognition of that person, resulting in greater accuracy. Systems that do not use training are called "speaker-independent" systems [11]. The systems that use the training are called "speaker-dependent". The speech recognition process is shown in Figure 11.

Fig 11 Speech Recognition



Source:
https://developer.apple.com/library/content/documentation/UserExperience/Conceptual/SpeechSynthesisProgrammingGuide/SpeechOverview/SpeechOverview.html

Voice recognition applications include voice user interfaces and voice dialing (for example, "home phone"), routing calls (for example, "I would like to make a charged call"), search engine automation control device (for example, finding a podcast in which words are spoken), simply inserting data (for example, entering a credit card number), preparing structured documents (for example, a radiology report), voice processing at text (eg word processors or e-mail) and airplanes (generally called direct voice input).

The term speech recognition [11] or the identification of speakers [12] refers to identifying the speaker rather than what they say. Speaker recognition can simplify the task of translating speech into systems that have been trained with a specific person's voice or can be used to authenticate or verify the identity of a speaker as part of a security process.

From a technological perspective, voice recognition has a long history with several waves of major innovations. More recently, the field has benefited from profound learning advances and macro data. Progress is evident not only by increasing academic publications published on the field, but even more important with world-wide adoption in a variety of deep learning methods in the design and implementation of voice recognition systems. These speech industry players include Google, Microsoft, IBM, Baidu, Apple, Amazon, Nuance, SoundHound, iFLYTEK and CDAC, many of whom reported that basic technology in their voice recognition system is based on deep learning.

- **Voice Recognition performance**

It is categorized into two measures: Voice recognition performance and system performance. The following four measures are used to determine voice recognition performance.

1. **Voice Recognition Accuracy**

$$Voice\ Accuracy = \frac{NuRecognition\ mber\ of\ correctly\ recognized\ words}{Number\ of\ test\ words} \times 100$$

2. **Substitution Error**

$$Substitution\ Error = \frac{Number\ of\ Substituted\ words}{Number\ of\ test\ words} \times 100$$

3. **No Response Error**

$$\text{No Response Error} = \frac{\text{Number of no Response}}{\text{Number of test words}} \times 100$$

4. **Insertion Error**

$$\text{Insertion } Error = \frac{Number\ of\ \text{insertion error}}{Number\ of\ test\ words} \times 100$$

- **Voice Recognition Applications**

Voice mail integration: The voice-mail message can be integrated with e-mail messages to create an integrated message.

2.11.1 Red Book Standard

The method for digitally encoding the high quality stereo of the consumer CD music market is an instrument standard, ISO 10149. This is also called as RED BOOK standard.

The developers of this standard claim that the digital audio sample size and sample rate of red book audio allow accurate reproduction of all sounds that humans can hear. The red book standard recommends audio recorded at a sample size of 16 bits and sampling rate of 44.1 KHz.

Check Your Progress 2

Write down the different specification used in red book standard?

Notes: a) Please write your answers in the space provided below.

b) Don't forget to check your answers with the one given at the end of this chapter.

- **Software used for Audio**

Software such as Toast and CD-Creator from Adaptec can translate the digital files of red book Audio format on consumer compact discs directly into a digital sound editing file, or decompress MP3 files into CD-Audio. There are several tools available for recording audio.

Following is the list of different software that can be used for recording and editing audio

- Soundrecorder from Microsoft
- Apple's QuickTime Player pro
- Sonic Foundry's SoundForge for Windows
- Soundedit16

Case study on Dealing with Computer Audio Latency

The small and not-so-small time delays between a signal entering and then emerging from a computer soundcard can turn hard disk recording into a frustrating experience. Martin Walker leads us through the twists and turns of latency. Latency may sound like something that escaped from a physics lesson at school, but it's real, affects lots of musicians who work with computers and audio, and is extremely frustrating. Only when you experience the problem do you realize why so many people have been bleating on about it for so long. So just what is it? When you put a new soundcard through its paces, one of the first things you are likely to do is to listen to some of the many real-time effects plug-ins available. You connect your mic, guitar or keyboard, patch in the effect, and then notice a half-second delay before anything happens. So you look for the switch to turn off the delay effect. Only there isn't one. What you're actually hearing is the result of latency, and, worse still, there's no way

to get rid of it. At this point, many people wish they'd bought a hardware based digital recorder instead, and also wonder why these effects are called real-time when they appear to be nothing of the sort. However, there are ways to minimize latency, though this usually involves making decisions before you choose your soundcard, not afterwards. So please read on. Finding out about latency might just prevent you from buying the wrong soundcard.

Latency - The Facts

Latency is normally thought of as the time delay between inputting a sound and hearing it emerge from the soundcard. However, it also affects playback of existing tracks and the general responsiveness of the application as outlined in the 'Other Effects Of Latency' box way to go. First, it gets converted from analogue to digital via the converter (a matter of about a millisecond, but a delay nonetheless). Then it passes internally along a digital buss
inside the soundcard, and emerges on to the PCI bus (the connector on the edge of every recent soundcard). From here it travels on the motherboard to the rest of the computer, where it meets a huge obstacle – the operating system. Whether Mac or PC, the modern operating system has a great deal to do, and so it does a little bit of everything in turn. As well as processing your audio, the operating system has to do a lot of 'housekeeping' tasks, and to keep everything tidy, it relies on the 'little but often' approach.

To ensure that there are no major glitches in the audio, the soundcard driver software has to be designed to anticipate and cope with any unexpected delays before the operating system deals with the audio. As is always the case with such delays, a small queue of audio data can form, and this slowly backs up in small memory buffers in the soundcard driver until the operating system returns from carrying out its other duties.

As we musicians don't like chunks missing from our audio, software developers include small RAM buffers as part of the sequencer design to hold enough audio data to ensure its smooth delivery. There will be a separate sequencer buffer (or set of buffers) for each enabled input port of your soundcard, and these get topped up by the operating system in fits and starts whenever it gets the chance to grab some more audio from the buffers on the soundcard. As long as there are enough buffers of a big enough size, there will always been ought data in hand to carry on delivering audio to the music application at a smooth and even rate. The sequencer then carries out lots of number-crunching – especially if you're adding software-based effects and EQ. Finally, the digital signal is sent to another set of buffers –one for each output port of your soundcard – this time to ensure that nothing gets lost on its outward journey. The operating system comes along when it's good and ready, shunts the new digital data stream back across the motherboard, through the PCI edge connect or into the soundcard buffers, and it is then clocked out steadily at the chosen sample rate.

After another millisecond's worth of conversion time it emerges as an analogue signal from the soundcard output socket. This is a long journey, the exact length of which depends on the route taken. In the case of a PC, the Windows operating system has a lot of other things to do besides updating its standard Multimedia (MME) soundcard drivers. This means that more and larger buffers are needed to hold the audio data to ensure that nothing is lost. Typically, an application like Cubase VST using the bog-standard MME drivers will have a latency of maybe half a second, depending on your settings. This may not sound like much, but if you remember that it's the same length as a single beat at 120bpm, you can begin to understand why it's such a problem. It means that when you are recording, you can't hear what's being recorded until a beat after it happens. But most people only discover this after they buy a system and set everything up. No wonder they get frustrated!

Solution

What's the answer? Does every soundcard suffer from this problem? This is where things get more interesting. As most people would prefer to bypass the problems of latency altogether, I'll start there. As described above, the length of the route taken by the audio signal is largely due to the operating system, and the RAM buffers that are needed to keep the audio stream steady and glitch-free. The way to avoid all these delays is to keep the audio signal on the soundcard for monitoring purposes, and ignore the operating system completely. Soundcards usually contain some sort of digital mixer. This is either permanently burned into specialist DSP chips (like the Yamaha DSP Factory) or the soundcard uses generic, programmable DSP chips (more often than not by Motorola). In the latter case, the code for the digital mixer is downloaded from your hard drive before it can be used, a process which normally happens as your computer boots up. All the soundcard developer needs to do is provide a way for you to route the signal at the soundcard input socket to one or more of its output sockets – a sort of hardware thru. The route taken by the audio signal then involves and there you are – you can hear your input signal with no more delay than you get when using any outboard effects hardware. If your soundcard features multiple outputs, you can even create several different monitor mixes for individual musicians. Various sound card manufacturers have adopted this solution.

The Lexicon Studio provides 'Punch Record', complete with its own software-controlled mix level fader, which allows you to bypass the normal monitoring facilities inside applications like Cubase, and directly patch any selected combination of Lexicon Studio input signals through to one of the

Lexicon Studio hardware gives output during recording. The MOTU 2408 has its CueMix Console utility, and the Event soundcard range has the Echo Console. The Yamaha DSP Factory has an extremely comprehensive digital mixer offering hardware thru as just one of its many features.

It can be confusing when you launch one of these routing and level control utilities, since many people assume that if it appears on a computer screen then the mechanics are no different from an application like Cubase VST. However, there is actually a big distinction between the two. Audio software such as Cubase VST runs entirely in software, and is therefore subject to operating system delays. The soundcard mixer utility, while it may be controlled using software, is actually a remote control for the DSP-based routing and level controls on the soundcard itself. Although changing the position of any control will be subject to operating system delays, the audio monitoring signals themselves never leave the soundcard, and are therefore entirely independent of the operating system.

Questions:

1. Critically analyze computer audio latency.
2. What do you understand by latency? Explain.

Source: http://www.soundonsound.com/sos/apr99/articles/letency.htm

➢ Summary

Following points have been discussed in this lesson:

- Audio is an important component of multimedia which can be used to provide liveliness to a multimedia presentation.
- The red book standard recommends audio recorded at a sample size of 16 bits and sampling rate of 44.1 KHz.
- MIDI is Musical Instrument Digital Interface
- MIDI is a communication standard developed for electronic musical instruments and computers.
- To make MIDI scores, however you will need sequencer software and a sound synthesizer.

➢ LESSON-END ACTIVITIES

Record an audio clip using sound recorder in Microsoft Windows for 1 minute. Note down the size of the file. Using any audio compression software convert the recorded file to MP3 format and compare the size of the audio.

➢ MCQ Questions

1. ..... is an example of uncompressed audio format.

   (a) MP3
   (b) AIFF
   (c) TTA
   (d) Mouse pack

2. Which of the following is not a function of monkey's audio?
   (a) To reduce bandwidth
   (b) To reduce file transfer time
   (c) To reduce storage requirements
   (d) To support sound streams

3. Which of the following is not an open file format for storing data?
   (a) MPEG4
   (b) VOX
   (c) Windows Media Audio
   (d) GSM

4. What is the largest entity on a CD called?
   (a) Track
   (b) Code
   (c) Codec
   (d) Encode

5. Which of the following formats is used in ringtones?

   (a) DCT
   (b) GSM
   (c) MMF
   (d) CDMA

KEY 1. (b) 2. (d) 3. (c) 4. (a) 5. (c)

➢ Terminal Questions

Q1. Write a short note on audio file formats.
Q2. What are the various advantages and disadvantages of MIDI?
Q3. Describe analogue and digital sound.
Q4. Have a discussion on the operations of digital video recordings.
Q5. How is digital audio different from MIDI?
Q6. Determine which audio formats are best suited for a multimedia project.
Q7. Explain sampling rate and bit rate with an example.
Q8. Describe types of digital audio file formats.
Q9. Explain multimedia sound systems.
Q10. Write a short note on the use of microphones in a multimedia presentation.

➢ Model answers to "Check your progress"

Check your progress1
Audio editing includes the following:

- Splicing and Assembly
- Trimming
- Multiple Tasks
- Volume Adjustments
- Resampling or downsampling
- Format Conversion
- Equalization
- Reversing Sounds
- Time Stretching
- Digital image processing

Check your Progress 2

The red book standard recommends audio recorded at a sample size of 16 bits and sampling rate of 44.1 KHz. The recording is done with 2 channels (stereo mode).

UNIT-3

MULTIMEDIA VIDEO

Structure

3.0 INTRODUCTION

The video is an electronic recording, copy, playback, transmission and viewing of moving visuals. Digital video has supplanted the analog video as the method of choice for creating video for multimedia use. While broadcasters and professional and post-production companies continue to invest massively in analog video hardware (according to Sony, more than 350,000 betacam SP devices in use today), digital video produces excellent finished products at a fraction of the cost of one thing analogous. A digital video camera connected directly to a computer workstation eliminates the degradation of the image Analog-digital conversion step typically carried out by expensive video capture cards and brings the power of nonlinear video editing and production to everyday users. Systems video is first developed for mechanical television systems, they have been quickly replaced by CRTs (CRTs) which were then replaced by flat screens of various types. Video systems vary in screen resolution, appearance ratio, refresh rate, color capacity, and other quality. Analog and digital existing variants that can be in a variety of media, including radio broadcasting, magnetic tapes, optical disks, computer files, and network transmissions.

3.1 OBJECTIVES

In this lesson we will learn the basics of video. At the end of this lesson the learner will be able to understand

- ✓ Representation of video.
- ✓ Enumerate the technique used for video.
- ✓ Describe how video work
- ✓ Understand broadcast video standards
- ✓ Understand digital video
- ✓ List the different broadcasting standards the basics of video recording and how they relate to multimedia production
- ✓ Different video formats.

3.2 REPRESENTATION OF DIGITAL VIDEO

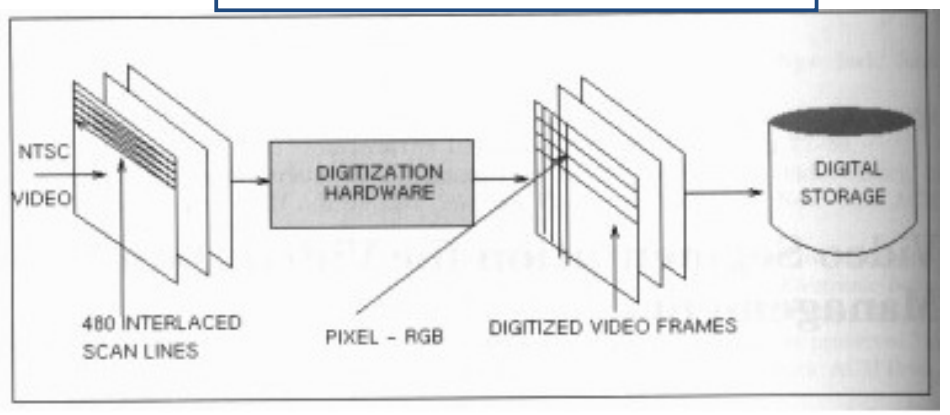
The binary format is used to represent audio/video in a digital image. Information in digital video is not in the form of continuous signal, but in the form of a digital data sequence. A moving frame sequence represents digital video.

Example A video is having a frame size of 720x580 (WxH) at a color depth of 32bits and a frame rate of 23 fps with a duration (T) of 1 hour (3600sec). This video will have the following properties: (W= width, H= height).

- pixels per frame = 720 * 580 = 417,600
- bits per frame = 417,600* 32 = 13,363,200 = 13.36Mbits
- bit rate (BR) = 13.36 * 23 = 307.28Mbits/sec
- video size = 307.28Mbits/sec * 3600sec = 1,106,208Mbits = 138,276Mbytes = 138.27Gbytes.

The Figure 1 is represents digital representation of video.

Figure 1: Digital representation of video



Source: http://people.cs.pitt.edu/~chang/265/C5/v2.html

3.4 FRAME GRABBING

A frame grabber captures single digital frames from a digital video transmission or an analog video signal. Therefore, image collection can be defined as a process or action of capturing images taken from a sequence of movies or television images. A video frame grabber is used to capture, manipulate, and enhance video images [1] [4] [5].
A video capture board consists of a video channel multiplexer, an ADC video, an input search table with an arithmetic logic unit, an image buffer, a compression decompression circuit, color output, DAC video and synchronization circuit. The components of frame grabbing are shown in Figure 3.

3.4.1 Video Channel Multiplexer

The video channel multiplexer has multiple inputs for video input ropes. The multiplexer of the video channel allows you to select the video channel under the control of the program and passes to the appropriate control circuit for the channel selected on its television with multiple system inputs.

3.4.2 Analog-to-Digital converter

The ADC takes the inputs of the video multiplexer and converts the amplitude of a sampled analog signal into an 8-bit monochrome digital value or a 24-bit digital color value for color.

3.4.3 Input Lookup Table

The input search table along with the arithmetic logic unit (ALU) allows you to create pixel-based and image-based image processing functions. Image processing functions Pixel have used the histogram that extends or reduces the histogram for brightness and contrast of the image and scrolls the histogram to lighten or darken the image. Image-based image processing functions perform logical and arithmetic operations.

3.4.4 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.

3.4.5 Video Compression-Decompression

The compression decompression video processor is used to compress and decompress data from still images and video data.

3.4.6 Frame Buffer Output Lookup Table

Buffer frame data represents pixel data and is used to index the results in output look up table. The output look up table generates an 8-bit pixel value for monochrome or a 24-bit pixel value for the color.

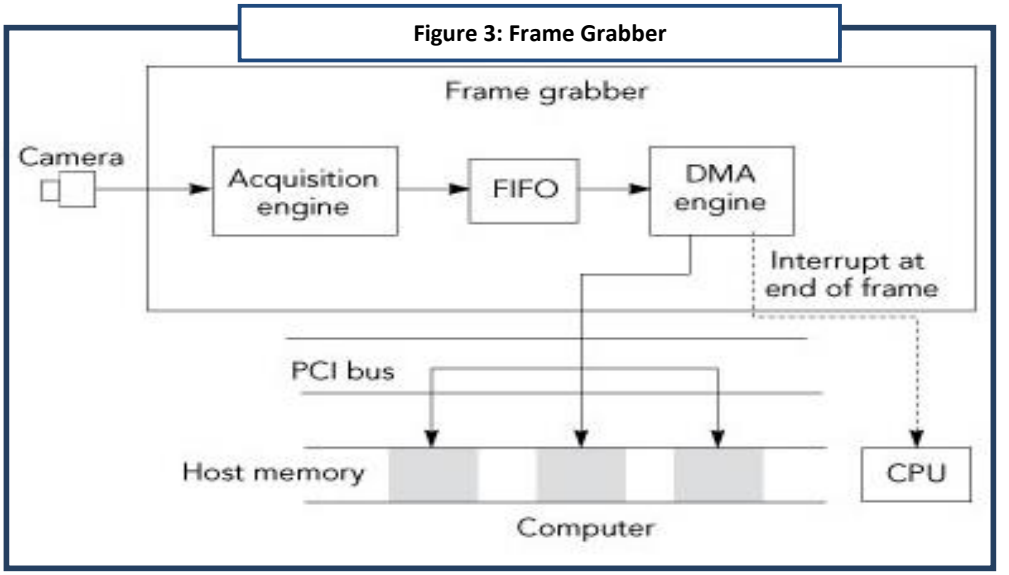
3.4.7 SVGA Interface

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

3.4.8 Analog Output Mixer

The output of the SVGA DAC and the output from image frame buffer DAC are mixed to generate overlapping output signals. The main components involved, include the visual frame image buffer and the SVGA display buffer. The display of the SVGA frame buffer overlaps the live image or video frame buffer. This allows SVGA to show live video.

Figure 3: Frame Grabber



Source: http://frmenet.limdns.org/frame-grabber.html

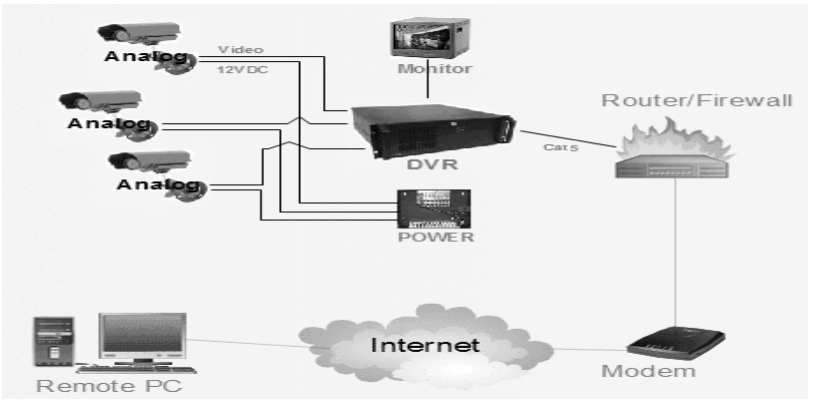
In the early days, frame grabbers had much less memory, stored a single digitized frame. But now, frame grabbers can store different frames. The frame grabber can be of the following types:

3.4.9 Analog Frame Grabbers

It accepts and process analog video signals which includes the following circuits:

- Input signal conditioner which buffers the input signal (analog video) to protect downstream circuitry.
- Video decoder: It converts analog video (SECAM/NTSC/PAL) into a digital format. The analog system design is shown in Figure 4.

Figure 4: Analog system design



Source: http://www.discount-security-cameras.net/images/products/detail/AnalogSystemDesign.gif

3.4.10 Digital Frame Grabbers

It accepts and process digital video streams which includes the following circuits: Digital video decoder, which act as interface and also converts a specific kind of digital video source, such as CoaXPress, Camera Link, DVI, LVDS, GigE Vision.

Circuitry common to digital as well as analog frame grabbers:

- The acquired image is stored using memory (i.e., a frame buffer)
- A processor can governor the acquisition and access the data using a bus interface.
- To controlling external equipment or to trigger image acquisition general purpose I/O is used.

3.5 VIDEO

3.5.1 Full Motion Video

FMV is a video game narrative technique that depends on pre-recorded video files to show the actions in the game. FMV has a much higher standard of real-time scenes. The FMV wave was originated in the arcades in 1983. The Dragon of Lair by Cinematronics and Astra Belt was released in 1983 by Segawas.

Most modem cameras use a CCD to capture the image. The HDTV camcorders will be fully digital and the capture method will be significantly different according to the new HDTV NTSC standard.

3.5.2 Full-Motion Video Controller Requirements

Following are the major requirements for Full-motion video controller.

3.5.2.1 Video Capture Board Architecture

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.

A video capture card can handle a range of input audio and video signals and convert them from analog to digital or digital to analog.

3.5.2.2 Multiplexer of Video Channels

It is similar to the video channel multiplexer of the video grabber.

3.5.2.3 Compression and Video Decompression

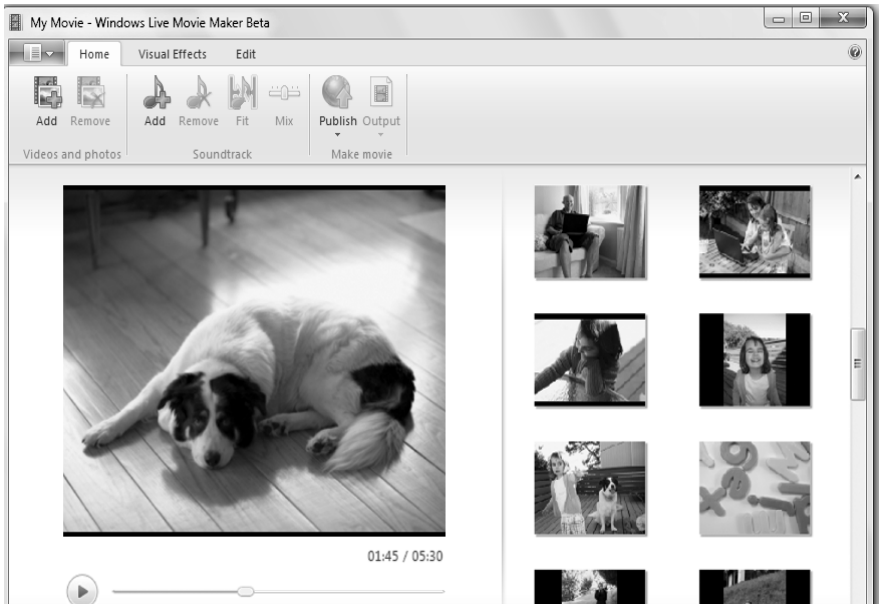
A compression and video compression processor is used to compress and decompress video data. The decompression processor and video compression contains more steps for compression and decompression. The phases include decent discrete cosine transformation and decent discrete transformation, quantization and quantization reverse, encoding and decoding ZigZag and the length of the zero path, and motion estimation and compensation.

3.5.2.4 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 the predicted sample value. The difference is encoded with a value of 4 bits or 8 bits, depending on the sampling frequency.3.5.2.5 Analog to Digital Converter

The ADC takes the inputs of the video switch and converts the amplitude of a sampled analog signal to a digital value of 8 or 16 bits.

Figure 5: Windows Live Movie Maker



Source: http://origin.arstechnica.com/images/windows7/Windows%20Live%20Movie%20Maker.png

3.5.2.6 Live Video in a Window

Live video streaming is the method of broadcasting live video footage, real-time or video feed to an audience accessing the stream via internet. It may be video, audio or both. Streaming media is multimedia which is presented and received by an end-user which is being delivered by a provider. The stream can be process of file downloading, a process where end user gets the complete file for the content. Window live movie maker is shown in Figure 5.

3.5.2.7 Video Processor

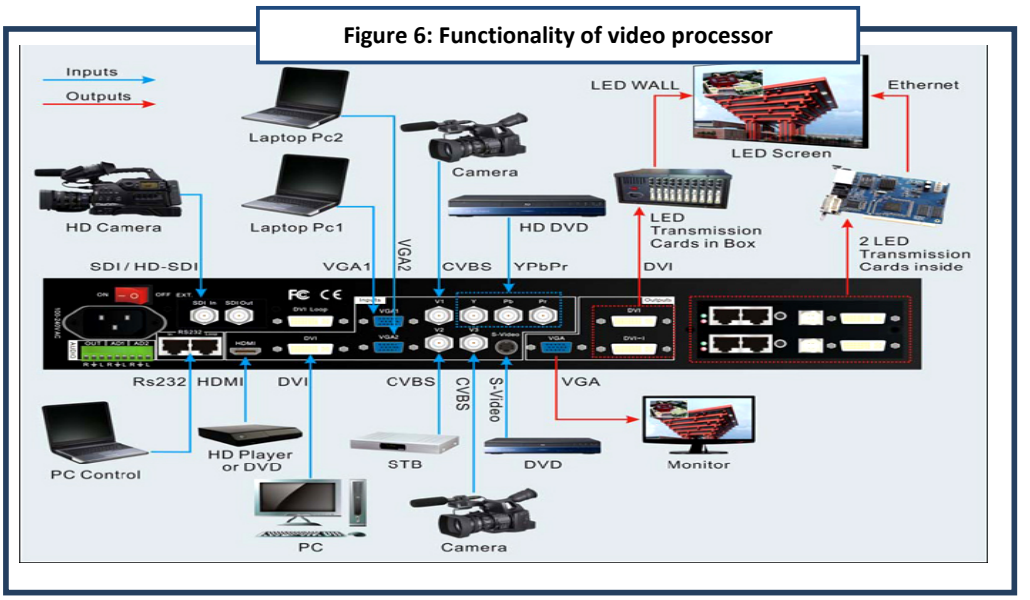
Video processor transforms a video signal or signals into various formats acceptable for variety of use. Video processors are combined with video scalars to build a video processor that improves the quality of video signals. The following tasks are performed by them:

- aspect ratio control
- de-interlacing
- contrast /brightness /gamma/sharpness/saturation/ hue adjustments.
- digital zoom and pan
- frame rate conversion and inverse-telecine
- color space conversion (YCBCR to RGB or RGB to YCBCR)
- color point conversion

- block noise reduction
- mosquito noise reduction
- edge enhancement
- detail enhancement
- primary and secondary color calibration
- motion compensation

The video processor functionality can be seen in the Figure 6.

Figure 6: Functionality of video processor



Source: http://www.led-card-china.com/vdwall-lvp605s-led-video-processor-with-sdi-hd-sdi-port.html

3.5.3 Broadcast Video Standards

Four transmission and video formats and recording formats are commonly used around the world: NTSC, PAL, SECAM and HDTV. Since these standards and formats are not easily interchangeable, it is important to know where the multimedia project will be used.

3.5.3.1 NTSC

The NTSC standard TV is mainly used in North America and Japan. Use a 4: 3 family member (that is, the ratio between width and height) and 525 scanning lines per 30 frames per second. More specifically, for historical reasons NTSC uses 29.97 fps, or, in other words, 33.37 msecby NTSC frame follows the interlaced scanning system and each frame is subdivided into two fields with 262.5 lines / field. Pixels that do not widen are called active pixels. Pixels are often found between the scanning lines. Therefore, even with non-interlaced scan, NTSC TV is able to show only 340 lines (visually different), about 70% of the 485 active lines specified. With interlaced scan, it may be less than 50%. Image data is not encoded in the delete regions, but other information can be provided there, such as information on V chips, stereo data of audio channels and subtitles

in many languages. The NTSC video is an analog signal without fixed horizontal resolution. Therefore, we have to decide how often to sample the signal to display it. Each sample responds to one pixel output. A pixel clock splits each horizontal video line into samples. NTSC uses the YIQ color model. The United States, Japan and many other countries use a system for transmitting and displaying videos according to the specifications of the National Television Standards Committee, 1952. These standards define a method for coding information in the ultimate electronic signal, a television image. As specified by the NTSC standard, a video frame consists of 525 horizontal scanning lines enclosed within a plexiglas phosphor coated every 1/30 second by a fast moving electron beam.

3.5.3.2 PAL

The Phase Alternate Line (PAL) system is used in the UK, Europe, Australia and South Africa. PAL is an additional color integrated into a 625-line black TV signal at a frame rate of 25 frames per second and black. PAL (Phase Alternating Line) is a standard TV set originally invented by German scientists, using 625 frames per frame, 25 frames per second, with an aspect ratio of 4:3 and interlaced fields. Their broadcast television signals are also used in composite video. This important standard is widely used in Western Europe, China, India and many other parts of the world. PAL uses the YUV color model with 8 MHz channel assigning a 5.5 MHz and 1.8 MHz bandwidth and Y each U and V. The color subcarrier frequency is 4.43 MHz FSC. To improve image quality, the chrominance signals have alternate signs (for example, + U and U) in subsequent scanning lines; hence the name of "Alternating Line 2 " This facilitates the use of a comb filter (line speed) receptor - signals on consecutive lines are mediated to eliminate the chrominance signals (always CALt) 'opposite sign) to separate Y and C and get a high quality Y signal world. PAL uses the YUV color model with 8 MHz channel assigning a 5.5 MHz and 1.8 MHz bandwidth and Y each U and V. The color subcarrier frequency is 4.43 MHz. To improve image quality, the chrominance signals have alternate signs (eg, + U and - U) in subsequent scan lines; hence the name of "Alternating Line Line" 2 This facilitates the use of a comb filter (line speed) receptor - signals on consecutive lines are mediated to eliminate the chrominance signals (always CALt) 'opposite sign) to separate Y and C and get high quality Y signals.

3.5.3.3 SECAM

The sequential color and memory system (SECAM) is used in France, Russia and other countries. Although SECAM is a 50 Hz system to 625 lines, it differs greatly from NTSC and PAL color systems in its basic and transmission method. SECAM, invented by the French, is the third most common television standard.

SECAM uses 625 frames per frame, 25 frames per second, with a 4: 3 aspect ratio and interlaced fields. The original project required more scanning lines (more than 800), but the final version was configured to 625. SECAM and PAL are similar, slightly different in their color coding scheme. In SECAM, U and V signals are modulated by using separate color subcarriers at 4.25 MHz and 4.41. MHz, respectively, alternative lines, that is, only one of the U or V signals will be sent on each scan line.

3.5.3.4 HDTV

High Definition Television (HDTV) offers a high resolution in a 16: 9 aspect ratio. This aspect ratio lets you view Cinemascope and Panavision movies. There is a dispute between the broadcasting industry and information about whether interlaced or progressive scanning technologies are to be used.

3.5.4 Shooting and Editing Video

To add full-screen video and full motion to your multimedia project, you need to invest in specialized hardware and software or purchase the services of a professional video production studio. In many cases, a professional studio will also provide editing tools and post-production capabilities that cannot be duplicated with the Macintosh or PC.

3.5.4.1 Video Tips

A useful tool that can be easily implemented in most digital video editing applications is the "blue screen", "ultimate" or "chrome key" tag. The blue screen is a popular technique for creating multimedia titles because expensive sets are not needed. Incredible backgrounds can be generated using 3D modeling software and graphics, and one or more actors, vehicles or other objects can be accurately layered in the background. Applications such as VideoShop, Premiere, Final Cut Pro and iMovie provide this feature.

3.5.4.2 S-VHS Video

In the S-VHS video, color and luminance information is stored in two different tracks. The result is a definitive improvement of image quality. This standard is also used in Hi-8. However, if your ultimate goal is to accept your project from broadcast stations, this would not be the best option.

3.5.4.3 Component (YUV)

In the early '80s, Sony began experimenting with a new, portable, professional video format based on Betamax. Panasonic has developed its own standard based on a similar technology called "MII", the Betacam SP has become the industry standard for professional video recording. This format can be quickly shaded by a new digital version called "Digital Betacam".

Check Your Progress 1

Write down different broadcast video standards and compare their specifications.

Notes: a) Please write your answers in the space provided below.

b) Don’t forget to check your answers with the one given at the end of this chapter.

3.5.4.4 Digital Video

Complete integration of motion video on computers eliminates analog video TV form from the multimedia delivery platform. If a video clip is stored as data on a hard drive, CD-ROM, or other mass storage device, that clip can be played on the computer monitor without overlapping cards, video discs, or second monitors. This digital video playback is made using software architecture such as QuickTime or AVI, a multimedia producer or developer; you may need to convert the video source material from its common analogue format (videotape) into a digital format manageable by the end-user computer system. So understanding an analog video and a particular hardware should stay in your multimedia media box.

Digital analog video conversion can be performed using the video overlay hardware described above or can be delivered directly to the disk using FireWire cables. To re-scan a full-color full-screen color image every 1/30 seconds and store it on disk or RAM, severely imposed on Macintosh and PC processing capabilities, special hardware, compression firmware and large amounts of digital storage space are required.

3.6 VIDEO COMPRESSION AND DECOMPRESSION

Eliminating and reducing redundant video data is through video compression technology to efficiently send digital video files through a network and mount or archive on computer disks. A compressed file is restored to Decompression, which is the opposite of compression. Electronic software is used to compress or decompress digital video. The relationship between the size of the original video and the compressed video size is known as the compression ratio. Figure 7 shows different video compression techniques [1] [4] [9].

Standards for video compression & decompression:

The various video compression and decompression standards include:

1. MPEG-1- It has a bit rate of 1.5 Mbps. MPEG refers to Moving Pictures Experts Group.

2. MPEG-2- It has a bit rate > 2 Mbps.

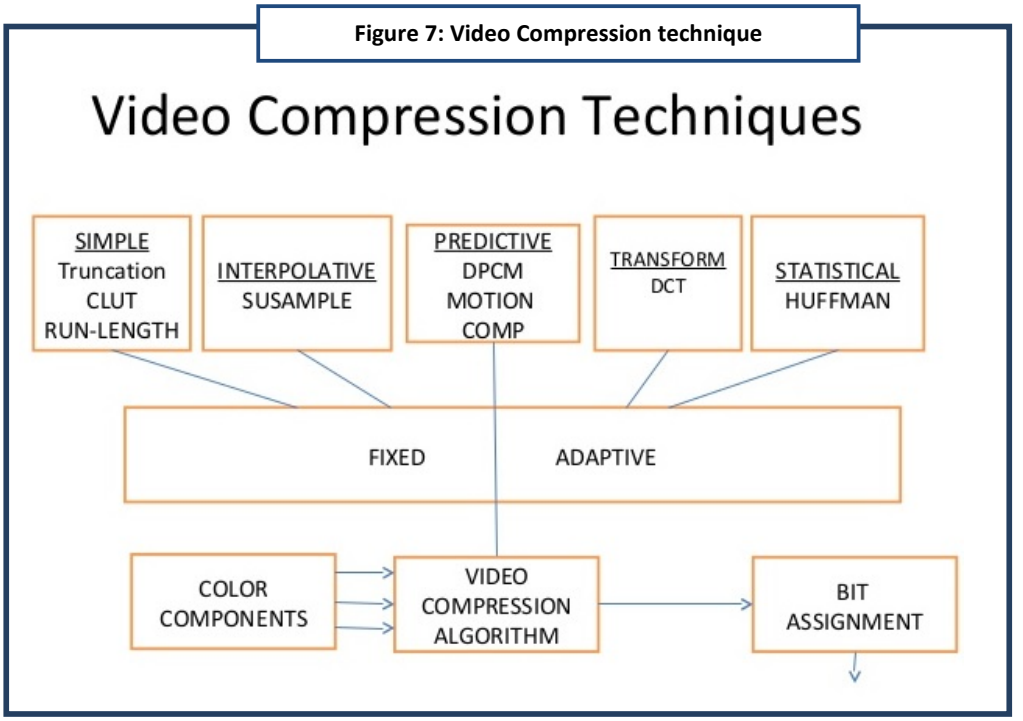
3. H.263- It has a bit rate < 33.6 kbps.

4. H.261- It has a bit rate of p x 64 kbps.

5. MPEG-4 AVC- It has a variable bit rate.

6. H.264 – It has a bit rate of 10 to 100 kbps.

Figure 7: Video Compression technique



Source: https://www.slideshare.net/PsEditor/multimedia-17664169

3.6.1 Video Compression

Digitizing and storing a 10 second full movie clip on your computer requires the transfer of a huge amount of data over a very short period of time. Playing a single 24-bit component video frame requires almost 1MB of computer data; 30 seconds of video will fill a gigabyte hard drive.

Full and moving video requires the computer to transmit data at about 30 MB per second. This overwhelming technological tear is overcome by using digital video compression schemes or codecs (encoders / decoders). A codec is the algorithm used to compress a video for delivery and then decode it in real time for fast playback.

Real-time video compression algorithms such as MPEG, P*64, DVI / Indeo, JPEG, Cinepak, Sorenson, ClearVideo, RealVideo and VDOwave are available to compress digital video information. Compression schemes use the Discrete Cosine Transform (DCT), a coding algorithm that quantifies the human eye's ability to detect color and distortion of the image. All these codecs use loss compression algorithms. In addition to compressing video data, streaming technologies are implemented to provide reasonable-quality broadband video on the Web.

Microsoft, RealNetworks, VXtreme, VDOnet, Xing, Precept, Cubic, Motorola, Viva, Vosaic and Oracle are actively seeking marketing of streaming technology on the web. QuickTime, the Apple-based software architecture to

perfectly integrate sound, animation, text and video (time-varying data), is often considered a compression standard, but in reality it is a lot more.

3.6.2 MPEG

The MPEG standard was developed by the Moving Picture Experts Group, a working group convened by the International Organization of Standards (ISO) and the International Electrotechnical Commission (IEC) to create standards for the digital representation of motion pictures and audio associated data, MPEG1 and MPEG2 are the current standards. Using MPEG1, you can provide 1.2 Mbps of video and 250 Kbps of two-channel stereo audio using CD-ROM technology. MPEG2, a completely different MPEG1 system, requires higher data rates (from 3 to 15 Mbps) but offers greater image resolution, image quality, interlaced video formats, multi-resolution scalability, and multichannel audio functions.

3.6.3 DVI/Indeo

DVI is a proprietary and programmable compression/decompression technology based on the Intel i750 chipset. This hardware consists of two VLSI (Very Large Scale Integrated) chips to separate the processing and visualization functions of the images.

DVI offers two levels of compression and decompression: video output (PLV) and real-time video (RTV). PLV and RTV use variable compression rate. DVI algorithms can compress video images in a ratio of 80: 1 to 160: 1. The DVI will play full frame and color at rate of 30 frames per second.

3.6.4 Optimizing Video Files for CD-ROM

CD-ROMs are an excellent means of distribution for computer-based videos. They are inexpensive for mass production and can store large amounts of information. CD-ROM players offer data transfer speeds, but you can get the appropriate video transfer by making sure, you properly prepare your digital video files.

Limit the amount of synchronization needed between video and audio. With Microsoft AVI files, audio and video data are already interspersed, so it's not necessary, but with QuickTime files, you need to "flatten" the movie. Flattening means that audio and video segments are put together.

Use spaced wrenches regularly, with a separation of 10 to 15 frames, and time compression can correct time search delays. The search time is how long it takes for the CD-ROM drive to locate specific data on the CD-ROM disk. Even fast 56x drives must rotate, causing some delay (and sometimes considerable noise).

The size of the video window and the specified frame rate dramatically affect performance. In QuickTime, 20 frames per second played in a 160x120 pixel window equates to 10 frames per second in a 320x240 window. More data you

have to decompress and transfer from the CD-ROM to the screen, playback is slower.

3.6.5 Video Decompression

Decompression is the process of restoring compressed data in its original form. Data decompression is needed in almost all cases of compressed data, including losses and lossless compression. Similar to compression of data, data decompression is also based on different algorithms. Decompression is considered important because the compressed data must be restored to the standard state of use. Decompression is widely used in data, multimedia, audio, video, and file transmissions. Data compression is beneficial as it helps to reduce storage space, transfer capacity, or resource usage. Decompression is therefore important for compressed data, as all compressed data must be decompressed. The application required for decompression depends to a large extent on how the data was compressed first. Various techniques and algorithms are available for decompressing data. In most cases, the software or application needed to decompress data is provided with the application or software used for data compression. For each compression technique, there is also a corresponding decompression technique. Some compressed files, such as those that end in ".exe" and ".SEA", are classified as self-extracting files. These files do not require any special decompression application, since they start automatically when the file is clicked or executed. Most decompression software uses a decoder, which helps in the data decompression process.

In the case of lossless compression, the original data is obtained without loss of decompression. This is not the case with decompression of loss methods, as they may cause leakage in the original data, although they cannot affect the receiver. Decompression of data helps to eliminate the complications added by data compression. Like compression, decompression can be slow and slow, and transmission errors are not uncommon during data decompression.

3.7 PLAYBACK ACCELERATION

Video decoding can be an extremely intensive CPU task, especially for higher resolutions such as HDTV 1080p. Fortunately, modern graphics cards, equipped with programmable GPUs, can take care of this job, which allows the CPU to concentrate on other functions. Having dedicated hardware becomes essential for low-power CPUs that simply are not able to decode such media fast enough.

In the current state of affairs (June 2016), each GPU manufacturer offers a different method to access its hardware (a different API) and a strong industry standard has not yet emerged. As of June 2016, there exist at least 8 different video decoding acceleration APIs.

3.7.1 The VAAPI (Video Acceleration API)

It was originally designed by Intel in 2007, led the X Window system to Unix-based, now open source operating systems. Now it is also compatible with Wayland through dmabuf. It is currently not limited to Intel GPUs, as other manufacturers are free to use this API, such as Imagination Technologies or S3 Graphics.

3.7.2 VDPAU (Video Decode and API Presentation for UNIX)

It was originally designed by NVIDIA in 2008, it brought the X Window system to Unix-based, now open source operating systems. Although it is also an open source library, it is not yet used by any other vendor other than NVidia. Accessing GStreamer through the vdpau element in plugins-bad.

3.7.3 OpenMAX (Open Media Acceleration)

It is managed by the non-profit consortium of Khronos Group technology, is a set of free word-of-speech, free Photography Platforms that provide abstractions for routines particularly useful for audio, video, and still images "Access to GStreamer via the gst-omx plugin.

3.7.4 Open Video Decode (OVD)

It is another AMD Graphics API, designed to be a platform-independent for developer to leverage universal software Video Decode (UVD) within AMD Radeon graphics cards. It is currently not available for GStreamer.

3.7.5 Distributed Codec Engine (DCE)

It is an open source software library ("libdce") and Texas Instruments API specifications, aimed at Linux platforms and ARM systems. It can be access to GStreamer via the gstreamer-ducati plugin.

3.7.6 Android MediaCodec

It is the Android API for accessing the device's hardware decoder and encoder, if available. This is accessible through the androidmedia plugin in gst-plugins-bad. This includes encoding and decoding.

3.7.7 Apple VideoTool Box Framework

The Apple API to access h is available through the applemedia plug-in, which includes encoding through the vtenc element and decoding via the vtdec element.

3.7.8 Video4Linux

Recent Linux kernels have an API kernel to expose standard hardware codecs, which is now compatible with plug-in. This can support decoding and encoding depending on the platform.

Jackson uses Engaging Online Video to More Effectively Educate Financial Advisors on Investment Choices (in words of Author)

A Success Story

Challenge

Jackson National Life Distributors is a leading distributor of third-party investments through their variable annuity lineup. The company leverages hundreds of wholesalers that network with thousands of financial advisors who then market these investment options to existing and potential clients. These investment professionals need to be educated and updated on the nearly 100 investments within Jackson's lineup so they can clearly communicate the distinct value of each investment option to their clients.

Solution: Jackson is working with its fund partners and Thomson Reuters to develop an investment education platform featuring a library of on-demand video webcasts for each money manager. Archived in a secure online portal, advisors and wholesalers can access these webcasts at their convenience to learn about each manager and its portfolio offered through Jackson. Leveraging video to deliver this content provides greater clarity in the key messages conveyed to Jackson's network so they can more effectively engage clients.

Powering Advisor Communications with Online Video

While many financial services firms are just beginning to integrate multimedia into their communication strategy to improve audience engagement, some have fully embraced this medium and are already looking for ways to build upon years of success. "We have been using multimedia to educate advisors and wholesalers," said Luis Gomez, Vice President of Marketing Strategy at Jackson National Life Distributors. An industry leader in variable and fixed index annuities. It also offers life insurance and institutional products. "If we relied solely on e-mail or mailings to deliver those messages it just would not be as effective. We are always looking for innovative ways to differentiate ourselves. Expanding the use of video was the next step in the evolution of our marketing program."

After discovering Flash-based presentations and video e-mail were more effective than text-based materials in educating advisors and wholesalers about complex products, Gomez sought to develop a library of online videos to provide an even richer experience. "We found that text-based communications led to a lot of confusion as they left room for interpretation and were not very dynamic. Video not only helps in simplifying products which are often complex, but it also communicates body language and tone so advisors and wholesalers can really understand how to deliver the message."

Online Video as the Centerpiece to Jackson's Investment Platform Lineup

The process of building the video library starts with Gomez asking fund partners to create video overviews for selecting variable annuity options. Once completed, the content is returned to Jackson's compliance group for review. After feedback is exchanged and the videos are approved, Thomson Reuters uploads the files into a completely customized on-demand video Notes webcast player. Featuring both Jackson's and the fund's branding, the player includes links to other fund videos in the series as well as additional resources. Viewers can access the videos in high-resolution 800 k Windows Media or Flash streams twenty-four hours a day, seven days a week using any modern Web browser and operating system."At Jackson we promote the freedom to choose from a variety of investment options, and we want to represent that diversity in this video library, we are working toward creating an online investment repository featuring video webcasts from all twenty fund partners along with supporting resources to enhance our communications program and more effectively market our products." said Gomez. Gomez added that the unique approach each money manager takes toward crafting its videos makes the resource even more valuable. The differences really come out in the video, both in the investment options themselves and in the way they are positioned by our partners," said Gomez. At the same time, we represent the videos in a consistent way through the webcast solution which Thomson Reuters designed for us. It's a seamless experience from the viewer's perspective."

Measuring the Success of Online Video

Gomez will consider both qualitative and quantitative metrics in gauging the success of the program. "The response we get from advisors and wholesalers is important and their feedback was one of the reasons we have expanded the use of video," said Gomez. "In addition, we will review the analytics Thomson Reuters provides for each of the webcasts-such as visits and viewing

time-to helps us to monitor how well the content is resonating with our audiences."

Questions:

1. What do you think about the above success story?
2. Write a note on video libraries.

Source: http://documents-cdn.mcs.thomsonreuters.com/4fb26df4983a8_Thomson-Reuters-Jackson-

➢ Summary

In this lesson we have learnt the use of animation and video in multimedia presentation. Following points have been discussed in this lesson:

- Four broadcast and video standards and recording formats are commonly in use around the world: NTSC, PAL, SECAM, and HDTV.
- Real-time video compression algorithms such as MPEG, P*64, DVI/Indeo, JPEG, Cinepak, Sorenson, ClearVideo, RealVideo, and VDOwave are available to compress digital video information.

➢

➢ LESSON-END ACTIVITIES

Locate three web sites that offer streaming video clips. Check the file formats and the duration, size of video. Make a list of software that can play these video clips.

➢ Terminal Questions

Q1. Define video editing. Write about two types of video editing techniques.

Q2. Explain how video works in detail.

Q3. Differentiate between NTSC and PAL.

Q4. Explain VGA and Super VGA.

Q5. Explain the process of recording videos.

Q6. How are video files optimized for CD-ROM?

Q7. Write a note on the following:

(a) NTSC

(b) PAL

(c) SECAM

(d) ATSC

(e) DTV

(f) HDTV

Q8. What are digital display standards? Discuss about any two of them.

Q9. Write in detail about analogue video.

Q10. What do you mean by digital video standards? Explain with examples.

MCQ

1. Most common compression technique that is used to create CD-quality audio is based on perceptual encoding technique is called
   A. Predictive Encoding
   B. Perceptual Encoding
   C. MPEG
   D. JPEG
2. In Audio and Video Compression, each frame is divided into small grids, called picture elements or
   A. Frame
   B. Packets
   C. Pixels
   D. Mega Pixels
3. Streaming stored audio/video, files are compressed and stored on a
   A. IP
   B. Server
   C. Domain
   D. Internet
4. If frames are displayed on screen fast enough, we get an impression of
   A. Signals
   B. Motions
   C. Packets
   D. Bits
5. The delay that occur during the playback of a stream is called
   a) stream delay
   b) playback delay
   c) jitter
   d) event delay
   6. Real time streaming protocol is used
   a) to control streaming media servers
   b) for establishing and controlling media sessions between endpoints
   c) to provide real time control of playback of media files from the server
   d) all of the mentioned

ANSWERS 1. B 2. 3. C 3. B 4. B 5. C 6.D

MODEL ANSWERS TO "CHECK YOUR PROGRESS"

Check your Progress 1

Four broadcast and video standards and recording formats are commonly in use NTSC, PAL, SECAM, and HDTV.

Uttar Pradesh Rajarshi Tandon
Open University

Master of Computer Science

MCS-114

Multimedia Technology

Block

2

Multimedia Animation, Authoring Tools and Internet

Course Design Committee

Course Preparation Committee

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UNIT-4
CREATING MULTIMEDIA ANIMATION

Structure

4.0 INTRODUCTION

As saying goes "A picture is worth a thousand words", the same applies to animation. Static presentations animate with the insertion of animations. The visual variation of multimedia projects can complement the power of the presentation. Well executed and planned video clips can fundamentally differentiate a multimedia project. The video is generated using real-time images, while the animation is extracted from the images. Animation to your computer or animation CGI is the process used to generate animated graphics using computer graphics. The most common term includes computer generated images and static dynamic scenes, while computer animation only refers to moving images.

Modern computer animation usually uses 3D graphics computer, though 2D graphics computer are still used for stylistic representations, bandwidth and fastest in real time low. Sometimes the purpose of animation is the computer itself, but sometimes the target is another means, such as the movie. Computer animation is essentially a digital stop motion successor technique used in traditional animation with 3D models and 2D image frame animation frames.

Computer-generated animations are more controllable than other more physically-based processes, such as building thumbnails for impact shots or taking extras for crowd scenes, because it allows the creation of images that could not be realized

an object through the screen while editing the shape, just change the shape and move or translate some pixels for each frame.

4.3 ANIMATION TECHNIQUES

When you create an animation, organize its execution into a series of logical steps.

First, collect all the activities in your brain that you wish to provide in the animation; if it is complex, you may wish to create a list of activities with a written script and required objects. Second, pick the animation tool which is best suited for the job. Then tweak and build your sequences; experiment with lighting effects. While experimenting and testing allow a proper amount of time for this phase.

Finally, in post-processing of animation, special rendering and sound effects can be added [1] [4] [7].

4.3.1 Computer Animation

Computer animation programs generally use the same procedural and logical concepts of animation cel. It uses keyframe, layer, and tweening techniques. Even vocabulary of classical animators can be borrowed. Computer animation is the same as logic and procedural concepts such as cel animation and uses the classical animation vocabulary - such as key-frame, layer, and tweening. The main difference between animation software programs is what is automatically generated by the software and how much it should be attracted by the animator.

In animation 2D, the animator creates an object and describes a path for the object to follow. The software takes control, it actually creates the animation in flight while the user sees the program.

In 3D animation, the animator strives to create models of individuals and design the features of their shapes and surfaces. Most of the time, the paint is filled or drawn with tools that use features like anti-aliasing and gradients.

4.3.2 Cel Animation

The term cel comes from transparent celluloid sheets used to draw every frame, now replaced by plastic or acetate. The celebrities of the famous cartoons have become ambiguous and sought after.

The animation techniques made famous by Disney. He used a series of progressively different frames in each frame of the movie that plays at 24 frames per second. One minute of animation can take up to 1,440 separate frames. The term cel derives from the clear celluloid leaves that have been used to draw every painting, which has now been replaced by acetate or plastic. Cel animation illustrations begin with key-frames.

4.3.3 Kinematics

Kinematics is the study of movement. It includes the movement of structures that have come, like a walking animal. The process of linking objects such as hands to arms takes place through reverse kinematics. It also defines its limits and relationships.
Once these relationships are established, you can drag these parts from one place to another, and then your computer will calculate the result.

4.3.4 Morphing

In morphing, one image transforms into another. The Morphing effect can perform transition with still images as well as between moving images. These effects are provided by morphing application and different tools.
The morphed images take 8 frames per second, with each transition compelling a total of 4 seconds. Some product that uses the morphing features are as follows

- Black Belt's Easy Morph and WinImages,
- Valis Group's Flo , MetaFlo, and MovieFlo.
- Human Software's Squizz

Check Your Progress 1

Write down different animation technique.

Notes: a) Please write your answers in the space provided below.

b) Don't forget to check your answers with the one given at the end of this chapter.

4.4 ANIMATION FILE FORMATS

Some file formats are designed specifically to contain animations and the can be ported among application and platforms with the proper translators.

➢ Director	*.dir, *.dcr
➢ AnimationPro	*.fli, *.flc
➢ 3D Studio Max	*.max
➢ SuperCard and Director	*.pics
➢ CompuServe	*.gif
➢ Flash	*.fla, *.swf

Following is the list of few Software used for computerized animation:

- 3D Studio Max
- Flash
- AnimationPro

4.5 INTRODUCTION TO MACROMEDIA FLASH 8

Flash 8 is a powerful tool created by Macromedia that has overcome the best expectations of its creators. Macromedia Flash was originally created in an effort to realize colorful animations for the web as well as to create animated GIFs. Designers, web professionals and amateurs have selected Flash 8 by many reasons [13].

4.5.1 Advantages of Macromedia Flash 8

The advantages of macromedia flash 8 are:

- With Flash we can create small multimedia files that are inserted into HTML pages and are displayed when the user has a Flash plug-in enabled in their browser.
- It is very easy to use because of its drag-and-drop interface.
- Fast loading with small files because Macromedia Flash uses vector-based graphics. Vector-based graphics can be easily re-sized and are stored as very small files.
- Flash is browser independent. It has no issues with cross browser compatibility.
- Flash can be used to replace text elements on HTML web pages with Flash equivalents. This image replacement technique is called Scalable Inman Flash Replacement.
- Flash supports audio, animation, and advanced video handling and interactivity. Flash is vector-based, but allows incorporation of bitmaps where needed.
- With Flash, you can express something to a visitor in a more efficient and attractive way.

4.5.2 Disadvantages of Macromedia Flash 8

The disadvantages of macromedia flash 8 are:

- Most Flash applications are very large and slow to download.
- Information embedded in Flash is invisible to search engines.

- Use of Flash disenables the back button, which makes the site difficult to use.
- Flash requires a plug-in, which most people have built into their computers, but some web browsers don't, so they won't be able to view the page.
- Most mobiles can't read Flash.

Sample example to create an animation to represent the growing moon in black sky

Step 1: Open **flash 8** software -> click on **flash document** -> go to **windows** ->**properties** ->select the **properties** tool -> choose the **Background** to black.

Step 2: Go to **fill color** under tool bar-> select the white color.
Step 3: Select the **oval tool** in order to draw the moon. You will get a white circle.
Step 4: Select the white circle on the worksheet using the **selection tool** -> right click ->**convert to symbol** -> select **movie clip** -> give suitable name e.g.: moon -> click **ok**.

Step 5: Go to **filter** -> click on the **+** symbol -> select **glow** to apply glowing effect -> select the **color** to white under **glow** and adjust the **blur x/blur y** values.

Step 6: Click on the **+** symbol again and chose **blur** -> again adjust the **blur x/blur y** values.
Step 7: Place the moon where ever you want on the work area. Double click on **layer 1** and rename as **MOON**.

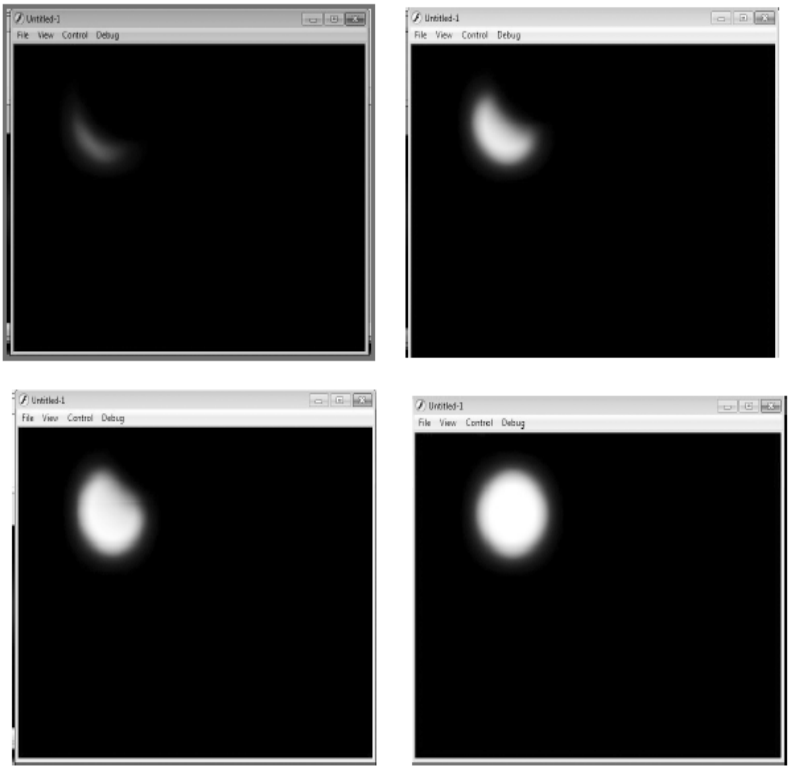
Step 8: **Insert** another layer -> rename it as **Animation.**
Step 9:Select the **fill color** to black -> select **oval tool** and draw a circle on the moon to cover the moon -> select the newly added circle -> right click ->**convert to symbol** ->**movie clip** -> name it as **Animation**.
Step 10: Go to **filter** -> select **+** symbol -> give the **glow** and **blur** effect as did for moon.
Step 11: Select the 150th frame in moon layer -> right click ->**insert key frame**. Repeat the same for Animation layer.

Step 12: Click on the 149th keyframe of animation layer -> right click -> press **create motion** -> select the animation movie clip and move slowly across the moon.

Step 13: Finally go to **control** ->**test movie** -> you will get a growing moon as the output. The output of animation is shown in Figure 2.

Figure 2: Output of animation

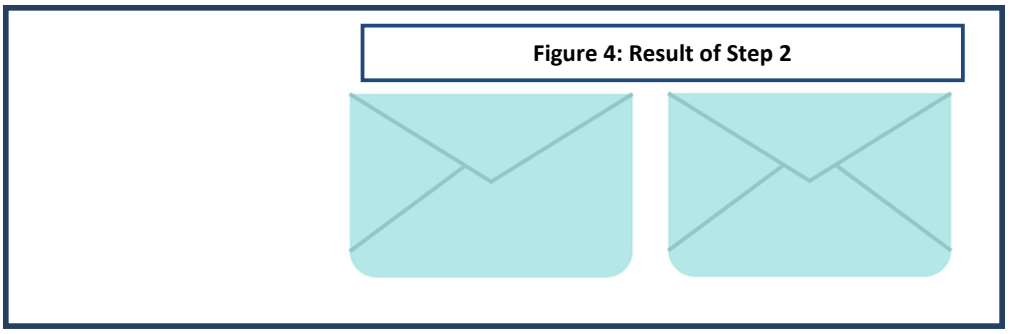
OUTPUT



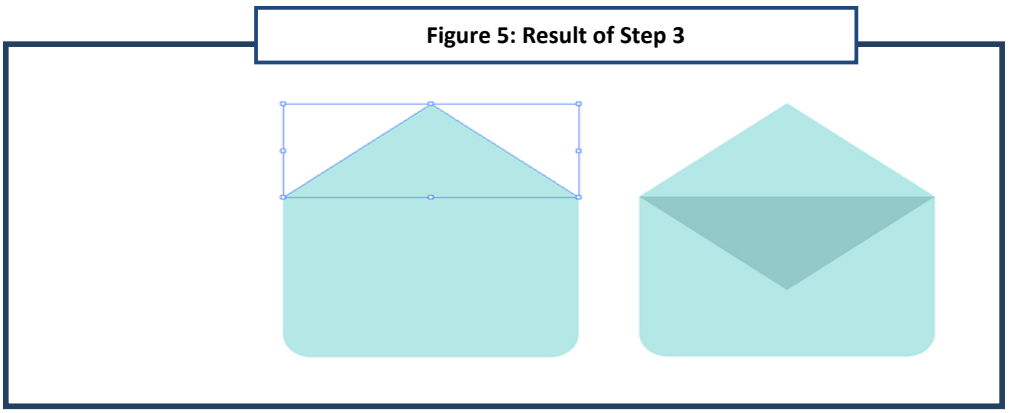
4.6 ICON ANIMATION

Animation through Images (Icon Animation): Icon animation is the way to express something that is attained by the help text on the action of hovering over them on web pages. Adding animation to the icons is eye catching while giving a sense of completeness to their existence. Icon animation can be achieved by using a sequence of images overlapped to each other with a slight and meaningful variation from the preceding image when it is shown in a time frame.

The design of all computer icons is limited by the device screen restrictions. They are limited in size, with the standard size of a thumbnail for desktop and mobile devices. They are often scalable, as they are displayed in different locations in the software. The colors used in both the image and the background of the icon should be highlighted in different backgrounds of the system. The detail of the icon image must be simple, remaining recognizable in different graphic resolutions and screen sizes.



Step 3: Copy (Control-C) and **Paste (Control-V)** the envelope design. Draw a triangle from top corner to top corner for the opening of the envelope. Select the triangle while holding down **Alt**, and drag out a duplicate of the triangle. **Rotate (R)** it around to create the opening of the envelope, and set the fill color to a darker blue. The result after step 3 is shown Figure 5.



Step 4: Now you should have two envelopes: one open and one closed. Our goal is to create several iterations of envelopes that bridge the gap between the closed envelope and the open envelope for our final animation. **Group (Control-G)** together each of your envelope's components. The result after step 4 is shown in Figure 6.

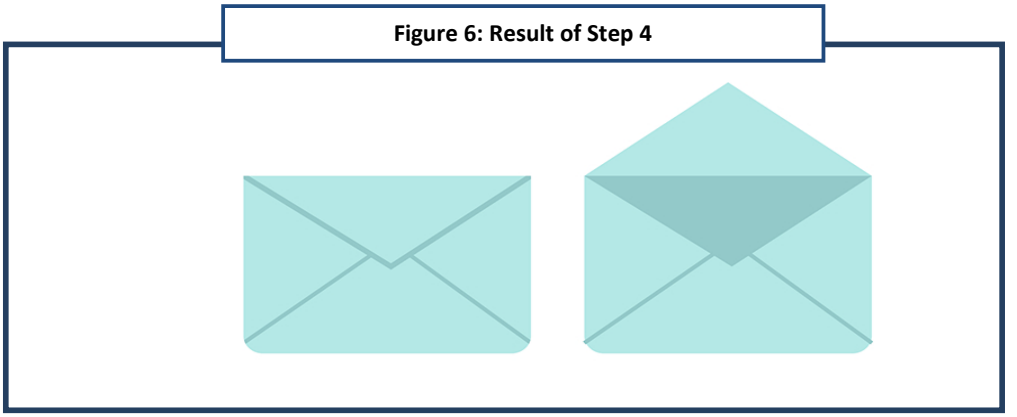
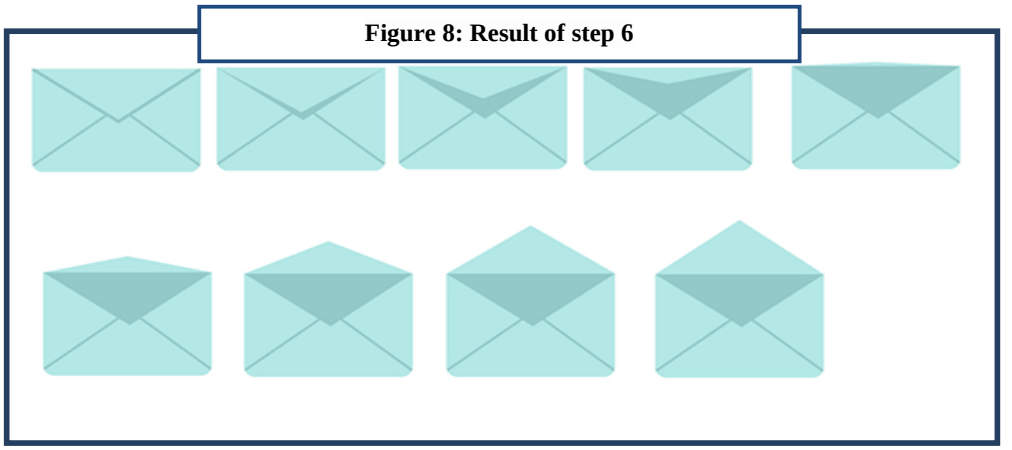


Figure 8: Result of step 6



Since we have got the building blocks of an animation, now we can do it by using animation timeline of Adobe Photoshop.

Step 7: We begin by creating a new document considering the size of the project that you have got. In **Adobe Illustrator**, **Copy** each envelope group and **Paste** them into your **Adobe Photoshop** document. If you want to resize your image without a loss in quality, paste each group in as a **Smart Object**. If you're happy with the size, **Paste** them into a new layer as **Pixels**. Make sure each object is layered sequentially. Additionally, you'll want to select all nine layers and Align them to their centers and bottom edges because not aligning them right will give a vibrating effect to the final outcome.

Step 8: Open the **Timeline** panel and create a **New Frame Animation**. Starting with the closed envelope layer (hide the others), create a **New Frame** and set the frame's delay to **0.1 second**. For each frame, unhide the next layer and hide the previous layer until the envelope is open. Then, set the delay at **0.2–0.5 seconds**.

Repeat un-hiding and hiding layers, but this time goes in reverse order so the envelope is closing again. Make sure it's looped "**Forever**" so the animation keeps opening and closing. The detailed screenshot below shows every setup of the Photoshop. Don't count the number of envelopes there as I have created a few more for a smooth animation.

Step 9: Hit the play button and you will be able to see animation effect of the icon.

Step 10: If you want to save it then just go to File/Save As then select web and your icon animation is ready.

We can achieve this feat of icon animation via any other different image formats but do always memorize what the next steps should look like and what is our goal along with how much time animation is required. Figure 6 shows final image after all processes.

4.7 REAL TIME VS FRAME BY FRAME ANIAMTION

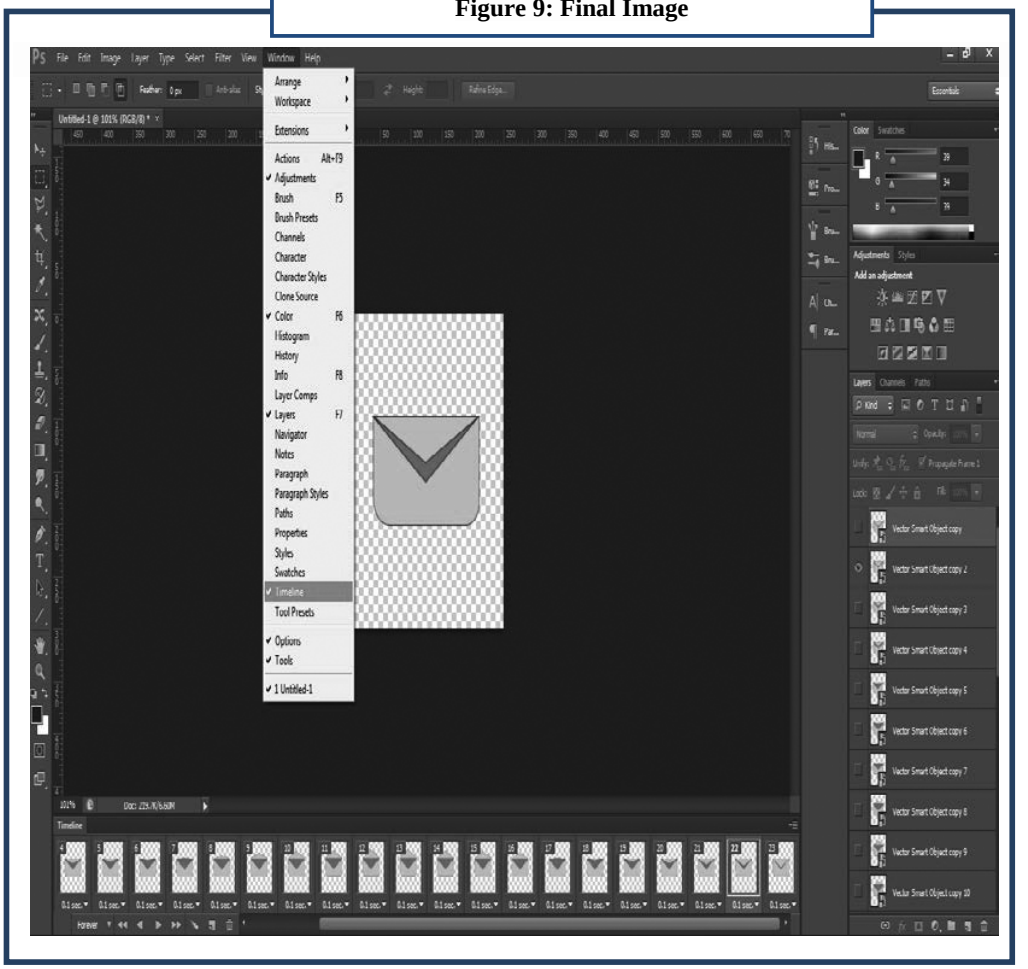
If images in animation can be displayed quickly enough on your computer screen, you can record the animation in real time. This is as simple as placing the video

recorder (VTR) in recording mode and playing the animation on the computer screen. This also requires scanning the conversion hardware that converts the

computer screen scan lines into a video signal sent to the VTR. In many cases, however, the animation cannot be played on the computer screen in real time. To create a video that plays animation at a convenient speed, the animation must be recorded frame per frame. This involves sending a photo to VTR, instructing to record the image on a specific spot on the tape, and then back up the VTR repeat the procedure with the following table. This process requires considerably more time than real-time recording, but the result may be a much smoother video animation. Animation can be generated in **real-time** or **single-frame** mode. Real-time implies that images are generated at a fast enough speed to produce the perception of motion persistence. For general purposes, the velocity capable of producing this perception is usually taken as 1/24 second; the actual frequency depends on the types of images displayed and the specific display conditions. Unfortunately, it's not uncommon to hear talk in real time when it comes to low rates of five frames per second.

If images cannot be produced at a fast enough pace to provide real-time animation, you can generate a single frame at a time and each frame can be recorded in some way so that it can play late animation rhythms (that is, it speeds fast enough to produce the persistence of movement). The final image is shown in Figure 9.

Figure 9: Final Image



Source: www.worldconf.in/animation/1.gif

The difference between animation and real-time animation of a single frame depends on the image quality, the computational complexity of motion and the power of hardware that is used to calculate motion and represent images. Model algorithms (eg computational fluid dynamics) may require for processing which are too intense to happen in real time. Sometimes you can pre-compile the motion and then make it in real time.

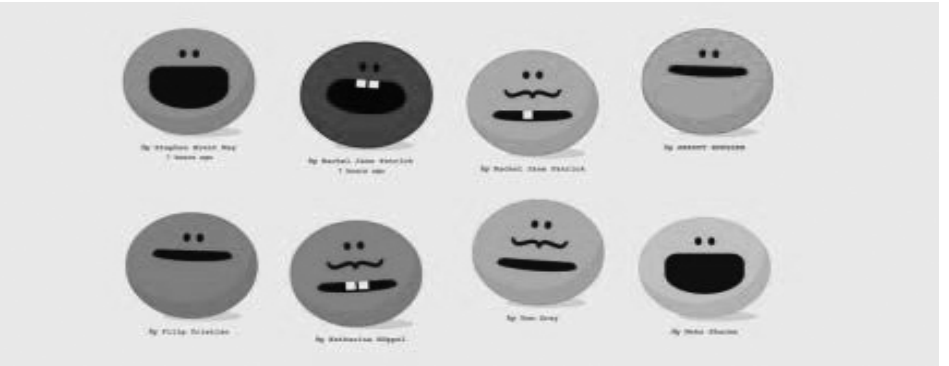
The reader should notice a distinction here in the two processes that occur: motion control and rendering. In a possible scenario, motion control could be sophisticated simulations of physical knee processes for a supercomputer. But at the end of the calculation, a number of object transformations occur on multiple occasions that the display hardware can read and render in real time. At the other end, simple motion control, such as linear interpolation, can be used together with a tracking beam for rendering software. In this case, motion calculation can be performed at real-time rates, but rendering cannot produce real-time images. Playback speed is the speed at which frames are displayed on the display device. The upgrade speed is the speed at which motion is calculated. For example, in common with some cartons, the discount rate can start from 8 frames per second, even though the playback rate is 30 frames per second. Similarly, with interlaced scanning (described below), the discount rate may be 60 times per second, while playback speed is 30 frames per second.

The icon itself is an easily understandable symbol of a software tool, function, or data file accessible in the system, and more like a traffic sign than a detailed illustration of the real enterprise it represents. It can be an electronic hyperlink or a direct file to access the program or data. The user can activate an icon using a mouse, pointer, finger or a recent voice command. Its position on the screen, also in relation to other icons, can provide more information to the user about its use. By activating an icon, the user can move directly and out of the identified function without knowing anything else about the position or requirements of the file or code. Icons as part of the graphical user interface of the computer system along with the windows, menus and devices (mouse) pointing to belong to the much wider issue of the history of the graphical interface has largely replaced the Text-Based Interface for Casual Use. The icon animation is shown in Figure 10.

Graphically, the icon is a stylized image of objects with which users are familiar with the office environment or with other professional fields. A set of icons was taken from the symbols found on all electronic devices, such as the on / off symbol and the USB icon.

Another group metaphorically represents desktop objects from the office environment of the 1980s. A third group of icons are trademark icons used to identify commercial software programs. These commercial icons serve as functional links in the system for programs or data files created by a specific software vendor. Although icons are usually represented in user graphical interfaces, icons are sometimes represented in a TUI by using special characters such as PETSCII MouseTextor.

Figure 10: Icon Animation

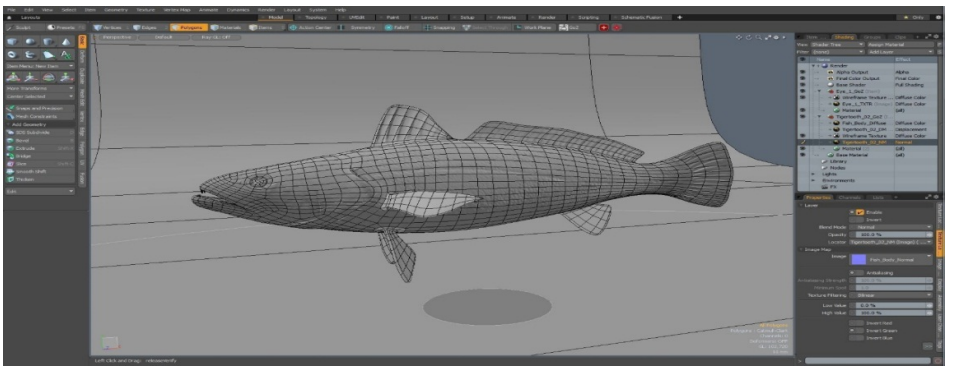


Source:https://www.webdesignerdepot.com/2014/07/can-web-animation-save-flat-design/

A Case study Animation (in words of author)

Animation has played an important role in entertainment for over 50 years, from its beginnings in television cartoons (aimed originally at children) through to sophisticated visual effects found in many of the latest films and computer games. Before the involvement of computers, animation was a long-drawn-out affair carried out by teams of designers painstakingly drawing a series of frames, each of which showed the 2D scene a fraction of a second after the previous one. These frames would then be copied onto transparent cels. The cels were photographed as a continuous film. If the frame rate was high enough, the motion would appear realistic to the human eye. Towards the end of the last century, computers were increasingly used in animation: an example being the production of the frames in between the hand-drawn keyframes. But it was not until 1995 that the first full length feature film to be completely generated through computer graphics techniques was produced, Toy Story from Pixar Studios. The wire frame diagram is shown in Figure 11.

Figure 11: Wire frame diagram



Source: https://www.cgtrader.com/3d-models/animals/fish/tigertooth-fish

Xiao-Ling is the head of one of the design teams at Pacific FX and discussed two of the current projects in which they are engaged. She explained that the steady increase in available and affordable processing power has allowed computer graphics and animation to reach levels that blur the distinction between fact and fiction, and allows small companies like Pacific FX to enter the market. “We are currently working on two projects: a computer game designed to be played on ordinary home computers and a short animated commercial. The fact that one needs to be rendered in real-time whilst the other can be completely prepared offline leads to the possibility of using different techniques.” She went on to explain how the main principles of animation are similar to the pre-computer era. “We still produce key-frames at significant points in the action, as was previously the case. But these key-frames are no longer hand-drawn. We either use modeling software directly to create the characters and objects or we create them as physical models and then use 3D scanners to import them into the software. In each case, wire-frame models are created out of many polygons (the smaller and more numerous the polygons, the more detail there will be) ready for the application of texture and colour. ” She explained how the in between frames that used to be passed to the assistant designers to be hand-drawn are now created by computer algorithms that interpolate between the key-frames. “The process of creating the frames is similar to the previous methods where key-frames are created and then the software carries out the tweening process. These key-frames are not necessarily created at regular intervals but must be carefully chosen. The algorithms basically interpolate between the attributes of each object to produce, usually, 24 frames per second. This, at its simplest, can be a straightforward translation in the x-direction (for example, rolling a sphere). However, in reality the process is far more complicated as each scene will have many objects, with each object being rigged Wire-frame model of a fish with possibly hundreds of control points (avars). Each of these control points will have different attributes and each attribute may have its own algorithm for dealing with the tweening process (for example, a person turning their face and changing expression). The amount of processing required quickly adds up. “For movement, built-in libraries based on inverse kinematics will be used. The process of morphing one face into another has some similarities to the tweening process, although the construction of the in between frames does differ. ” She used the model of a fish (see wire-frame diagram) to illustrate the use of polygons and the positions of avars (shown as red circles). These avars are the significant points on each object that can be controlled by the animators through properties assigned to them which are then processed by the tweening algorithms.

Source: http://retrosnob.files.wordpress.com/2015/08/case-study-2015-2016.pdf

LET US SUM UP

In this lesson we have learnt the use of animation and video in multimedia presentation. Following points have been discussed in this lesson:

- Animation is created from drawn pictures and video is created using real time visuals.
- Animation is possible because of a biological phenomenon known as *persistence of vision* and *phi*
- The different techniques used in animation are computer animation, cel animation, kinematics and morphing.

LESSON-END ACTIVITIES

Choose animation software available for windows. List its name and its capabilities. Find whether the software is capable of handling layers? Key-frames? Tweening? Morphing? Check whether the software allows cross platform playback facilities.

MODEL ANSWERS TO "CHECK YOUR PROGRESS"

Check your progress 1

The different techniques used in animation are: cel animation, computer animation, kinematics and morphing.

Terminal Questions

Q1. Write down principle of animation?

Q2. How is cel animation differ from Morphing?

Q3 How is animation different from static image?

Q4.What is icon animation? Where is it used?

Q5.What is flash?

MCQ

1. Short films that use stop motion techniques are what type of animation?
   a) Production
   b) Frame-based animation
   c) Animation
   d) HTML

2. Stuart is playing a video game that has a lot of depth and a very realistic appearance. What type of animation is Stuart enjoying?
   a) AVI
   b) 3D animation
   c) Vector Animation
   d) 2d Animation

3. Which type of animation uses still frames with a graphic that slightly changes position?
   a) Frame-based animation
   b) Animation
   c) Pre-production
   d) Vector Animation

4. Which type of animation is best for developing characters that would showcase depth and realism?
   a) Vector
   b) 2D Animation
   c) 3D animation
   d) Alpha

5. What type of animation is best for creating a flat appearance?
   a) SWF
   b) 3D Animation
   c) 2D animation
   d) Path Animation

6. Dave is animating a ball moving with slight changes on each frame. What type of animation is being used?
   a) Frame-based animation
   b) Vector
   c) Frames Per Second
   d) Scenes

7. How is the movement of text or graphics classified?
   a) Vector
   b) Animation
   c) Alpha
   d) MOV

8. Rachel is creating an animation that consists of movement defined by computer-generated formulas. What type of animation is being used?
   a) Animated GIF
   b) Vector animation
   c) Alpha
   d) Animation

Key: 1 b 2 b 3 a 4 c 5c 6a 7b 8b

UNIT-5

MULTIMEDIA AUTHORING TOOLS

Structure

5.0 INTRODUCTION

Multimedia authoring is the creation of multimedia productions, sometimes called "movies" or "presentations", since we are interested in this subject from a computer science point of view, we are mostly interested in interactive applications. Also, we need to consider still-image editors, such as Adobe Photoshop, and simple video editors, such as Adobe Premiere, because these applications help us create interactive multimedia projects [5] [9]. How much interaction is necessary or meaningful depends on the application. In a slide show, interactivity generally consists of being able to control the pace (e.g., click to advance to the next slide). The next level of interactivity is being able to control the sequence and choose where to go next. Next is media control: start/stop video, search text, scroll the view, zoom. More control is available if we can control variables, such as changing a database search query. The level of control is substantially higher if we can control objects - say, moving objects around a screen, playing interactive games, and so on. Finally, we can control an entire simulation: move our perspective in the scene, control scene objects. In this section, we shall look at

- Multimedia authoring metaphors
- Multimedia production
- Multimedia presentation
- Automatic authoring

The final item deals with general authoring issues and what benefit automated tools, using some artificial intelligence techniques, for example, can bring to the authoring task. As a first step, we consider programs that carry out automatic linking for legacy documents. After an introduction to multimedia paradigms, we present some of the practical tools of multimedia content production - software tools that form the arsenal of multimedia.

Multimedia Authoring Tools: The Multimedia authoring tools provide the ability to create
multimedia presentation, with interactive user control. Some of the examples are:

1) Macromedia Director
2) Macromedia Flash
3) Quest
4) Author ware

Multimedia authoring tools provide

- The basis for shaping and editing the elements in a multimedia project.
- Integrated environment to combine the functions and content of a project.
- The developer to edit, import create and data.

Authoring tools should have desirable capabilities such as:

- Editing
- Playback
- Interactivity
- Programming / Scripting
- Delivery/Distribution
- Internet Playability
- Cross Platform
- Project organization.

5.1 OBJECTIVE

At the end of this unit, you will be able to:

- ✓ categorize the various multimedia development tool
- ✓ discuss in detail the various multimedia authoring tools
- ✓ understand hot spot, project and topic editors
- ✓ discuss the need of authoring tool and how it is accomplished in multimedia
- ✓ discuss the various elements and applications of authoring.

5.2 PROJECT EDITOR

Editing can be revising, arranging and preparing an audio, a video or a written document or material for ultimate production, by an editor. The elements of

multimedia – animation, image, text, MIDI music, digital audio and video clips which is to be shaped, edited and converted to some standard file formats. The expert applications provide these capabilities.
The entire project is managed by a project editor. Project editor can hire members of the editorial team altogether (excluding the author). The project editor has following responsibilities:

a) The tracking and Scheduling of project members.
b) To enforce consistent standards all the way through.
c) Reviewing and go through all phases of the production and editorial process.
d) Safeguarding the communication among every member of the team (editorial), including the designer.

5.3 TOPIC EDITOR

A topic editor provides a template based layout that reduces the amount of formatting you need to do on a Topic by Topic basis. The Topic Editor provides powerful authoring functionality such as:

- **Mapping of pages** – The pages are correctly mapped or not.
- **Table editing** – It provides manipulation of column, row in a table. It also ensures the feature like resize, delete, cut, copy and paste.
- **Undo**- The unlimited number of undo can be done.
- **Hyperlink designer**- The hyperlink is provided by topic edition.

5.4 HOT-SPOT EDITOR

The hotspot editor is where you define the spot of interactivity and thereby you can modify the hotspot's actions in the skin editor using a template for user interaction, for selecting the hotspot. There are different types of hotspots as defined below:

1. Point and Polygon Hotspots: A point hotspot defines a point of interactivity. A polygon hotspot defines a customized and user defined area of interactivity.
2. Area Hotspots: The area hotspot defines an area of interaction.

Developing a multimedia title:

1) **Planning**

Step 1: Developing the concept

- What, in general, do we want the title to accomplish?

Step 2: Stating the purpose

- What, specifically, do we want to accomplish?

Step 3: Identifying the target audience

- Who will use the title?

Step 4: Determining the treatment

- What is the look and feel?

- Tone: funny, serious, light, heavy, formal, informal
- Approach: amount and type of user direction for interactivity
- Metaphor: theme
- Emphasis: on various multimedia elements (budget can dictate)

Step 5: Developing the specifications

- What precisely does the title include, and how does it work?

- Playback system: platform & processor speed
- Elements included: How sound is recorded, Design resolution, Video specifications, Fonts/colors.
- Functionality: interactivity specifications
- User interface: how to navigate

Step 6: Storyboard and navigation

- Navigation is linking screens via buttons, hypertext and hot spots.

- Sequential type: linear (stories, books, presentations, tutorials)
- Topical type: menu/search (catalog, encyclopedia, kiosk)

2) **Creating**

a) Developing the content

b) Authoring the title

3) **Testing**

a) Alpha testing

b) Beta testing

4) **Distribution (Objectives)**

a) Clear

b) Measurable

c) Obtainable

Check Your Progress 1

What are the steps you think necessary for multimedia title?

Notes: Please write your answers in the space provided below.

5.5 MULTIMEDIA TEXT AUTHORING SYSTEMS

These systems are used to write a letter, documentation for a project and other reports required in building a project plan or software e.g. Word pad, MS Word, Open Office Word, Notepad. It provides the following features:

5.4.1 Media Authoring Tools

Media authoring tools provide the important framework that you need to organize and edit multimedia items like graphics, sounds, animations, and video clips. Creation tools are used to design interactivity and user interfaces for presentation your project on the screen and assemble media in a unique cohesive project. Creating software provides an integrated connection environment together with the content and the functions of the project. Authorization systems typically include the ability to create, edit, and import specific types of data; Assemble raw data in a reproduction sequence or in a reference sheet and provide a structured method or language to respond to the user's comments.

5.4.2 Types of a Authoring Tools

Various authoring tools can be categorized into three categorized categories on the metaphor used for sequencing or multimedia organization elements and events.

- Tab or page based tools

- Icon base, event-oriented tools
- Basic tools and presentation tools

5.4.2.1 Tab or Page Based Tools

In these authoring systems, elements are organized as pages of a book or a bunch of letters. These tools are best used when most of them Content consists of elements that can be displayed individually, for example pages of a book or cards in a card file. The authoring system allows you link these pages or letters in organized sequences. You can jump in command to any desired page in the structured navigation model. Allows you to play audio items and start animations and digital video.

5.4.2.2 Icon and Event Based Tools

In these creation systems, multimedia elements and interaction signalsthey are organized asobjects in a framework or in a structural process. IconBase, event oriented tools simplify the organization of your project and typically show flow charts of activity along branching paths. In complicate structures, this layout is particularly useful during development.

5.4.2.3 Time Instruments

In these authoring systems, elements and events are organized along one timeline, with resolutions higher than or greater than 1/30 second. Time based tools are the best ones to use when you have a startup message and an end sequential organized graphics are played back in a speed you can set Other elements are re-activated in a certain one time or position in the sequence of events. The most powerful moment based tools allow you to program jumps at any position in a sequence, adding navigation and interactive control.

5.4.3 Characteristics of Authoring Tools

Below are the features of multimedia authoring tools:

• Modify the functions
• Organize functions
• Programming functions
• Interactive functions
• Performance adjustment functions
• Playback functions
• Delivery functions
• Multiplatform functions
• Gameplay Internet

5.4.3.1 Editing Functions

Multimedia elements - image, animation, text, digital audio and MIDI and video clips - must be created, edited, and edited converted to standard file formats and specialized applications provide these Edit Tool features for these items, especially text and still images are often included in their author system.

5.4.3.2 Organizational Features

The organization, design and production process for multimedia includes storyboard and flowchart. Some authoring tools provide a visual flowchart system or a general function for illustrating the structure of the project at a macro level. Storyboards or Navigation charts can also help you organize a project. Because often by designing the interactivity and navigation flow of your project it requires a lot of planning and programming activities, its history board should describe not only the graphics of each screen, but the even interactive elements. Functions that help you organize yours material, such as those provided by Super Edit, Authorware, IconAuthor and other creation systems are an advantage.

5.4.3.3 Programming Functions

Authoring tools that offer a high level or interpreted language script for navigation control and to allow the user entries such as Macromedia Director, Macromedia Flash, HyperCard.

1. Open Files, create and save existing files.
2. Find or replace the text from a document.
3. Cut, copy, paste of a selected document.
4. Insert page numbers on top, bottom or center of the page.
5. Format the font of the text
6. Spell check.
7. Making tables with variable number of columns and rows.

Usage of authoring tools:

1. It requires less technical knowledge.
2. It can produce attractive and useful graphic applications
3. It creates a mixture of textual, audio and graphic data.
4. Easy to use and understand.
5. It has a clear structure.
6. Easy to edit and update elements.
7. Provide good user interactivity.
8. Great for creating animations.

5.4.4 Types and Application of Authoring Tool

The types of authoring tools are as follows [10].

5.4.4.1 Author Ware

Macromedia Author software is a dependable industrial security environment that allows more people to contribute to an application. Artists can upload a media library, programmers can provide templates for complex interactions, and interface designers can assemble everything. And a designer who is not programming can also do all the work alone.

Author ware 3 allows you to create programs in identical environments in the file PC or Macintosh and produce runtime for anyone. Author icons contain a large amount of programming information that never requires the user to think like a programmer.
Some article icons author can manipulate media on the screen. They can show and delete graphics, move or animate objects, play.
The new frame icon automates hypermedia interactions and provides a predefined navigation structure. With a 10-page document in RTF format, it's easy to import it to the first "page" of the framework using Author ware. Author Ware can create a new viewing page for each page break in a rich text format (RTF) file. Eight buttons are used to navigate through the pages, display a list of page selections, search for documents, and exit the frame. Ware 3 author has added text styles that can be applied to any text (labels, menu options, scrollboxes).
It is also possible to design in the author's articles. Ware Editor elegantly integrates total data integrity with its icon and variable nomenclature. Change the name of a variable and change where it is used. Author's software can run timers, change the flow in response to a user, keep score, and access laser disc readers through the dialog box. Although Author ware includes ODBC to enable connectivity to and from databases, it does not allow for adequate database interactivity and reduces any records retrieved to a single text string.
Additionally, although author ware has a complete assortment of buttons, dialog boxes, cursors, indicators, text box slots, and data entry boxes, there are no functions such as the critical list and combo boxes used in other programs create order screens.
The author Ware rewards an open mind and willingness to tackle its various approaches by providing accessibility to non-programmers and allowing them to produce complex interactivity with minimal programming thought. Integrated knowledge of caring by interaction, test, and score makes it a mature and prohibitive environment for the creation of kiosks or CBTS.

5.4.4.2 Everest Authoring System

Everest Authoring System 1.5 is more suitable for CBT application developers looking for a powerful but easy-to-use Windows based environment. As for CBT environments, Everest (a Windows 3.1 application that is also in Windows 95) has strong multimedia support, sufficient object orientation to improve productiveness on product competencies, and great technical support. Everest's almost seamless multi-paradigm approach includes features such as visual programming with icons, direct manipulation of interface elements, and procedural programming. Everest has successfully integrated these elements to facilitate application development.
The Everest development environment opens with multiple views of an application. When creating the Everest application, the user starts with a library and assigns an initial screen. Dragging a design object icon from the tool set to that screen provides the basis for the first screen. The layout object, visible as an icon in the script icon, also occupies the attribute window where the user can choose a background color in the bitmap, select a screen size, and specify up to 34 other properties.
You can also drag the interface icons and media objects on the screen; such as lists and combo boxes, edit boxes, text screens, bitmap place boards, sliders and meters, all kinds of buttons, video and audio, OLE and animation. These objects

can be moved, visually resized and their properties set by clicking on them on the visual screen or the script icon. Placeholder objects can be left blank or their content can be specified immediately.
Targeting Everest objects, which supports the creation of object instances, but not the subclass, increases the productivity of developers. For example, suppose you drag a button object, leave it on the visual and size screen to use it as a Back button to return to the previous screens. In the Attributes window, we name it, configure the bitmap used to press and release and assign it an "event code" - in this case, 33 - that will be generated when pressed. And we did all this by simply dragging, pointing and clicking and filling the empty space.
Then comes the funny part in the attribute window, you set up as object as true. On the next screen, drag another button from the Toolkit. With a simple choice of a drop-down menu in the window, we create this new button as an instance of the Back button that we save as an object and the newly created button inherits all its properties. Once the screen design meets the user, Everest has provided a simple way to guide the navigation and control flow. In general, Everest offers a lovely environment to create CBT applications. Additional modules from third-party providers can infuse Everest with data management facilities to access databases and use rich text format. The basic product can access only its proprietary database, capable of reading and writing text files.

5.4.4.3 Icon Author

Icon Author, an authoring tool requires the use of an icon-based flowchart for building an application. It still maintains a strict separation between an application's structure and the actual content and still ships with a number of ancillary programs that help to edit and manage content.
The role of Smart Object editor has become central to the creation of Icon Author applications. Smart Object Editor assembles individual object such as imported pictures, sound files, video clips, animations, database links, text push buttons, tables and list boxes into coherent pages layouts. The appearance and behavior of these objects can be controlled by changing the properties associated with each one.
Icon Author handles multimedia objects with aplomb. The sound, movie and animation files are not only easy to be imported but it also takes less effort to control them. For example, adding VCR start and stop buttons to a movie object requires just activating the control bar property in *Smart Object Editor*.
Creation of CBT application or authoring a CD/Kiosk presentation requires importing and manipulation of data. Icon Author has the ability to access databases via Microsoft Open Database Connectivity (ODBC) drivers. Once the connection to a database is established externally (via the ODBC Administrator), the database object is simply inserted into a Smart Object Page.

5.4.4.4 ImageQ

ImageQ is another multimedia creation software package. Although it is a Windows application, it can also be played on Windows 95, create slide shows and provide a way to easily distribute them. There is lack of intuitive programming language and the solid interface needed for the development of truly productive multimedia applications. ImageQ presentations include a set of background images and associated control scripts that add user interface controls,

overlapping images, and programming below to each slide. Use a multi-document interface to manage one or more presentations simultaneously.
The slide strip for each presentation contains thumbnails or files information for each slideshow image and provides the means to navigate through the presentation at the time of design. Although images in the slideshow strip are thumbnail versions of background images, they do not show any of the user-added elements of the user, such as buttons and check boxes. The user must create these with the code that ImageQ will only interpret as a runtime as a major defect that other authoring systems (such as Icon Author and Director) avoid by providing design tools to organize visually-free code-based interface controls. While ImageQ does not provide robust slide design tools that include competing products, it imports a wide variety of graphics formats. Once images have been imported into an ImageQ presentation, they can be kept in their native format or saved as BMP or HKF files.
Each time images are imported into an ImageQ presentation, it is only about creating nail clippings and slide references and the images themselves remain as separate files. The list of file names and control and transition settings are stored in a file with an IMQ extension, which acts as the main file for the presentation. ImageQ programming language is uncomfortable to work because it uses syntax and unconventional event handlers. For example, ImageQ uses lines like "add X to Y", put 150 in X to add the two values to a single statement and assign the value to 150 at X respectively.
Although ImageQ lacks planning and programming tools, it is well distributed. It is easy to create portable presentations as separate EXE files that include the ImageQ runtime. ImageQ is really a presentation package in the clothing of an authoring system. Its true strength is in the ability to create traditional shows with pre-built images and distribute them without copyright. However, the lack of interactive product design tools and their embarrassing programming languages ultimately make it a poor choice for robust development of multimedia applications.

5.4.4.5 Macromedia Director

Macromedia Director 4.04 is better suited to multimedia presentations and kiosk applications than CBT or interactive catalogs that require more database work.
This product offers
(i) central scoring component that provides precise timing control
(ii) cross-platform compatibility
(iii) strong yet intuitive animation features
(iv) extensive architecture to add functionality.

The application in the Director's UI is a movie, the playback screen is the stage and the elements of the movie are cast members. The film of a director consists of frames that are many separate channels, each one can contain an element or sound, a custom palette and the like. Each sprite is an instance of a cast member, such as a piece of text, a bitmap image, or a digital video clip. Since you can access all sprites during each movie frame, you can get time-based control.
The director has 48 channels of separate sprites available in each frame. Sprites are just copies of cast members, so their appearance can be changed in a particular environment without affecting the original cast member. Each channel number

represents a phase layer so that sprites can be moved between levels simply up and down. There are some special channels that refer to each image; transition, palette, time, script and two audio channels. One of the strongest features of Director is its multiplatform compatibility. Windows and Macintosh versions of product support files allow you to transfer director movies simply by moving the file. The director imports a wide range of graphic formats. When a file is imported, it automatically becomes a cast member and receives a number. Version 4.04 can mix audio files displayed at different speeds and sizes, but you cannot mix AIF and WAV files with audio in digital movie clips. An animation feature that is one of the strongest director games allows you to set sprites in another way.

The director allows the non-programmer to often organize cast members and make them move, but robust movies have a bit of coding. (The language of the director, Lingo, uses phrases in English as commands, but it does take some time). It has been shown that the director is very useful for the implementation of linear, but is weak for complex programming. Although the Director can create complex multimedia events such as CBT, a programming experience is still needed to run them. However, for real-time interactive online titles and demonstration CDs, the director is an exceptionally useful tool that leverages a logical metaphor for spectacular results.

Case study on

Authors of Mobile Multimedia Content

From the authoring tool point of view, we can roughly divide the authors of mobile multimedia content into three major groups: professional content creators, hobbyists, and ordinary phone users. Each of these groups possesses different level of skills and resources for creating multimedia content. Therefore, the needs for authoring tools also differ between the three groups.

Professional content creators like graphic artists, multimedia designers, and professional musicians typically us

e powerful multimedia workstations, often equipped with special input and output devices, for creating multimedia content. They are highly skilled and appreciate the power and flexibility these tools offer. Taking into account the technical and user interface limitations of mobile phones, it is very difficult to match the power of the workstation based tools with mobile phone based tools. Therefore, we expect that the professionals will primarily use workstations and the existing tools they are familiar with when creating content for the mobile environment. Extensions and plug-ins to the existing tools are needed to better integrate them with the mobile environment, for example mobile phone emulators that allow previewing and testing the content on the workstation without the need to transfer it to the real device.

Hobbyists, for example amateur video and still photographers and hobby musicians, use fairly similar tools and techniques for creating multimedia content as the professionals. However, since their skills and resources are

typically more limited, they often prefer to work with simpler and cheaper versions of the tools used by the professionals. While we expect professionals and hobbyists to prefer workstation based tools, mobile phone might still be a useful tool for them. For example, it could be used as an always-present tool for capturing raw material like photographs, which are then later transferred to a workstation for further processing, or as a "sketch pad" for immediate recording of new ideas.Ordinary mobile phone users, by far the largest group, have typically no training and only limited experience on multimedia content creation. Authoring multimedia content easily becomes too difficult or time-consuming for them. To make authoring of multimedia content attractive, tools, which are very easy to learn and use, are needed.
To allow fast content creation, it should be possible to create the content with the mobile phone alone, without need to transfer it to a workstation for additional processing.

Workstation based tools for creating mobile multimedia content are not very different from workstation based tools for creating content for other environments, which have been extensively studied in the literature.

Source: http://ieeexplore.ieee.org/document/1221697/

MODEL ANSWERS TO "CHECK YOUR PROGRESS"

Check your progress 1

Your answers may include the following

- Planning
- Creating
- Testing
- Distribution

LESSON END ACTIVITIES

Make a simple system which includes the work of text authoring systems.

MCQs

1. A multimedia project is said to be _____ and user-interactive when users are given navigational control.

   A. Hypertext
   B. Linear
   C. Non-linear
   D. Plug-in

2. What does GUI stand for?

   A. Gaming User interface
   B. Geometric User Interface
   C. Graphical User Interface
   D. Guidance User Interface

3. A project is packaged and delivered to the end user in the ____stage.

   A. Delivery
   B. Design and Production
   C. Planning and Costing
   D. Testing

4. Which of the following is not a stage in a multimedia project?

   A. Designing
   B. Forecasting
   C. Planning
   D. Testing

5. ---------is the study of movement and motion structures that have joints

   A. Cel-animation
   B. Kinematics
   C. Morphing
   D. Tweaking

   Key: 1 C 2C 3A 4B 5B

Terminal Questions

Q1. What is the basic software tools used to develop multimedia project? Explain them.

Q.2 Consider your own skills, abilities, and goals. Where do you see yourself fitting in to a multimedia production team? What abilities would you bring to team now? What abilities do you need to work to develop? What are your creative abilities? What is your level of mastery of multimedia tools (software and hardware)?

Q3. What we need for developing multimedia project?

Q4. What features should be considered when choosing a multimedia authoring tool?

UNIT-6

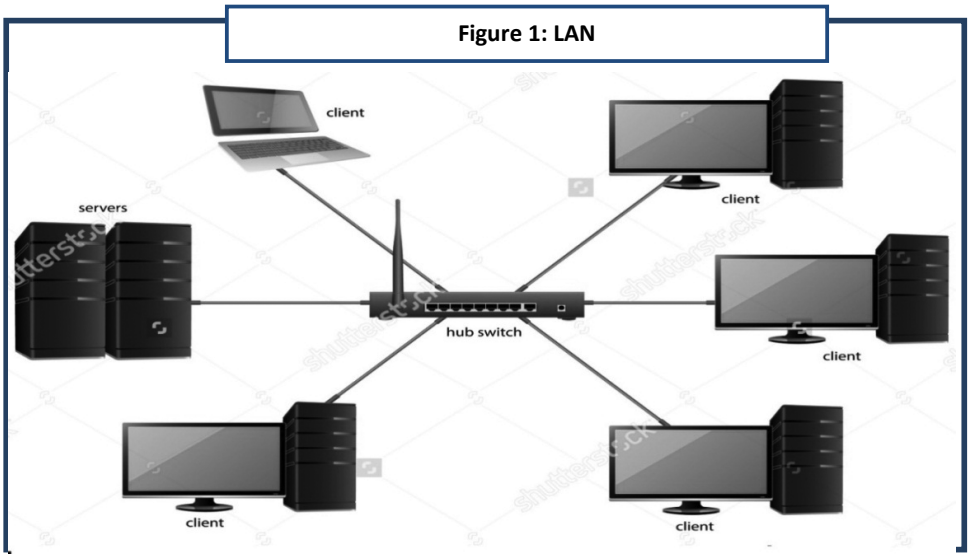
MULTIMEDIA ON LANs & INTERNET

Structure

6.0 INTRODUCTION

Multimedia on LAN: In a LAN (Local Area Network) each PC consists of an interface which is connected to the cable known as LAN cable/ LAN wire. The PCs together with a file server and associated secondary devices such as printers, form nodes on the network. The following Figure 1 depicts setup of local area network.

Figure 1: LAN



Source: https://www.123rf.com/photo_23981414_lan-network-diagram-vector-illustrator--eps-10-for-business- and-technology-concept.html

A multimedia networking system allows for the data exchange of discrete and continuous media among computers. This communication requires proper services and protocols for data transmission. Multimedia networking enables distribution of media to different workstation.

6.1 OBJECTIVES

In this lesson we will learn the basics of animation and video. At the end of this lesson the learner will be able to

- know the different layers of network .
- fast modem and digital network.
- know high speed digital network.
- video conferencing technique.

6.2 NETWORK LAYERS, PROTOCOLS AND SERVICES

A service provides a number of operations to the applicant application. Logically related services are grouped in layers according to the OSI functional reference model. Consequently, each level is a level service provider above it. Services describe the behavior of the layer and its Service Data Units (SDU). An appropriate service specification does not contain information about any aspect of the application [6] [9] [10].

A protocol consists of a set of rules that must be followed by level instances even during any communication between these two pairs. It consists of the form (syntax) and the (semantic) meaning of the exchanged data units (PDUs = protocol data unit).

Multimedia communication imposes a number of requirements in terms of services and protocols, independent of the level of network architecture. In general, this set of requirements largely depends on the corresponding application. However, without specifying a precise value of the individual parameters, the following requirements must be considered:

Processing audio and video data must be limited by deadlines or even defined over a period of time. Transmission of both data between the components involved in the transport layer applications and interfaces must meet the requirements for time domains.

End-to-end fluctuation must be delimited. This is especially important for interactive applications such as the phone. Large fluctuation values would represent big buffers and higher end-to-end delays.

All the warranties necessary for reaching and the date of the transfer must be fulfilled within the required time limit. This includes the required processor performance, as well as the data transfer bus and storage available for protocol processing.

Cooperative work scenarios using multimedia conference systems are the main areas of application of multimedia communication systems. These systems must

support multicast connections to save resources. The sending instance can often change during a single session. In addition, a user must be able to join or leave a multicast group without requiring a new connection configuration, which must be managed by all other members of this group. Services must provide mechanisms for synchronizing different data streams, or alternatively, synchronize through primitives available implemented in another component of the system.

Multimedia communication must be compatible with the most commonly used communication protocols and must use current ones as well as future networks. This means that the compatibility of different communication protocols at least coexist and work on the same machine at the same time. The relevance of expected protocols can only be achieved if the same protocols are widely used. Many of today's multimedia communication systems are, unfortunately, experimental property systems.

Discrete Data Communication should not starve because of the preferred video / audio transmission or guaranteed. Discrete data must be transmitted without any penalty. The principle of equity between different applications, users and workstations must be applied. The actual audio/video data rate varies considerably. This leads to data rate fluctuations, which must be managed by the services.

6.2.1 Physical Layer

The physical layer defines the transmission method of individual bits over the physical medium, such as fiber optics.

For example, the type of modulation and bit-synchronization are important issues. With respect to the particular modulation, delays during the data transmission arise due to the propagation speed of the transmission medium and the electrical circuits used. They determine the maximal possible bandwidth of this communication channel. For audio/video data in general, the delays must be minimized and a relatively high bandwidth should be achieved.

6.2.2 Data Link Layer

The data link layer provides the transmission of information blocks known as data frames. Further, this layer is responsible for access protocols to the physical medium, error recognition and correction, flow control and block synchronization.

Access protocols are very much dependent on the network. Networks can be divided into two categories: those using point-to-point connections and those using broadcast channels, sometimes called multi-access channels or random access channels. In a broadcast network, the key issue is how to determine, in the case of competition, who gets access to the channel. To solve this problem, the Medium Access Control (MAC) sublayer was introduced and MAC protocols, such as the Timed Token Rotation Protocol and Carrier Sense Multiple Access with Collision Detection (CSMA/CD), were developed.

Continuous data streams require reservation and throughput guarantees over a line. To avoid larger delays, the error control for multimedia transmission needs a different mechanism than retransmission because a late frame is a lost frame.

6.2.3 Network Layer

The network layer transports information blocks, called packets, from one station to another. The transport may involve several networks. Therefore, this layer provides services such as addressing, internetworking, error handling, network management with congestion control and sequencing of packets.

Again, continuous media require resource reservation and guarantees for transmission at this layer. A request for reservation for later resource guarantees is defined through Quality of Service (QoS) parameters, which correspond to the requirements for continuous data stream transmission. The reservation must be done along the path between the communicating stations.

6.2.4 Transport Layer

The transport layer provides a process-to-process connection. At this layer, the QoS, which is provided by the network layer, is enhanced, meaning that if the network service is poor, the transport layer has to bridge the gap between what the transport users want and what the network layer provides. Large packets are segmented at this layer and reassembled into their original size at the receiver. Error handling is based on process-to-process communication.

6.2.5 Session Layer

In the case of continuous media, multimedia sessions which reside over one or more transport connections, must be established. This introduces a more complex view on connection reconstruction in the case of transport problems.

6.2.6 Presentation Layer

The presentation layer abstracts from different formats (the local syntax) and provides common formats (transfer syntax). Therefore, this layer must provide services for transformation between the application-specific formats and the agreed-upon format. An example is the different representation of a number for Intel or Motorola processors.

The multitude of audio and video formats also required conversion between formats. This problem also comes up outside of the communication components during exchange between data carriers, such as CD-ROMs, which store continuous data. Thus, format conversion is often discussed in other contexts.

6.2.7 Application Layer

The application layer considers all application-specific services, such as file transfer service embedded in the file transfer protocol (FTP) and the electronic mail service. With respect to audio and video, special services for support of real-time access and transmission must be provided.

Check Your Progress 1

List the different layers which are used in networking?

Notes: a) Please write your answers in the space provided below.

b) Don't forget to check your answers with the one given at the end of this chapter.

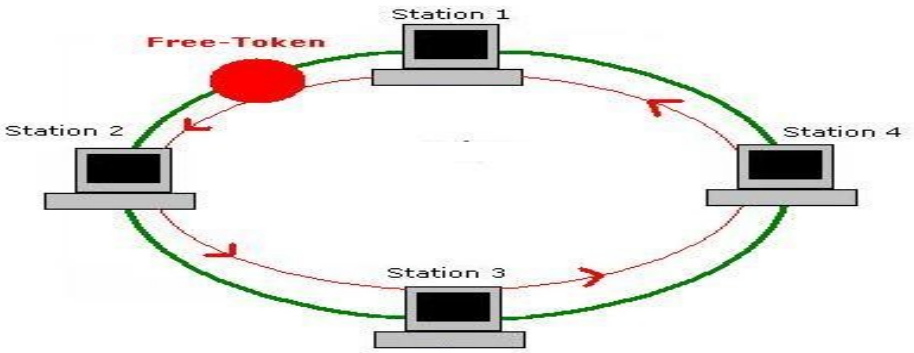
The most popular type of LAN is Ethernet and Token Ring. The Ethernet options are shown in Table 1.

- **Ethernet**

a. Ethernet was initially developed by Xerox PARC in 1973 and later standardized by IEEE in IEEE 802.3 family.

b. The host having token can send data. After the completion of data transfer the host passes the token to another host connected to it.
c. The collision is prevented in network because the host having token can only send data.
d. The disadvantage of token ring is failure of a host or loss of token can stop the complete network. The structure of token ring is shown in Figure 2.

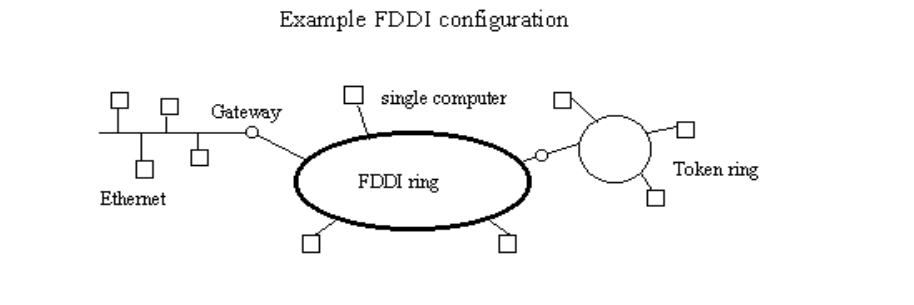
Figure 2: Token ring



Source: http://kamudiad.blogspot.in/2012/11/token-ring.html

- **Fiber Distributed Data Interface (FDDI):**
  a. FDDI is a collection of ISO and ANSI standards for transmission of data lines in a local area network (LAN) on fiber optics.
  b. The range FDDI local area range can be up to 200 km.
  c. This protocol is centered on the token ring protocol.
  d. Thousands of users can work on FDDI local area network. The FDDI configuration is shown in Figure 3.

Figure 3: FDDI



Source:http://www.ictglobal.com/network_types.html

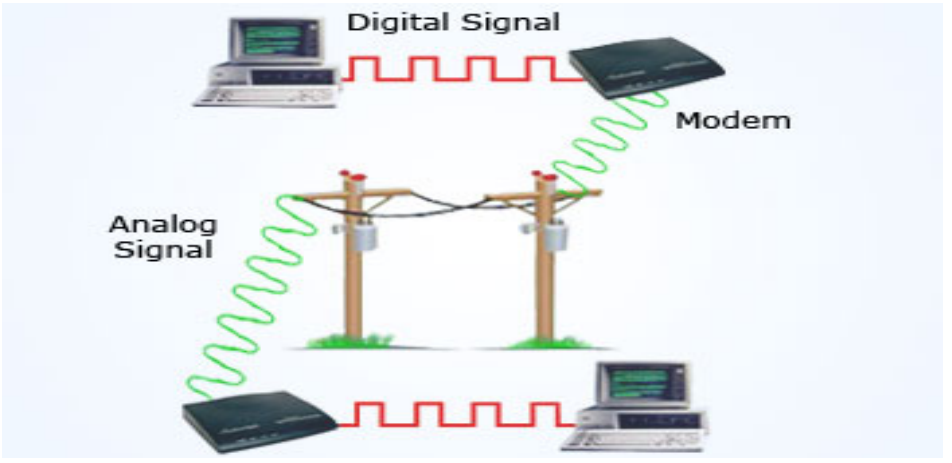
b. It has a bandwidth of 19.2 Kbit/s for asynchronous channel and 64 Kbit/s for synchronous channel.

6.3 FAST MODEMS & DIGITAL NETWORKS

Modems refer to MODulators dEModulators. A modem is a hardware device that converts analog data to digital data and vice versa in real time for two-way network communication. Digital network multimedia include set top box, DTH. The goal is to produce a signal that can be easily transmitted and decoded to reproduce the original digital data. Modems can be used with any means of transmitting analog signals from radio emitter diodes. A common type of modem is one that converts digital data from a computer into a modulated electrical signal for telephone line transmission and demodulated by another modem on the receiver side to retrieve digital data. The communication via modem is shown in Figure 5.

Modems are generally classified by the maximum amount of data that can be sent at a given time unit, usually expressed in bits per second (bit/symbol s, sometimes abbreviated as "bps"), or bytes per second (symbol B/s). Modems can also be classified for their symbol rate, measured in baud. The baud unit indicates the number of symbols per second or number of times per second that the modem sends a new signal. For example, the ITU V.21 standard uses frequency-shift keying with two possible audio frequencies, corresponding to two different symbols (or a bit per symbol) for transporting 300 bits per second using 300 baud. By contrast, the original ITU V.22 standard, which could transmit and receive four different symbols (two bits per symbol), transmitted 1200 bits by sending 600 shots per second (600 baud) using Phase Shift Keying.

Figure 5: Modem



Source: http://www.cyberfreewishes.com/blog/communication-between-computers-and-modems

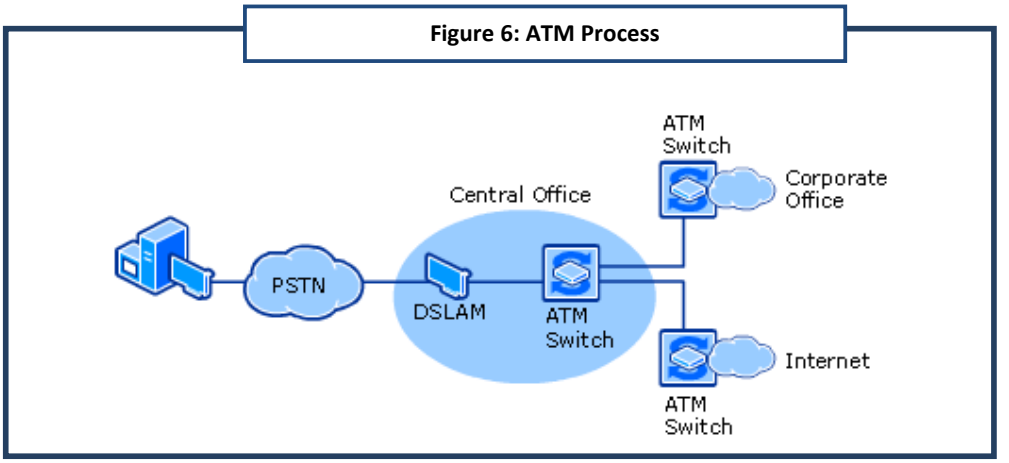
6.4 HIGH SPEED DIGITAL NETWORKS

They provide very high speed of data transfer over a short period of time.

ATM (Asynchronous Transfer Mode):

a. Asynchronous Transfer Mode provides low delay and high speed.
b. It provides fixed cell length, dedicated media connection and connection- orientation.
c. In ATM, information is transferred as a continuous stream of fixed cells, which can be: text, images, voice or audio.
d. It supports parallel connections because each user is supplied with a dedicated media connection to a switch.
e. The application is given a bandwidth of up to 155 Mbit/s which is expandable to 622 Mbit/s. The ATM process is shown in Figure 6.

Figure 6: ATM Process



Source: https://technet.microsoft.com/en-us/library/cc756793(v=ws.10).aspx

6.5 VIDEO CONFRENCING TECHNIQUE

Video Conferencing is telecommunication technology that allows communicating simultaneously with two or more locations having two-way video and audio transmissions.

TCP, **UDP** & **RTP** are standard protocols used in video conferencing. The content is identified with the use of header which is configured into packets. These protocols are used based on reliable, non-reliable communication type.

TCP is a reliable protocol ingenuous for transmitting alphanumeric type data. It is self-correcting in nature. The delay in this protocol is high but it guarantees error free and sequenced transmission.

User Datagram Protocol **(UDP)** within the IP stack, is an unreliable protocol. It has higher speed than TCP.

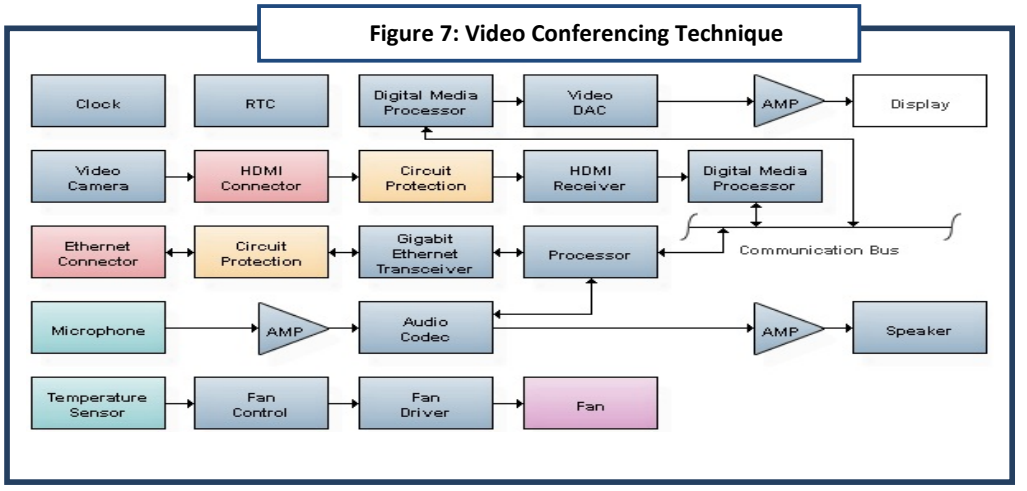
Real-Time Protocol **(RTP)** was designed to handle streaming video and audio. It uses IP Multicast. The sequence number and time-stamp is added in the packet

header, **RTP** can be said as derivative of **UDP**. **RTP** is controlled by real-time control Protocol **(RTCP)**.

Multimedia interactive applications on internet:

- **Generating Content in Real Time** Multimedia technologies are used to create 3D content in real time. The program content is projected into space when sensors are activated.
- **3D Printing**3D printing is done using multimedia applications.
- **Social Media** People use multimedia application to make their significant presence.
- **Fine arts and Entertainment** Multimedia is used to make special effects and animations over internet. Video conferencing techniques are shown in Figure 7.

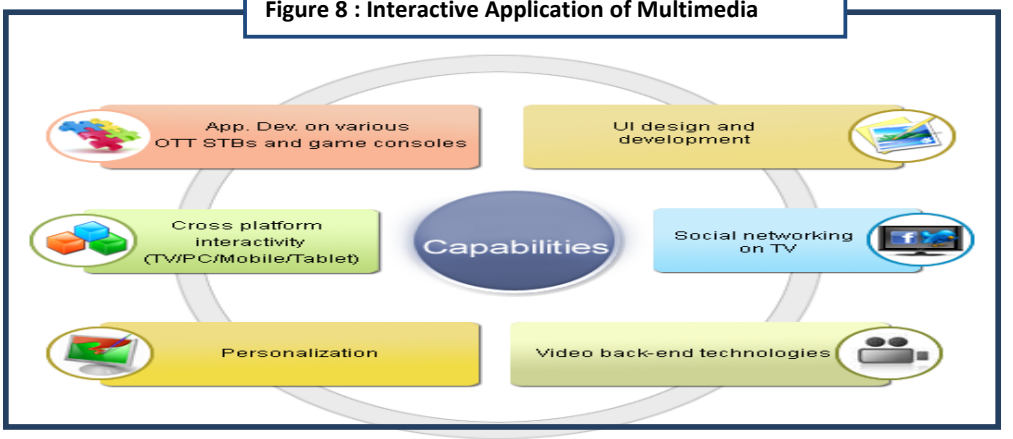
Figure 7: Video Conferencing Technique



Source:https://www.electronicproducts.com/Digital_ICs/Video_Graphics_Audio/Video_conferencing_system_block_diagram.aspx

The Figure 8 shows the interactive application of multimedia.

Figure 8 : Interactive Application of Multimedia



Source: https://www.xoriant.com/interactive-multimedia-applications-development

6.6 FUTURE DIRECTION

- The data on internet is growing very fast, the next generation multimedia technologies should be space efficient.
- The multimedia technologies can be used in many fields in future, if the intelligent decision features are included.
- The functionality like low effort, high re-usability is important to maintain for complex application like natural language processing, computer vision, etc.
- Refinements are necessarily to be made in order to reduce time and to improve the quality of multimedia objects.
- Multimedia system's hardware developments.
- Distributed environments and networking compatible multimedia development.

A case Study on **MULTIMEDIA SYSTEM DESIGN & DEVELOPMENT (in words of author…..)**

Multimedia means the use of electronic media to store and experience multimedia content. It also represents the computer information through audio, graphics, image, video and animation in addition to traditional media (text and graphics). The application of multimedia can be found in various spheres of life including but not limited to Education, Advertisement, Art, Entertainment, Engineering, Medicine, Business, Video Conferencing and Residential Services. Multimedia integrates different media. Activities have been planned regarding the various multimedia lessons to find out how combinations of text, graphics, and sound can increase student motivation and promote subject mastery. Activities have been planned to nurture this domain in all aspects. The detailed discussions of relevant technology, suggestions for lesson plans, and exercises for mastery are all provided here, as well as an extensive catalog of resources and list of search tools and Internet sites. The list of planned activities with their description has been done and mentioned below in order to escalate the bounds of this domain and reach to a height which can gain a good recognition in the sphere of multimedia domain.

1. Idea presentation, that helps the student express out their views about this domain and help them to come up with unique ideas.
2. Icon design contest, which helps them think constructively to design an action/verb into a single picture.
3. Story making contest, which will make the students to first understand the content, select and justify appropriate images that best represent the content and sequence them in a logical order. It allows them to apply higher order thinking skills.
4. Learn animation, which will help students to explore and explain whatever their mind can conceive. This will make it the most versatile and explicit means of

communication which is devised for quick mass appreciation".

5. Creating educational clipart, which will help them learn about how to create clipart for a specific subject.

6. Podcasting, which will allow them to share their work and experiences with a potentially huge audience over the Internet. It is useful for developing literacy skills (writing scripts, setting up interviews, etc), allows students to develop and practice their speaking and listening skills, and they also learn some ICT skills. Podcasts can be interactive, and the audience can be invited to send their comments, giving valuable feedback to the students about their work.

7. Create postcards, which can make them aware of how a problem definition can be portrayed as a poster. This will inculcate in them innovative design thought process and enhance the visualization skills of the students. This will help them prepare for poster competition for various research conferences conducted under state or national level.

8. Research Paper Publication, will help the students to write a research paper on the innovative ideas that they have presented during the Idea presentation on multimedia system design and development, and to publish the paper in reputed journals.

9. Game builder idea, will make the students come with the idea of a game (Educational, Entertainment, Action, Adventure, Simulation, Puzzle, etc.) and create it according to the specifications defined.

10. Build a project or a user interface application. Students can make a project or a user interface application based on the above learned skills. Also, make a project which is in the form a solution to a realistic problem or a simulation model for a new idea. This will help the students to get motivated and become determined to elevate this domain in all respects and flourish this domain by working with complete dedication to make a mark for them and gain recognition at a greater level.

Source:https://tcetmumbai.in/CMPN/Case%20Studies/Multimedia-Case%20Study.pdf

LESSON-END ACTIVITIES

- Identify a network of your own choice and find the protocols installed in the computer.
- Using the internet search engine list the different network standards available and differentiate their features.

MODEL ANSWERS TO "CHECK YOUR PROGRESS"

Check your Progress 1 The protocol layers are

- Physical Layer
- Data Link Layer
- Network Layer
- Transport Layer
- Session Layer
- Presentation Layer
- Application Layer

Check your Progress2 FDDI Architect includes the following:

- PHYsical Layer Protocol (PHY)
- Physical Layer Medium-Dependent (PMD)
- Station Management (SMT)
- Media Access Control (MAC)

MCQ

1. Media player uses URL in metafile to access media server to
   A. download file
   B. Upload file
   C. Stored The File
   D. Stream file
2. Primary Colors for Color TV are
   A. Blue, White, Black
   B. Red, Green, Yellow
   C. Red, Green, Black
   D. Red, Green, Blue
3. In Real Time Interactive Audio Video, mixing means combining several streams of traffic into
   A. 1 Stream
   B. 2 Stream
   C. 3 Stream
   D. 4 Stream

4. Live streaming is still using Transmission Control Protocol (TCP), and multiple unicasting instead of
   A. Unicasting
   B. Multicasting
   C. Layered Control
   D. Protocol Control
5. Real-time traffic needs support of
   A. Unicasting
   B. Multicasting
   C. Layered Control
   D. Protocol Control
6. HTTP client accesses Web server by using the
   A. SEND message
   B. GET message
   C. AUTO receive message
   D. None
7. To join the internet, the computer has to be connected to a
   A. internet architecture board
   B. internet society
   C. internet service provider
   D. none of the mentioned

1. A 2. D 3.A 4. B 5. B 6. B 7. C

Terminal questions

Q1. What are the layers of the OSI reference model?

Q2. What is a LAN?

Q3. What are routers?

Q4. What is token ring?

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