Structure

1.1 Introduction

1.2 Categories of Multimedia

1.3 Applications of Multimedia

1.4 Stages of Multimedia Application Development

1.5 Delivering methods of Multimedia Contents.

Learning Objectives

In this lesson we will learn the preliminary concepts of Multimedia. We will discuss the various benefits and applications of multimedia. After going through this chapter the reader will be able to:

(i) Define multimedia

(ii) List the elements of multimedia

(iii) Enumerate the different applications of multimedia

(iv) Describe the different stages of multimedia software development
1.1 Introduction

Multimedia has become an inevitable part of any presentation. It has found a variety of applications right from entertainment to education. The evolution of internet has also increased the demand for multimedia content.

Multimedia is the media that uses multiple forms of information content and information processing (e.g. text, audio, graphics, animation, video, interactivity) to inform or entertain the user. Multimedia also refers to the use of electronic media to store and experience multimedia content. Multimedia is similar to traditional mixed media in fine art, but with a broader scope. The term “rich media” is synonymous for interactive multimedia.

Multimedia elements

- Text
- Graphics
- Audio
- Video
- Animation
- Interactivity

1.2 Categories of Multimedia

Multimedia may be broadly divided into linear and non-linear categories. Linear active content progresses without any navigation control for the viewer such as a cinema presentation. Non-linear content offers user interactivity to control progress as used with a computer game or used in self-paced computer based training. Non-linear content is also known as hypermedia content.

Multimedia presentations can be live or recorded. A recorded presentation may allow interactivity via a navigation system. A live multimedia presentation may allow interactivity via interaction with the presenter or performer.

1.2.1 Features of Multimedia

Multimedia presentations may be viewed in person on stage, projected, transmitted, or played locally with a media player. A broadcast may be a live or recorded multimedia presentation. Broadcasts and recordings can be either analog or digital electronic media technology. Digital online multimedia may be downloaded or streamed. Streaming multimedia may be live or on-demand.
Multimedia games and simulations may be used in a physical environment with special effects, with multiple users in an online network, or locally with an offline computer, game system, or simulator.

Enhanced levels of interactivity are made possible by combining multiple forms of media content. But depending on what multimedia content you have, it may vary. Online multimedia is increasingly becoming object-oriented and data-driven, enabling applications with collaborative end-user innovation and personalization on multiple forms of content over time. Examples of these range from multiple forms of content on websites like photo galleries with both images (pictures) and title (text) user-updated, to simulations whose coefficients, events, illustrations, animations, or videos are modifiable, allowing the multimedia "experience" to be altered without reprogramming.

1.3 Application of Multimedia

Multimedia finds its application in various areas including, but not limited to, advertisements, art, education, entertainment, engineering, medicine, mathematics, business, scientific research and spatial, temporal applications. A few application areas of multimedia are listed below:

1.3.1 Creative Industries

Creative industries use multimedia for a variety of purposes ranging from fine arts, to entertainment, to commercial art, to journalism, to media and software services provided for any of the industries listed below. An individual multimedia designer may cover the spectrum throughout their career. Request for their skills range from technical, to analytical, and to creative.

1.3.2 Commercial

Much of the electronic old and new media utilized by commercial artists is multimedia. Exciting presentations are used to grab and keep attention in advertising. Industrial, business to business, and interoffice communications are often developed by creative services firms for advanced multimedia presentations beyond simple slide shows to sell ideas or liven-up training. Commercial multimedia developers may be hired to design for governmental services and nonprofit services applications as well.

1.3.3 Entertainment and Fine Arts

In addition, multimedia is heavily used in the entertainment industry, especially to develop special effects in movies and animations. Multimedia games are a popular pastime and are software programs available either as CD-ROMs or
online. Some video games also use multimedia features. Multimedia applications that allow users to actively participate instead of just sitting by as passive recipients of information are called *Interactive Multimedia*.

### 1.3.4 Education

In Education, multimedia is used to produce computer-based training courses (popularly called CBTs) and reference books like encyclopedia and almanacs. A CBT lets the user go through a series of presentations, text about a particular topic, and associated illustrations in various information formats.

Edutainment is an informal term used to describe combining education with entertainment, especially multimedia entertainment.

### 1.3.5 Engineering

Software engineers may use multimedia in Computer Simulations for anything from entertainment to training such as military or industrial training. Multimedia for software interfaces are often done as collaboration between creative professionals and software engineers.

### 1.3.6 Industry

In the Industrial sector, multimedia is used as a way to help present information to shareholders, superiors and coworkers. Multimedia is also helpful for providing employee training, advertising and selling products all over the world via virtually unlimited web-based technologies.

### 1.3.7 Mathematical & Scientific Research

In Mathematical and Scientific Research, multimedia is mainly used for modeling and simulation. For example, a scientist can look at a molecular model of a particular substance and manipulate it to arrive at a new substance. Representative research can be found in journals such as the Journal of Multimedia.

### 1.3.8 Medicine

In Medicine, doctors can get trained by looking at a virtual surgery or they can simulate how the human body is affected by diseases spread by viruses and bacteria and then develop techniques to prevent it.

### 1.3.9 Multimedia in Public Places

In hotels, railway stations, shopping malls, museums, and grocery stores, multimedia will become available at stand-alone terminals or kiosks to provide information and help. Such installation reduce demand on traditional information
booths and personnel, add value, and they can work around the clock, even in
the middle of the night, when live help is off duty.

A menu screen from a supermarket kiosk that provide services ranging
from meal planning to coupons. Hotel kiosk list nearby restaurant, maps of the
city, airline schedules, and provide guest services such as automated checkout.
Printers are often attached so users can walk away with a printed copy of the
information. Museum kiosk are not only used to guide patrons through the exhibits,
but when installed at each exhibit, provide great added depth, allowing visitors
to browser though richly detailed information specific to that display.

(Virtual Reality)

At the convergence of technology and creative invention in multimedia is
virtual reality, or VR. Goggles, helmets, special gloves, and bizarre human
interfaces attempt to place you “inside” a lifelike experience. Take a step forward,
and the view gets closer, turn your head, and the view rotates. Reach out and
grab an object; your hand moves in front of you. Maybe the object explodes in
a 90-decibel crescendo as you wrap your fingers around it. Or it slips out from
your grip, falls to the floor, and hurriedly escapes through a mouse hole at the
bottom of the wall.

VR requires terrific computing horsepower to be realistic. In VR, your
cyberspace is made up of many thousands of geometric objects plotted in three-
dimensional space: the more objects and the more points that describe the objects,
the higher resolution and the more realistic your view. As the user moves about,
each motion or action requires the computer to recalculate the position, angle
size, and shape of all the objects that make up your view, and many thousands
of computations must occur as fast as 30 times per second to seem smooth.

On the World Wide Web, standards for transmitting virtual reality worlds
or “scenes” in VRML (Virtual Reality Modeling Language) documents (with the
file name extension .wrl) have been developed.

Using high-speed dedicated computers, multi-million-dollar flight simulators
built by singer, RediFusion, and others have led the way in commercial application
of VR. Pilots of F-16s, Boeing 777s, and Rockwell space shuttles have made
many dry runs before doing the real thing. At the California Maritime academy
and other merchant marine officer training schools, computer-controlled simulators
teach the intricate loading and unloading of oil tankers and container ships.

Specialized public game arcades have been built recently to offer VR combat
and flying experiences for a price. From virtual World Entertainment in walnut
Greek, California, and Chicago, for example, BattleTech is a ten-minute interactive video encounter with hostile robots. You compete against others, perhaps your friends, who share coaches in the same containment Bay. The computer keeps score in a fast and sweaty firefight. Similar “attractions” will bring VR to the public, particularly a youthful public, with increasing presence during the 1990s.

The technology and methods for working with three-dimensional images and for animating them are discussed. VR is an extension of multimedia—it uses the basic multimedia elements of imagery, sound, and animation. Because it requires instrumented feedback from a wired-up person, VR is perhaps interactive multimedia at its fullest extension.

### 1.4 Stages of Multimedia Application Development

A Multimedia application is developed in stages as all other software are being developed. In multimedia application development a few stages have to complete before other stages being, and some stages may be skipped or combined with other stages. Following are the four basic stages of multimedia project development:

1. **Planning and Costing**: This stage of multimedia application is the first stage which begins with an idea or need. This idea can be further refined by outlining its messages and objectives. Before starting to develop the multimedia project, it is necessary to plan what writing skills, graphic art, music, video and other multimedia expertise will be required.

   It is also necessary to estimate the time needed to prepare all elements of multimedia and prepare a budget accordingly. After preparing a budget, a prototype or proof of concept can be developed.

2. **Designing and Producing**: The next stage is to execute each of the planned tasks and create a finished product.

3. **Testing**: Testing a project ensure the product to be free from bugs. Apart from bug elimination another aspect of testing is to ensure that the multimedia application meets the objectives of the project. It is also necessary to test whether the multimedia project works properly on the intended deliver platforms and they meet the needs of the clients.

4. **Delivering**: The final stage of the multimedia application development is to pack the project and deliver the completed project to the end user. This stage has several steps such as implementation, maintenance, shipping and marketing the product.
### 1.5 Delivering Methods of Multimedia Content

#### (a) CD-ROM

A **Compact Disc** or **CD** is an optical disc used to store digital data, originally developed for storing digital audio. The CD, available on the market since late 1982,

remains the standard playback medium for commercial audio recordings to the present day, though it has lost ground in recent years to MP3 players.

An audio CD consists of one or more stereo tracks stored using 16-bit PCM coding at a sampling rate of 44.1 kHz. Standard CDs have a diameter of 120 mm and can hold approximately 80 minutes of audio. There are also 80 mm discs, sometimes used for

CD singles, which hold approximately 20 minutes of audio. The technology was later adapted for use as a data storage device, known as a CD-ROM, and to include recordonce and re-writable media (CD-R and CD-RW respectively). CD-ROMs and CD-Rs remain widely used technologies in the computer industry as of 2007. The CD and its extensions have been extremely successful: in 2004, the worldwide sales of CD audio, CD-ROM, and CD-R reached about 30 billion discs. By 2007, 200 billion CDs had been sold worldwide.

#### (b) DVD

**DVD** (also known as “**Digital Versatile Disc**” or “**Digital Video Disc**”) is a popular optical disc storage media format. Its main uses are video and data storage. Most DVDs are of the same dimensions as compact discs (CDs) but store more than 6 times the data. Variations of the term DVD often describe the way data is stored on the discs:

DVD-ROM has data which can only be read and not written, DVD-R can be written once and then functions as a DVD-ROM, and DVD-RAM or DVD-RW holds data that can be re-written multiple times.

DVD-Video and DVD-Audio discs respectively refer to properly formatted and structured video and audio content. Other types of DVD discs, including those with video content, may be referred to as DVD-Data discs. The term “DVD” is commonly misused to refer to high density optical disc formats in general, such as Blu-ray and HD DVD.

“DVD” was originally used as an initialism for the unofficial term “digital video disc”. It was reported in 1995, at the time of the specification finalization,
that the letters officially stood for “digital versatile disc” (due to non-video applications), however, the text of the press release announcing the specification finalization only refers to the technology as “DVD”, making no mention of what (if anything) the letters stood for. Usage in the present day varies, with “DVD”, “Digital Video Disc”, and “Digital Versatile Disc” all being common.

(c) About Flash Drives

A USB flash drive is a data storage device that includes flash memory with an integrated Universal Serial Bus (USB) interface. USB flash drives are typically removable and rewritable, and physically much smaller than a floppy disk. Most weigh less than 30 g. As of January 2012 drives of 1 terabytes (TB) are available, and storage capacities as large as 2 terabytes are planned, with steady improvements in size and price per capacity expected. Some allow up to 100,000 write/erase cycles (depending on the exact type of memory chip used) and 10 years shelf storage time.

USB flash drives are often used for the same purposes for which floppy disks or CD-ROMs were used. They are smaller, faster, have thousands of times more capacity, and are more durable and reliable because they have no moving parts. Until approximately 2005, most desktop and laptop computers were supplied with floppy disk drives, but floppy disk drives have been abandoned in favor of USB ports.

USB flash drives use the USB mass storage standard, supported natively by modern operating systems such as Linux, Mac OS X, Windows, and other Unix-like systems, as well as many BIOS boot ROMs. USB drives with USB 2.0 support can store more data and transfer faster than much larger optical disc drives like CD-RW or DVD-RW drives and can be read by many other systems such as the Xbox 360, PlayStation 3, DVD players and in some upcoming mobile smart phones.

(d) About Internet

The Internet is a global system of interconnected computer networks that use the standard Internet protocol suite (TCP/IP) to serve billions of users worldwide. It is a network of networks that consists of millions of private, public, academic, business, and government networks, of local to global scope, that are linked by a broad array of electronic, wireless and optical networking technologies. The Internet carries an extensive range of information resources and services, such as the inter-linked hypertext documents of the World Wide Web (WWW) and the infrastructure to support email.
Short Answer Type Questions

1. Define categories of Multimedia.
2. List out the features of Multimedia.
3. List out the stages of Multimedia application development.
4. Explain about Internet.

Long Answer Type Questions

1. Explain different applications of Multimedia.
2. Explain delivering methods of Multimedia content.
Learning Objectives

In this lesson we will learn the different multimedia building blocks. Later we will learn the significant features of text.

(i) At the end of the lesson you will be able to

(ii) List the different multimedia building blocks

(iii) Enumerate the importance of text

(iv) List the features of different font editing and designing tools

2.1 Introduction

All multimedia content consists of texts in some form. Even a menu text is accompanied by a single action such as mouse click, keystroke or finger pressed.
in the monitor (in case of a touch screen). The text in the multimedia is used to communicate information to the user. Proper use of text and words in multimedia presentation will help the content developer to communicate the idea and message to the user.

### 2.2 Multimedia Building Blocks

Any multimedia application consists any or all of the following components:

1. **Text:** Text and symbols are very important for communication in any medium. With the recent explosion of the Internet and World Wide Web, text has become more the important than ever. Web is HTML (Hyper text Markup language) originally designed to display simple text documents on computer screens, with occasional graphic images thrown in as illustrations.

2. **Audio:** Sound is perhaps the most element of multimedia. It can provide the listening pleasure of music, the startling accent of special effects or the ambience of a mood-setting background.

3. **Images:** Images whether represented analog or digital plays a vital role in a multimedia. It is expressed in the form of still picture, painting or a photograph taken through a digital camera.

4. **Animation:** Animation is the rapid display of a sequence of images of 2D artwork or model positions in order to create an illusion of movement. It is an optical illusion of motion due to the phenomenon of persistence of vision, and can be created and demonstrated in a number of ways.

5. **Video:** Digital video has supplanted analog video as the method of choice for making video for multimedia use. Video in multimedia are used to portray real time moving pictures in a multimedia project.

### Text in Multimedia

Words and symbols in any form, spoken or written, are the most common system of communication. They deliver the most widely understood meaning to the greatest number of people. Most academic related text such as journals, e-magazines are available in the Web Browser readable form.

### 2.3 About Fonts and Faces

A typeface is family of graphic characters that usually includes many type sizes and styles. A font is a collection of characters of a single size and style belonging to a particular typeface family. Typical font styles are bold face and italic. Other style attributes such as underlining and outlining of characters, may be added at the users choice.
The size of a text is usually measured in points. One point is approximately 1/72 of an inch i.e. 0.0138. The size of a font does not exactly describe the height or width of its characters. This is because the x-height (the height of lower case character x) of two fonts may differ. Typefaces of fonts can be described in many ways, but the most common characterization of a typeface is serif and sans serif. The serif is the little decoration at the end of a letter stroke. Times, Times New Roman, Bookman are some fonts which comes under serif category. Arial, Optima, Verdana are some examples of sans serif font. Serif fonts are generally used for body of the text for better readability and sans serif fonts are generally used for headings. The following fonts shows a few categories of serif and sans serif fonts.

(F) (F)
(Serif Font) (Sans serif font)

Selecting Text fonts

It is a very difficult process to choose the fonts to be used in a multimedia presentation. Following are a few guidelines which help to choose a font in a multimedia presentation.

- As many number of typefaces can be used in a single presentation, this concept of using many fonts in a single page is called ransom-note topography.
- For small type, it is advisable to use the most legible font.
- In large size headlines, the kerning (spacing between the letters) can be adjusted.
- In text blocks, the leading for the most pleasing line can be adjusted.
- Drop caps and initial caps can be used to accent the words.
- The different effects and colors of a font can be chosen in order to make the text look in a distinct manner.
- Anti aliased can be used to make a text look gentle and blended.
- For special attention to the text the words can be wrapped onto a sphere or bent like a wave.
- Meaningful words and phrases can be used for links and menu items.
In case of text links (anchors) on web pages the messages can be accented.

The most important text in a web page such as menu can be put in the top 320 pixels.

### 2.4 Computers and Text

#### 2.4.1 Fonts

Postscript fonts are a method of describing an image in terms of mathematical constructs (Bezier curves), so it is used not only to describe the individual characters of a font but also to describe illustrations and whole pages of text. Since postscript makes use of mathematical formula, it can be easily scaled bigger or smaller. Apple and Microsoft announced a joint effort to develop a better and faster quadratic curves outline font methodology, called **truetype**. In addition to printing smooth characters on printers, TrueType would draw characters to a low resolution (72 dpi or 96 dpi) monitor.

#### 2.4.2 Character Set and Alphabets

**i) ASCII Character set**

The American standard code for information interchange (SCII) is the 7 bit character coding system most commonly used by computer systems in the United States and abroad. ASCII assigns a number of value to 128 characters, including both lower and uppercase letters, punctuation marks, Arabic numbers and math symbols. 32 control characters are also included. These control characters are used for device control messages, such as carriage return, line feed, tab and form feed.

**ii) The Extended Character set**

A byte which consists of 8 bits is the most commonly used building block for computer processing. ASCII uses only 7 bits to code is 128 characters; the 8th bit of the byte is unused. This extra bit allows another 128 characters to be encoded before the byte is used up, and computer systems today use these extra 128 values for an extended character set. The extended character set is commonly filled with ANSI (American National Standards Institute) standard characters, including frequently used symbols.

**iii) Unicode**

Unicode makes use of 16-bit architecture for multilingual text and character encoding. Unicode uses about 65,000 characters from all known languages and alphabets in the world. Several languages share a set of symbols that have a
historically related derivation, the shared symbols of each language are unified into collections of symbols (Called scripts). A single script can work for tens or even hundreds of languages. Microsoft, Apple, Sun, Netscape, IBM, Xerox and Novell are participating in the development of this standard and Microsoft and Apple have incorporated Unicode into their operating system.

2.5 Font Editing and Design Tools

There are several software that can be used to create customized font. These tools help an multimedia developer to communicate his idea or the graphic feeling. Using these software different typefaces can be created.

In some multimedia projects it may be required to create special characters. Using the font editing tools it is possible to create a special symbols and use it in the entire text. Following is the list of software that can be used for editing and creating fonts:

- Fontographer
- Fontmonger
- Cool 3D text

Special font editing tools can be used to make your own type so you can communicate an idea or graphic feeling exactly. With these tools professional typographers create distinct text and display faces.

1. Fontographer

It is macromedia product; it is a specialized graphics editor for both Macintosh and Windows platforms. You can use it to create postscript, true type and bitmapped fonts for Macintosh and Windows.

2. Making Pretty Text

To make your text look pretty you need a toolbox full of fonts and special graphics applications that can stretch, shade, color and anti-alias your words into real artwork. Pretty text can be found in bitmapped drawings where characters have been tweaked, manipulated and blended into a graphic image.

3. Hypermedia and Hypertext

Multimedia is the combination of text, graphic, and audio elements into a single collection or presentation – becomes interactive multimedia when you give the user some control over what information is viewed and when it is viewed.

When a hypermedia project includes large amounts of text or symbolic content, this content can be indexed and its element then linked together to
afford rapid electronic retrieval of the associated information. When text is stored in a computer instead of on printed pages the computer’s powerful processing capabilities can be applied to make the text more accessible and meaningful. This text can be called as hypertext.

4. **Hypermedia Structures**

Two Buzzwords used often in hypertext are link and node. Links are connections between the conceptual elements, that is, the nodes that may consists of text, graphics, sounds or related information in the knowledge base.

5. **Searching for words**

Following are typical methods for a word searching in hypermedia systems: Categories, Word Relationships, Adjacency, Alternates, Association, Negation, Truncation, Intermediate words, Frequency.

**Summary**

In this lesson we have learnt the following

(i) The multimedia building blocks such as text, audio, video, images, animation.

(ii) The importance of text in multimedia.

(iii) The difference between fonts and typefaces.

(iv) Character sets used in computers and their significance.

(v) The font editing software which can be used for creating new fonts and the features of such software.

**Short Answer Type Questions**

1. List out the Multimedia Building Blocks.

2. What is ASCII Character set.

3. What is hypermedia and hypertext.

4. What is hypermedia structures

**Long Answer Type Questions**

1. Explain about fonts and faces

2. Explain about fonts and character sets.

3. Explain about font editing and design tools.
Structure

3.1 Introduction
3.2 Digital Image
3.3 Making Still image
3.4 Colors
3.5 Image File format
3.6 Summary

Learning Objectives

In this lesson we will learn how images are captured and incorporated into a multimedia presentation. Different image file formats and the different color representations have been discussed in this lesson.

At the end of this lesson the learner will be able to

(i) Create his own image
(ii) Describe the use of colors and palettes in multimedia
(iii) Describe the capabilities and limitations of vector images.
(iv) Use clip arts in the multimedia presentations
3.1 Introduction

Still images are the important element of a multimedia project or a web site. In order to make a multimedia presentation look elegant and complete, it is necessary to spend ample amount of time to design the graphics and the layouts. Competent, computer literate skills in graphic art and design are vital to the success of a multimedia project.

3.2 Digital Image

A digital image is represented by a matrix of numeric values each representing a quantized intensity value. When \( I \) is a two-dimensional matrix, then \( I(r,c) \) is the intensity value at the position corresponding to row \( r \) and column \( c \) of the matrix.

The points at which an image is sampled are known as picture elements, commonly abbreviated as pixels. The pixel values of intensity images are called gray scale levels (we encode here the “color” of the image). The intensity at each pixel is represented by an integer and is determined from the continuous image by averaging over a small neighborhood around the pixel location. If there are just two intensity values, for example, black, and white, they are represented by the numbers 0 and 1; such images are called binary-valued images. If 8-bit integers are used to store each pixel value, the gray levels range from 0 (black) to 255 (white).

3.2.1 Digital Image Format

There are different kinds of image formats in the literature. We shall consider the image format that comes out of an image frame grabber, i.e., the captured image format, and the format when images are stored, i.e., the stored image format.

3.2.2 Captured Image Format

The image format is specified by two main parameters: spatial resolution, which is specified as pixels x pixels (e.g., 640x480) and color encoding, which is specified by bits per pixel. Both parameter values depend on hardware and software for input/output of images.

3.2.3 Stored Image Format

When we store an image, we are storing a two-dimensional array of values, in which each value represents the data associated with a pixel in the image. For a bitmap, this value is a binary digit.
3.2.4 Bitmaps

A bitmap is a simple information matrix describing the individual dots that are the smallest elements of resolution on a computer screen or other display or printing device. A one-dimensional matrix is required for monochrome (black and white); greater depth (more bits of information) is required to describe more than 16 million colors the picture elements may have, as illustrated in following figure. The state of all the pixels on a computer screen make up the image seen by the viewer, whether in combinations of black and white or colored pixels in a line of text, a photograph-like picture, or a simple background pattern.

Where do bitmap come from? How are they made?

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

Once made, a bitmap can be copied, altered, e-mailed, and otherwise used in many creative ways.

3.2.5 Clip Art

A clip art collection may contain a random assortment of images, or it may contain a series of graphics, photographs, sound, and video related to a single topic. For example, Corel, Micrografx, and Fractal Design bundle extensive clip art collection with their image-editing software.

3.2.6 Multiple Monitors

When developing multimedia, it is helpful to have more than one monitor, or a single high-resolution monitor with lots of screen real estate, hooked up to your computer. In this way, you can display the full-screen working area of your project or presentation and still have space to put your tools and other menus. This is particularly important in an authoring system such as Macromedia Director, where the edits and changes you make in one window are immediately visible in the presentation window—provided the presentation window is not obscured by your editing tools.
3.3 Making Still Images

Still images may be small or large, or even full screen. Whatever their form, still images are generated by the computer in two ways: as *bitmap* (or paint graphics) and as *vector-drawn* (or just plain drawn) graphics.

Bitmaps are used for photo-realistic images and for complex drawing requiring fine detail. Vector-drawn objects are used for lines, boxes, circles, polygons, and other graphic shapes that can be mathematically expressed in angles, coordinates, and distances. A drawn object can be filled with color and patterns, and you can select it as a single object. Typically, image files are compressed to save memory and disk space; many image formats already use compression within the file itself—for example, GIF, JPEG, and PNG. Still images may be the most important element of your multimedia project. If you are designing multimedia by yourself, put yourself in the role of graphic artist and layout designer.

3.3.1 Bitmap Software

The abilities and feature of image-editing programs for both the Macintosh and Windows range from simple to complex. The Macintosh does not ship with a painting tool, and Windows provides only the rudimentary Paint (see following figure), so you will need to acquire this very important software separately—often bitmap editing or *painting* programs come as part of a bundle when you purchase your computer, monitor, or scanner.

3.3.2 Capturing and Editing Images

The image that is seen on a computer monitor is digital bitmap stored in video memory, updated about every 1/60 second or faster, depending upon monitor’s scan rate. When the images are assembled for multimedia project, it may often be needed to capture and store an image directly from screen. It is possible to use the *Prt Scr* key available in the keyboard to capture a image.

3.3.3 Scanning Images

After scanning through countless clip art collections, if it is not possible to find the unusual background you want for a screen about gardening. Sometimes when you search for something too hard, you don’t realize that it’s right in front of your face. Open the scan in an image-editing program and experiment with different filters, the contrast, and various special effects. Be creative, and don’t be afraid to try strange combinations—sometimes mistakes yield the most intriguing results.
3.3.4 Vector Drawing

Most multimedia authoring systems provide for use of vector-drawn objects such as lines, rectangles, ovals, polygons, and text.

Computer-aided design (CAD) programs have traditionally used vector-drawn object systems for creating the highly complex and geometric rendering needed by architects and engineers.

Graphic artists designing for print media use vector-drawn objects because the same mathematics that put a rectangle on your screen can also place that rectangle on paper without jaggies. This requires the higher resolution of the printer, using a page description language such as PostScript.

Programs for 3-D animation also use vector-drawn graphics. For example, the various changes of position, rotation, and shading of light required to spin the extruded.

**How Vector Drawing Works**

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

```
RECT 0,0,200,200
```

3.4 Color

Color is a vital component of multimedia. Management of color is both a subjective and a technical exercise. Picking the right colors and combinations of colors for your project can involve many tries until you feel the result is right.

3.4.1 Understanding Natural Light and Color

The letters of the mnemonic **ROY G. BIV**, learned by many of us to remember the colors of the rainbow, are the ascending frequencies of the visible light spectrum: red, orange, yellow, green, blue, indigo, and violet. Ultraviolet light, on the other hand, is beyond the higher end of the visible spectrum and can be damaging to humans.

The color white is a noisy mixture of all the color frequencies in the visible spectrum. The cornea of the eye acts as a lens to focus light rays onto the retina. The light rays stimulate many thousands of specialized nerves called *rods* and
cones that cover the surface of the retina. The eye can differentiate among millions of colors, or hues, consisting of combination of red, green, and blue.

3.4.2 Additive Color

In additive color model, a color is created by combining colored light sources in three primary colors: red, green and blue (RGB). This is the process used for a TV or computer monitor.

3.4.3 Subtractive Color

In subtractive color method, a new color is created by combining colored media such as paints or ink that absorb (or subtract) some parts of the color spectrum of light and reflect the others back to the eye. Subtractive color is the process used to create color in printing. The printed page is made up of tiny halftone dots of three primary colors, cyan, magenta and yellow (CMY).

3.5 Image File Formats

There are many file formats used to store bitmaps and vectored drawing. Following is a list of few image file formats.

<table>
<thead>
<tr>
<th>Format Extension</th>
<th>Format Extension</th>
</tr>
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<tbody>
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3.6 Summary

In this lesson the following points have been discussed.

- Competent, computer literate skills in graphic art and design are vital to the success of a multimedia project.

- A digital image is represented by a matrix of numeric values each representing a quantized intensity value.
A bitmap is a simple information matrix describing the individual dots that are the smallest elements of resolution on a computer screen or other display or printing device.

In additive color model, a color is created by combining colored lights sources in three primary colors: red, green and blue (RGB).

Subtractive colors are used in printers and additive color concepts are used in monitors and television.

**Short Answer Type Questions**

1. What is Bitmap.
2. What is Clip art.
3. Define scanning images.
4. List out the different image formats.

**Long Answer Type Questions**

1. Explain digital images.
2. Explain about making still images.
3. Explain about colors.
Learning Objectives

In this lesson we will learn the basics of Audio. We will learn how a digital audio is prepared and embedded in a multimedia system.

At the end of the chapter the learner will be able to:

(i) Distinguish audio and sound

(ii) Prepare audio required for a multimedia system
(iii) The learner will be able to list the different audio editing softwares.

(iv) List the different audio file formats

4.1 Introduction

Sound is perhaps the most important element of multimedia. It is meaningful “speech” in any language, from a whisper to a scream. It can provide the listening pleasure of music, the startling accent of special effects or the ambience of a moodsetting background. Sound is the terminology used in the analog form, and the digitized form of sound is called as audio.

4.2 Power of Sound

When something vibrates in the air it is moving back and forth it creates wave of pressure. These waves spread like ripples from pebble tossed into a still pool and when it reaches the eardrums, 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 measurement is actually the ratio between a chosen reference point on a logarithmic scale and the level that is actually experienced.

4.2.1 Multimedia Sound Systems

The multimedia application user can use sound right off the bat on both the Macintosh and on a multimedia PC running Windows because beeps and warning sounds are available as soon as the operating system is installed. On the Macintosh you can choose one of the several sounds for the system alert. In Windows system sounds are WAV files and they reside in the windows\Media subdirectory. There are still more choices of audio if Microsoft Office is installed. Windows makes use of WAV files as the default file format for audio and Macintosh systems use SND as default file format for audio.

4.2.2 Digital Audio

Digital audio is created when a sound wave is converted into numbers – a process referred to as digitizing. It is possible to digitize sound from a microphone, a synthesizer, existing tape recordings, live radio and television broadcasts, and popular CDs. You can digitize sounds from a natural source or prerecorded. Digitized sound is sampled sound. Every nth fraction of a second, a sample of sound is taken and stored as digital information in bits and bytes. The quality of this digital recording depends upon how often the samples are taken.
4.2.3 Preparing Digital Audio Files

Preparing digital audio files is fairly straightforward. 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 the sampling rate determines the frequency at which samples will be drawn for the recording. Sampling at higher rates more accurately captures the high frequency content of your sound. Audio resolution determines the accuracy with which a sound can be digitized.

### 4.3 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.

### 4.4 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.

1. **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.
2. **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.

3. **Splicing and Assembly**: Using the same tools mentioned for trimming, you will probably want to remove the extraneous noises that inevitably creep into recording.

4. **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.

5. **Format Conversion**: In some cases your digital audio editing software might read a format different from that read by your presentation or authoring program.

6. **Resampling or downsampling**: If you have recorded and edited your sounds at 16 bit sampling rates but are using lower rates you must resample or downsample the file.

7. **Equalization**: Some programs offer digital equalization capabilities that allow you to modify a recording frequency content so that it sounds brighter or darker.

8. **Digital Signal Processing**: Some programs allow you to process the signal with reverberation, multitap delay, and other special effects using DSP routines.

9. **Reversing Sounds**: Another simple manipulation is to reverse all or a portion of a digital audio recording. Sounds can produce a surreal, other worldly effect when played backward.

10. **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.

### 4.5 Making MIDI Audio

MIDI (Musical Instrument Digital Interface) is a communication standard developed for electronic musical instruments and computers. MIDI files allow music and sound synthesizers from different manufacturers to communicate with each other by sending messages along cables connected to the devices. Creating your own original score can be one of the most creative and rewarding aspects of building a multimedia project, and MIDI (Musical Instrument Digital Interface) is the quickest, easiest and most flexible tool for this task.
The process of creating MIDI music is quite different from digitizing existing audio. To make MIDI scores, however, you will need sequencer software and a sound synthesizer.

The MIDI keyboard is also useful to simply the creation of musical scores. An advantage of structured data such as MIDI is the ease with which the music director can edit the data.

A MIDI file format is used in the following circumstances:

- Digital audio will not work due to memory constraints and more processing power requirements
- When there is high quality of MIDI source
- When there is no requirement for dialogue.
- A digital audio file format is preferred in the following circumstances:
  - When there is no control over the playback hardware
  - When the computing resources and the bandwidth requirements are high.
- When dialogue is required.

### 4.6 Audio File Formats

A file format determines the application that is to be used for opening a file.

Following is the list of different file formats and the software that can be used for opening a specific file.

1. *.AIF, *.SDII in Macintosh Systems
2. *.SND for Macintosh Systems
3. *.WAV for Windows Systems
4. MIDI files – used by north Macintosh and Windows
5. *.WMA – windows media player
6. *.MP3 – MP3 audio
7. *.RA – Real Player
8. *.VOC – VOC Sound
9. AIFF sound format for Macintosh sound files
10. *.OGG – Ogg Vorbis

4.7 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.

4.8 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:

- Sound recorder from Microsoft
- Apple’s QuickTime Player pro
- Sonic Foundry’s SoundForge for Windows
- Sound edit 16

4.9 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.
Short Answer Type Questions

1. What is Multimedia Audio system.
2. What is Digital Audio.
3. List out the different audio file formats.
5. How to determine the size of digital audio.

Long Answer Type Questions

1. Explain about power of sound.
2. Explain about making MIDI audio.
3. Explain about editing digital recordings.
Structure

5.1 Introduction
5.2 Principles of Animation
5.3 Animation Techniques
5.4 Cell Animation
5.5 Computer Animation
5.6 Kinematics
5.7 Morphing
5.8 Animation File Formats

Learning Objectives

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

(i) List the different animation techniques.
(ii) Enumerate the software used for animation.
(iii) List the different broadcasting standards.
5.1 Introduction

Animation makes static presentations come alive. It is visual change over time and can add great power to our multimedia projects. Carefully planned, well-executed video clips can make a dramatic difference in a multimedia project. Animation is created from drawn pictures and video is created using real time visuals.

5.2 Principles of Animation

Animation is the rapid display of a sequence of images of 2-D artwork or model positions in order to create an illusion of movement. It is an optical illusion of motion due to the phenomenon of persistence of vision, and can be created and demonstrated in a number of ways. The most common method of presenting animation is as a motion picture or video program, although several other forms of presenting animation also exist.

Animation is possible because of a biological phenomenon known as persistence of vision and a psychological phenomenon called phi. An object seen by the human eye remains chemically mapped on the eye’s retina for a brief time after viewing. Combined with the human mind’s need to conceptually complete a perceived action, this makes it possible for a series of images that are changed very slightly and very rapidly, one after the other, to seemingly blend together into a visual illusion of movement. The following shows a few cells or frames of a rotating logo. When the images are progressively and rapidly changed, the arrow of the compass is perceived to be spinning.

Television video builds entire frames or pictures every second; the speed with which each frame is replaced by the next one makes the images appear to blend smoothly into movement. To make an object travel across the screen while it changes its shape, just change the shape and also move or translate it a few pixels for each frame.

5.3 Animation Techniques

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

The term *cel* derives from the clear celluloid sheets that were used for drawing each frame, which have been replaced today by acetate or plastic. Cels of famous animated cartoons have become sought-after, suitable-for-framing collector's items.

Cel animation artwork begins with *keyframes* (the first and last frame of an action). For example, when an animated figure of a man walks across the screen, he balances the weight of his entire body on one foot and then the other in a series of falls and recoveries, with the opposite foot and leg catching up to support the body.

- The animation techniques made famous by Disney use a series of progressively different on each frame of movie film which plays at 24 frames per second.
- A minute of animation may thus require as many as 1,440 separate frames.
- The term *cel* derives from the clear celluloid sheets that were used for drawing each frame, which is been replaced today by acetate or plastic.
- Cel animation artwork begins with keyframes.

5.5 Computer Animation

Computer animation programs typically employ the same logic and procedural concepts as cel animation, using layer, keyframe, and tweening techniques, and even borrowing from the vocabulary of classic animators. On the computer, paint is most often filled or drawn with tools using features such as gradients and antialiasing. The word *links*, in computer animation terminology, usually means special methods for computing RGB pixel values, providing edge detection, and layering so that images can blend or otherwise mix their colors to produce special transparencies, inversions, and effects.

- Computer Animation is same as that of the logic and procedural concepts as cel animation and use the vocabulary of classic cel animation – terms such as layer, Keyframe, and tweening.
- The primary difference between the animation software program is in how much must be drawn by the animator and how much is automatically generated by the software.
In 2D animation the animator creates an object and describes a path for the object to follow. The software takes over, actually creating the animation on the fly as the program is being viewed by your user.

In 3D animation the animator puts his effort in creating the models of individual and designing the characteristic of their shapes and surfaces.

Paint is most often filled or drawn with tools using features such as gradients and anti-aliasing.

5.6 Kinematics

It is the study of the movement and motion of structures that have joints, such as a walking man.

Inverse Kinematics is in high-end 3D programs, it is the process by which you link objects such as hands to arms and define their relationships and limits.

Once those relationships are set you can drag these parts around and let the computer calculate the result.

5.7 Morphing

Morphing is popular effect in which one image transforms into another. Morphing application and other modeling tools that offer this effect can perform transition not only between still images but often between moving images as well.

The morphed images were built at a rate of 8 frames per second, with each transition taking a total of 4 seconds.

Some product that uses the morphing features are as follows

- Black Belt’s EasyMorph and WinImages,
- Human Software’s Squizz
- Valis Group’s Flo, MetaFlo, and MovieFlo.

5.8 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
• Animation Pro

**Short Answer Type Questions**

1. Define animation.
2. Define Kinematics.
3. Define morphing.
4. Define cel animation.

**Long Answer Type Questions**

1. Explain about principles of Animation.
2. Explain about animation techniques.
3. Explain about Computer animation.
Structure

6.1 Introduction
6.2 Video
6.3 Shooting and editing video
6.4 Recording Formats
6.5 Optimizing files for CD-Rom
6.6 Summary

Learning Objectives

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

(i) List the different video signals.
(ii) Various video compressions.
(iii) List the different broadcasting standards.
(iv) Describe the basics of video recording and how they relate to multimedia production.
(v) Have knowledge on different video formats.
6.1 Introduction

Carefully planned, well-executed video clips can make a dramatic difference in a multimedia project. Video is nothing but sequences of images captured by camcorder or any other video recording device of live actions.

6.2 Video

6.2.1 Analog versus Digital

Digital video has supplanted analog video as the method of choice for making video for multimedia use. While broadcast stations and professional production and postproduction houses remain greatly invested in analog video hardware (according to Sony, there are more than 350,000 Beta cam SP devices in use today), digital video gear produces excellent finished products at a fraction of the cost of analog. A digital camcorder directly connected to a computer workstation eliminates the image-degrading analog-to-digital conversion step typically performed by expensive video capture cards, and brings the power of nonlinear video editing and production to everyday users.

6.2.2 Broadcast Video Standards

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

6.2.3 NTSC

The United States, Japan, and many other countries use a system for broadcasting and displaying video that is based upon the specifications set forth by the 1952 National Television Standards Committee. These standards define a method for encoding information into the electronic signal that ultimately creates a television picture. As specified by the NTSC standard, a single frame of video is made up of 525 horizontal scan lines drawn onto the inside face of a phosphor-coated picture tube every 1/30th of a second by a fast-moving electron beam.

6.2.4 PAL

The Phase Alternate Line (PAL) system is used in the United Kingdom, Europe, Australia, and South Africa. PAL is an integrated method of adding color to a black-and-white television signal that paints 625 lines at a frame rate 25 frames per second.
6.2.5 SECAM

The Sequential Color and Memory (SECAM) system is used in France, Russia, and few other countries. Although SECAM is a 625-line, 50 Hz system, it differs greatly from both the NTSC and the PAL color systems in its basic technology and broadcast method.

6.2.6 HDTV

High Definition Television (HDTV) provides high resolution in a 16:9 aspect ratio (see following Figure). This aspect ratio allows the viewing of Cinemascope and Panavision movies. There is contention between the broadcast and computer industries about whether to use interlacing or progressive-scan technologies.

6.3 Shooting and Editing Video

To add full-screen, full-motion video to your multimedia project, you will 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 you cannot duplicate with your Macintosh or PC.

6.3.1 VideoTips

A useful tool easily implemented in most digital video editing applications is “blue screen,” “Ultimate,” or “chromo key” editing. Blue screen is a popular technique for making multimedia titles because expensive sets are not required. Incredible backgrounds can be generated using 3-D modeling and graphic software, and one or more actors, vehicles, or other objects can be neatly layered onto that background. Applications such as VideoShop, Premiere, Final Cut Pro, and iMovie provide this capability.

6.4 Recording Formats

6.4.1 S-VHS Video

In S-VHS video, color and luminance information are kept on two separate tracks. The result is a definite improvement in picture quality. This standard is also used in Hi-8. still, if your ultimate goal is to have your project accepted by broadcast stations, this would not be the best choice.

6.4.2 Component (YUV)

In the early 1980s, Sony began to experiment with a new portable professional video format based on Betamax. Panasonic has developed their own standard based on a similar technology, called “MII,” Betacam SP has
become the industry standard for professional video field recording. This format may soon be eclipsed by a new digital version called “Digital Betacam.”

6.4.3 Digital Video

Full integration of motion video on computers eliminates the analog television form of video from the multimedia delivery platform. If a video clip is stored as data on a hard disk, CD-ROM, or other mass-storage device, that clip can be played back on the computer’s monitor without overlay boards, videotape players, or second monitors. This playback of digital video is accomplished using software architecture such as QuickTime or AVI, a multimedia producer or developer; you may need to convert video source material from its still common analog form (videotape) to a digital form manageable by the end user’s computer system. So an understanding of analog video and some special hardware must remain in your multimedia toolbox. Analog to digital conversion of video can be accomplished using the video overlay hardware described above, or it can be delivered direct to disk using FireWire cables. To repetitively digitize a full-screen color video image every 1/30 second and store it to disk or RAM severely taxes both Macintosh and PC processing capabilities—special hardware, compression firmware, and massive amounts of digital storage space are required.

6.4.4 Video Compression

To digitize and store a 10-second clip of full-motion video in your computer requires transfer of an enormous amount of data in a very short amount of time. Reproducing just one frame of digital video component video at 24 bits requires almost 1MB of computer data; 30 seconds of video will fill a gigabyte hard disk. Full-size, full-motion video requires that the computer deliver data at about 30MB per second. This overwhelming technological bottleneck is overcome using digital video compression schemes or codecs (coders/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, DVI/Indeo, JPEG, Cinepak, Sorenson, ClearVideo, RealVideo, and VDOwave are available to compress digital video information. Compression schemes use Discrete Cosine Transform (DCT), an encoding algorithm that quantifies the human eye’s ability to detect color and image distortion. All of these codecs employ lossy compression algorithms. In addition to compressing video data, streaming technologies are being implemented to provide reasonable quality low-bandwidth video on the Web. Microsoft, RealNetworks, VXTreme, VDOnet, Xing, Precept, Cubic, Motorola, Viva, Vosaic, and Oracle are actively pursuing the commercialization of streaming technology on the Web.
QuickTime, Apple’s software-based architecture for seamlessly integrating sound, animation, text, and video (data that changes over time), is often thought of as a compression standard, but it is really much more than that.

### 6.4.5 MPEG

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

### 6.4.6 DVI/INDEO

DVI is a property, programmable compression/decompression technology based on the Intel i750 chip set. This hardware consists of two VLSI (Very Large Scale Integrated) chips to separate the image processing and display functions. Two levels of compression and decompression are provided by DVI: Production Level Video (PLV) and Real Time Video (RTV). PLV and RTV both use variable compression rates. DVI’s algorithms can compress video images at ratios between 80:1 and 160:1. DVI will play back video in full-frame size and in full color at 30 frames per second.

### 6.5 Optimizing Video Files for CD-ROM

CD-ROMs provide an excellent distribution medium for computer-based video: they are inexpensive to mass produce, and they can store great quantities of information. CDROM players offer slow data transfer rates, but adequate video transfer can be achieved by taking care to properly prepare your digital video files.

- Limit the amount of synchronization required between the video and audio. With Microsoft’s AVI files, the audio and video data are already interleaved, so this is not a necessity, but with QuickTime files, you should “flatten” your movie. Flattening means you interleave the audio and video segments together.

- Use regularly spaced key frames, 10 to 15 frames apart, and temporal compression can correct for seek time delays. Seek time is how long it takes
the CD-ROM player to locate specific data on the CD-ROM disc. Even fast 56x drives must spin up, causing some delay (and occasionally substantial noise).

- The size of the video window and the frame rate you specify dramatically affect performance. In QuickTime, 20 frames per second played in a 160X120-pixel window is equivalent to playing 10 frames per second in a 320X240 window. The more data that has to be decompressed and transferred from the CD-ROM to the screen, the slower the playback.

### 6.6 Summary

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

### Short Answer Type Questions

1. What is NTSC and PAL.
2. What is SECAM and HDTV.
3. Define Video Tips.
4. What is MPEG.
5. What is DVI/INDEO.

### Long Answer Type Questions

1. Explain about video.
2. Explain about recording formats.
3. Explain about optimizing video files for CD-Rom.
### Creating Multimedia Content

#### Structure

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#### Learning Objectives

This lesson aims at introducing the multimedia hardware used for providing interactivity between the user and the multimedia software, and also intended to teach the learner the basic tools (software) used for creating and capturing multimedia. The first part deals with Hardware and Second part deals with Software.

At the end of the lesson the learner will be able to:

(i) Identify software for creating multimedia objects

(ii) Locate software used for editing multimedia objects

(iii) understand different hardware and software tools
7.1 Introduction

The basic tools set for building multimedia project contains one or more authoring systems and various editing applications for text, images, sound, and motion video. A few additional applications are also useful for capturing images from the screen, translating file formats and tools for the making multimedia production easier.

7.2 What is Creativity?

Creativity as the act of turning new and imaginative ideas into reality. Creativity involves two processes: thinking, then producing. Innovation is the production or implementation of an idea. If you have ideas, but don’t act on them, you are imaginative but not creative.

“Creativity is the process of bringing something new into being...creativity requires passion and commitment. Out of the creative act is born symbols and myths. It brings to our awareness what was previously hidden and points to new life. The experience is one of heightened consciousness-ecstasy.”

- Rollo May, The Courage to Create

“A product is creative when it is (a) novel and (b) appropriate. A novel product is original not predictable. The bigger the concept, and the more the product stimulates further work and ideas, the more the product is creative.”

- Sternberg & Lubart, Defying the Crowd

Creativity can be improved with lot of observation and thinking of new possibilities in the way you like to implement.

Stages of a Multimedia Project

The stages for multimedia application development are Planning and costing, designing and producing, testing and delivery.

Communication Process:

Every communicator must know the significance of language which is essential for effective communication. There is no life without communication and communication flows like a river. Hence communication is the life line of management and it is vital for good management. Unless and until one should master the communication skills, he/she cannot get employability. He/ she should develop communication and language skills practicing the following:

- While interacting with someone, give importance to the message.
• Do not be pre-occupied with grammatical accuracy.
• Once you become fluent, you should try to improve grammar.
• Accept yourself as you are.
• Practice is very important. Whenever you get an opportunity to speak in front of others, make use of it. Face the audience boldly.
• Keep a good dictionary with you as your companion.
• Read newspapers, read stories, articles, news-items, watch news on T.V., Radio, develop your listening skills.
• Mingle with others freely; it helps you to develop interpersonal and group skills.
• Cultivate habit of reading books. By reading books, you can improve and develop ‘Creativity’.
• Selection of right books, good books to read is the key factor to success.
• Motivate the young minds and activate to learn subject and language.
• The great ideas will definitely help the reader in his later life. So read, Mark, learn and inwardly digest what is there in the books.
• Books are temples of knowledge. Visit the Library regularly at fixed hour.
• Now-a-days, knowledge is open for all in so many forms. You need to acquire desired knowledge from vast sources available.

7.3 Hardware

7.3.1 Input devices

Often, input devices are under direct control by a human user, who uses them to communicate commands or other information to be processed by the computer, which may then transmit feedback to the user through an output device. Input and output devices together make up the hardware interface between a computer and the user or external world. Typical examples of input devices include keyboards and mice. However, there are others which provide many more degrees of freedom. In general, any sensor which monitors, scans for and accepts information from the external world can be considered an input device, whether or not the information is under the direct control of a user.
Classification of Input Devices

Input devices can be classified according to:-

- The modality of input (e.g. mechanical motion, audio, visual, sound, etc.)

- Whether the input is discrete (e.g. keypresses) or continuous (e.g. a mouse’s position, though digitized into a discrete quantity, is high-resolution enough to be thought of as continuous)

- The number of degrees of freedom involved (e.g. many mice allow 2D positional input, but some devices allow 3D input, such as the Logitech Magellan Space Mouse)

Pointing devices, which are input devices used to specify a position in space, can further be classified according to

- Whether the input is direct or indirect. With direct input, the input space coincides with the display space, i.e. pointing is done in the space where visual feedback or the cursor appears. Touchscreens and light pens involve direct input. Examples involving indirect input include the mouse and trackball.

- Whether the positional information is absolute (e.g. on a touch screen) or relative (e.g. with a mouse that can be lifted and repositioned) Note that direct input is almost necessarily absolute, but indirect input may be either absolute or relative. For example, digitizing graphics tablets that do not have an embedded screen involve indirect input, and sense absolute positions and are often run in an absolute input mode, but they may also be setup to simulate a relative input mode where the stylus or puck can be lifted and repositioned.

(a) Keyboards

A keyboard is the most common method of interaction with a computer. Keyboards provide various tactile responses (from firm to mushy) and have various layouts depending upon your computer system and keyboard model. Keyboards are typically rated for at least 50 million cycles (the number of times a key can be pressed before it might suffer breakdown).

The most common keyboard for PCs is the 101 style (which provides 101 keys), although many styles are available with more are fewer special keys, LEDs, and others features, such as a plastic membrane cover for industrial or food-service applications or flexible “ergonomic” styles. Macintosh keyboards connect to the Apple Desktop Bus (ADB), which manages all forms of user input- from digitizing tablets to mice.
Examples of types of keyboards include

- Computer keyboard
- Keyer
- Chorded keyboard
- LPFK

(b) **Pointing devices**

A **pointing device** is any computer hardware component (specifically human interface device) that allows a user to input spatial (i.e., continuous and multidimensional) data to a computer. CAD systems and graphical user interfaces (GUI) allow the user to control and provide data to the computer using physical gestures - point, click, and drag - typically by moving a hand-held mouse across the surface of the physical desktop and activating switches on the mouse.

While the most common pointing device by far is the mouse, many more devices have been developed. However, mouse is commonly used as a metaphor for devices that move the cursor. A mouse is the standard tool for interacting with a graphical user interface (GUI). All Macintosh computers require a mouse; on PCs, mice are not required but recommended. Even though the Windows environment accepts keyboard entry in lieu of mouse point-and-click actions, your multimedia project should typically be designed with the mouse or touchscreen in mind. The buttons the mouse provide additional user input, such as pointing and double-clicking to open a document, or the click-and-drag operation, in which the mouse button is pressed and held down to drag (move) an object, or to move to and select an item on a pull-down menu, or to access context-sensitive help. The Apple mouse has one button; PC mice may have as many as three.

Examples of common pointing devices include

- Mouse
- Trackball
- Touchpad
- SpaceBall - 6 degrees-of-freedom controller
- Touchscreen
- Graphics tablets (or digitizing tablet) that use a stylus
- Light pen
- Light gun
- Eye tracking devices
- Steering wheel - can be thought of as a 1D pointing device
- Yoke (aircraft)
- Jog dial - another 1D pointing device
- Isotonic joysticks - where the user can freely change the position of the stick, with more or less constant force
- Joystick
- Analog stick
- Isometric joysticks - where the user controls the stick by varying the amount of force they push with, and the position of the stick remains more or less constant.
- Pointing stick
- Discrete pointing devices
- Directional pad - a very simple keyboard
- Dance pad - used to point at gross locations in space with feet

(c) **High-degree of freedom input devices**

Some devices allow many continuous degrees of freedom to be input, and could sometimes be used as pointing devices, but could also be used in other ways that don’t conceptually involve pointing at a location in space.

- Wired glove
- Shape Tape

(d) **Composite devices**

**Wii Remote with attached strap**

Input devices, such as buttons and joysticks, can be combined on a single physical device that could be thought of as a composite device. Many gaming devices have controllers like this.

- Game controller
- Gamepad (or joypad)
(e) Imaging and Video input devices

Flat-Bed Scanners

A scanner may be the most useful piece of equipment used in the course of producing a multimedia project; there are flat-bed and handheld scanners. Most commonly available are gray-scale and color flat-bed scanners that provide a resolution of 300 or 600 dots per inch (dpi). Professional graphics houses may use even higher resolution units. Handheld scanners can be useful for scanning small images and columns of text, but they may prove inadequate for the multimedia development.

Be aware that scanned images, particularly those at high resolution and in color, demand an extremely large amount of storage space on the hard disk, no matter what instrument is used to do the scanning. Also remember that the final monitor display resolution for your multimedia project will probably be just 72 or 95 dpi—leave the very expensive ultra-high-resolution scanners for the desktop publishers. Most expensive flat-bed scanners offer at least 300 dpi resolution, and most scanners allow to set the scanning resolution. Scanners helps make clear electronic images of existing artwork such as photos, ads, pen drawings, and cartoons, and can save many hours when you are incorporating proprietary art into the application. Scanners also give a starting point for the creative diversions. The devices used for capturing image and video are:

- Webcam
- Image scanner
- Fingerprint scanner
- Barcode reader
- 3D scanner
- Medical imaging sensor technology
- Computed tomography
- Magnetic resonance imaging
- Positron emission tomography
- Medical ultrasonography
Audio input devices

The devices used for capturing audio are

- Microphone
- Speech recognition

Note that MIDI allows musical instruments to be used as input devices as well.

(f) Touch Screens

Touch screens are monitors that usually have a textured coating across the glass face. This coating is sensitive to pressure and registers the location of the user’s finger when it touches the screen. The Touch Mate System, which has no coating, actually measures the pitch, roll, and yaw rotation of the monitor when pressed by a finger, and determines how much force was exerted and the location where the force was applied.

Other touchscreens use invisible beams of infrared light that crisscross the front of the monitor to calculate where a finger was pressed. Pressing twice on the screen in quick and dragging the finger, without lifting it, to another location simulates a mouse click and drag. A keyboard is sometimes simulated using an onscreen representation so users can input names, numbers, and other text by pressing “keys”.

Touch screen recommended for day-to-day computer work, but are excellent for multimedia applications in a kiosk, at a trade show, or in a museum delivery system anything involving public input and simple tasks. When your project is designed to use a touch screen, the monitor is the only input device required, so you can secure all other system hardware behind locked doors to prevent theft or tampering.

7.3.2 Output Devices

Presentation of the audio and visual components of the multimedia project requires hardware that may or may not be included with the computer itself—speakers, amplifiers, monitors, motion video devices, and capable storage systems. The better the equipment, of course, the better the presentation.

There is no greater test of the benefits of good output hardware than to feed the audio output of your computer into an external amplifier system: suddenly the bass sounds become deeper and richer, and even music sampled at low quality may seem to be acceptable.
(a) **Audio devices**

All Macintoshes are equipped with an internal speaker and a dedicated sound clip, and they are capable of audio output without additional hardware and/or software. To take advantage of built-in stereo sound, external speaker are required. Digitizing sound on the Macintosh requires an external microphone and sound editing/recording software such as SoundEdit16 from Macromedia, Alchemy from Passport, or SoundDesingner from DigiDesign.

(b) **Amplifiers and Speakers**

Often the speakers used during a project’s development will not be adequate for its presentation. Speakers with built-in amplifiers or attached to an external amplifier are important when the project will be presented to a large audience or in a noisy setting.

(c) **Monitors**

The monitor needed for development of multimedia projects depends on the type of multimedia application created, as well as what computer is being used. A wide variety of monitors is available for both Macintoshes and PCs. High-end, large-screen graphics monitors are available for both, and they are expensive.

Serious multimedia developers will often attach more than one monitor to their computers, using add-on graphic board. This is because many authoring systems allow to work with several open windows at a time, so we can dedicate one monitor to viewing the work we are creating or designing, and we can perform various editing tasks in windows on other monitors that do not block the view of your work. Editing windows that overlap a work view when developing with Macromedia’s authoring environment, director, on one monitor. Developing in director is best with at least two monitors, one to view the work the other two view the “score”. A third monitor is often added by director developers to display the “Cast”.

(d) **Video Device**

No other contemporary message medium has the visual impact of video. With a video digitizing board installed in a computer, we can display a television picture on your monitor. Some boards include a frame-grabber feature for capturing the image and turning it in to a color bitmap, which can be saved as a PICT or TIFF file and then used as part of a graphic or a background in your project.
Display of video on any computer platform requires manipulation of an enormous amount of data. When used in conjunction with videodisc players, which give precise control over the images being viewed, video cards you place an image into a window on the computer monitor; a second television screen dedicated to video is not required. And video cards typically come with excellent special effects software.

There are many video cards available today. Most of these support various video in-a-window sizes, identification of source video, setup of play sequences are segments, special effects, frame grabbing, digital movie making; and some have built-in television tuners so you can watch your favorite programs in a window while working on other things. In windows, video overlay boards are controlled through the Media Control Interface. On the Macintosh, they are often controlled by external commands and functions (XCMDs and XFCNs) linked to your authoring software.

Good video greatly enhances your project; poor video will ruin it. Whether you delivered your video from tape using VISCA controls, from videodisc, or as a QuickTime or AVI movie, it is important that your source material be of high quality.

(e) Projectors

When it is necessary to show a material to more viewers than can huddle around a computer monitor, it will be necessary to project it on to large screen or even a white painted wall. Cathode-ray tube (CRT) projectors, liquid crystal display (LCD) panels attached to an overhead projector, stand-alone LCD projectors, and light-valve projectors are available to splash the work on to big-screen surfaces.

CRT projectors have been around for quite a while - they are the original “big screen” televisions. They use three separate projection tubes and lenses (red, green, and blue), and three color channels of light must “converge” accurately on the screen. Setup, focusing, and aligning are important to getting a clear and crisp picture. CRT projectors are compatible with the output of most computers as well as televisions. LCD panels are portable devices that fit in a briefcase.

The panel is placed on the glass surface of a standard overhead projector available in most schools, conference rooms, and meeting halls. While they overhead projectors does the projection work, the panel is connected to the computer and provides the image, in thousands of colors and, with active-matrix technology, at speeds that allow full-motion video and animation.
Because LCD panels are small, they are popular for on-the-road presentations, often connected to a laptop computer and using a locally available overhead projector. More complete LCD projection panels contain a projection lamp and lenses and do not recover a separate overheads projector. They typically produce an image brighter and shaper than the simple panel model, but they are some what large and cannot travel in a briefcase.

Light-valves complete with high-end CRT projectors and use a liquid crystal technology in which a low-intensity color image modulates a high-intensity light beam. These units are expensive, but the image from a light-valve projector is very bright and color saturated can be projected onto screen as wide as 10 meters.

(f) **Printers**

With the advent of reasonably priced color printers, hard-copy output has entered the multimedia scene. From storyboards to presentation to production of collateral marketing material, color printers have become an important part of the multimedia development environment. Color helps clarify concepts, improve understanding and retention of information, and organize complex data. As multimedia designers already know intelligent use of colors is critical to the success of a project.

Tektronix offers both solid ink and laser options, and either Phases 560 will print more than 10000 pages at a rate of 5 color pages or 14 monochrome pages per minute before requiring new toner. Epson provides lower-cost and lower-performance solutions for home and small business users; Hewlett Packard’s Color LaserJet line competes with both. Most printer manufactures offer a color model-just as all computers once used monochrome monitors but are now color, all printers will became color printers.

### 7.3.3 Communication Devices

Many multimedia applications are developed in workgroups comprising instructional designers, writers, graphic artists, programmers, and musicians located in the same office space or building. The workgroup members’ computers typically are connected on a local area network (LAN). The client’s computers, however, may be thousands of miles distant, requiring other methods for good communication.

Communication among workshop members and with the client is essential to the efficient and accurate completion of project. And when speedy data transfer is needed, immediately, a modem or network is required.
If the client and the service provider are both connected to the Internet, a combination of communication by e-mail and by FTP (File Transfer Protocol) may be the most cost-effective and efficient solution for both creative development and project management.

In the workplace, it is necessary to use quality equipment and software for the communication setup. The cost-in both time and money-of stable and fast networking will be returned to the content developer.

(a) **Modems**

Modems can be connected to the computer externally at the port or internally as a separate board. Internal modems often include fax capability. Be sure your modem is Hayes-compatible. The Hayes AT standard command set (named for the ATTENTION command that precedes all other commands) allows to work with most software communications packages.

Modem speed, measured in baud, is the most important consideration. Because the multimedia file that contains the graphics, audio resources, video samples, and progressive versions of your project are usually large, you need to move as much data as possible in as short a time as possible. Today’s standards dictate at least a V.34 28,800 bps modem.

Transmitting at only 2400 bps, a 350KB file may take as long as 45 minutes to send, but at 28.8 kbps, you can be done in a couple of minutes. Most modems follows the CCITT V.32 or V.42 standards that provide data compression algorithms when communicating with another similarly equipped modem. Compression saves significant transmission time and money, especially over long distance. Be sure the modem uses a standard compression system (like V.32), not a proprietary one.

According to the laws of physics, copper telephone lines and the switching equipment at the phone companies’ central offices can handle modulated analog signals up to about 28,000 bps on “clean” lines. Modem manufactures that advertise data transmission speeds higher than that (56 Kbps) are counting on their hardware-based compression algorithms to crunch the data before sending it, decompressing it upon arrival at the receiving end.

If we have already compressed the data into a .SIT, .SEA, .ARC, or .ZIP file, you may not reap any benefit from the higher advertised speeds because it is difficult to compress an already-compressed file. New high-speed/high transmission over telephone lines are on the horizon.
(b) ISDN

For higher transmission speeds, you will need to use Integrated Services Digital Network (ISDN), Switched-56, T1, T3, DSL, ATM, or another of the telephone companies’ Digital Switched Network Services. ISDN lines are popular because of their fast 128 Kbps data transfer rate—four to five times faster than the more common 28.8 Kbps analog modem. ISDN lines (and the required ISDN hardware, often misnamed “ISDN modems” even though no modulation/demodulation of the analog signal occurs) are important for Internet access, networking, and audio and video conferencing.

They are more expensive than conventional analog or POTS (Plain Old Telephone Service) lines, so analyze your costs and benefits carefully before upgrading to ISDN. Newer and faster Digital Subscriber Line (DSL) technology using copper lines and promoted by the telephone companies may overtake ISDN.

(c) Cable Modems

In November 1995, a consortium of cable television industry leaders announced agreement with key equipment manufacturers to specify some of the technical ways cable networks and data equipment talk with one another. 3COM, AT&T, COM21, General Instrument, Hewlett Packard, Hughes, Hybrid, IBM, Intel, LANCity, MicroUnity, Motorola, Nortel, Panasonic, Scientific Atlanta, Terayon, Toshiba, and Zenith currently supply cable modem products.

While the cable television networks cross 97 percent of property lines in North America, each local cable operator may use different equipment, wires, and software, and cable modems still remain somewhat experimental. This was a call for interoperability standards.

Cable modems operate at speeds 100 to 1,000 times as fast as a telephone modem, receiving data at up to 10Mbps and sending data at speeds between 2Mbps and 10 Mbps. They can provide not only high-bandwidth Internet access but also streaming audio and video for television viewing. Most will connect to computers with 10baseT Ethernet connectors.

Cable modems usually send and receive data asymmetrically; they receive more (faster) than they send (slower). In the downstream direction from provider to user, the data are modulated and placed on a common 6 MHz television carrier, somewhere between 42 MHz and 750 MHz. The upstream channel, or reverse path, from the user back to the provider is more difficult to engineer because cable is a noisy environment with interference from HAM radio, CB radio, home appliances, loose connectors, and poor home installation.
7.3.4 Multimedia Storage Devices

![Multimedia Storage Devices](image)

**7.4 Software**

(a) Text Editing and Word Processing Tools

A word processor is usually the first software tool computer users rely upon for creating text. The word processor is often bundled with an office suite. Word processors such as Microsoft Word and WordPerfect are powerful applications that include spellcheckers, table formatters, thesauruses and prebuilt templates for letters, resumes, purchase orders and other common documents.

(b) OCR Software

Often there will be multimedia content and other text to incorporate into a multimedia project, but no electronic text file. With optical character recognition
(OCR) software, a flat-bed scanner, and a computer, it is possible to save many hours of rekeying printed words, and get the job done faster and more accurately than a roomful of typists.

OCR software turns bitmapped characters into electronically recognizable ASCII text. A scanner is typically used to create the bitmap. Then the software breaks the bitmap into chunks according to whether it contains text or graphics, by examining the texture and density of areas of the bitmap and by detecting edges. The text areas of the image are then converted to ASCII character using probability and expert system algorithms.

(c) **Image-Editing Tools**

Image-editing application is specialized and powerful tools for enhancing and retouching existing bitmapped images. These applications also provide many of the feature and tools of painting and drawing programs and can be used to create images from scratch as well as images digitized from scanners, video frame-grabbers, digital cameras, clip art files, or original artwork files created with a painting or drawing package.

Here are some features typical of image-editing applications and of interest to multimedia developers:

- Multiple windows that provide views of more than one image at a time
- Conversion of major image-data types and industry-standard file formats
- Direct inputs of images from scanner and video sources
- Employment of a virtual memory scheme that uses hard disk space as RAM for images that require large amounts of memory
- Capable selection tools, such as rectangles, lassos, and magic wands, to select portions of a bitmap
- Image and balance controls for brightness, contrast, and color balance
- Good masking features
- Multiple undo and restore features
- Anti-aliasing capability, and sharpening and smoothing controls
- Color-mapping controls for precise adjustment of color balance
- Tools for retouching, blurring, sharpening, lightening, darkening, smudging, and tinting
- Geometric transformation such as flip, skew, rotate, and distort, and perspective changes
- Ability to resample and resize an image
- X34-bit color, 8- or 4-bit indexed color, 8-bit gray-scale, black-and-white, and customizable color palettes
- Ability to create images from scratch, using line, rectangle, square, circle, ellipse, polygon, airbrush, paintbrush, pencil, and eraser tools, with customizable brush shapes and user-definable bucket and gradient fills
- Multiple typefaces, styles, and sizes, and type manipulation and masking routines.
- Filters for special effects, such as crystallize, dry brush, emboss, facet, fresco, graphic pen, mosaic, pixelize, poster, ripple, smooth, splatter, stucco, twirl, watercolor, wave, and wind
- Support for third-party special effect plug-ins
- Ability to design in layers that can be combined, hidden, and reordered

Plug-Ins

Image-editing programs usually support powerful plug-in modules available from third-party developers that allow to wrap, twist, shadow, cut, diffuse, and otherwise “filter” your images for special visual effects.

(d) Painting and Drawing Tools

Painting and drawing tools, as well as 3-D modelers, are perhaps the most important items in the toolkit because, of all the multimedia elements, the graphical impact of the project will likely have the greatest influence on the end user. If the artwork is amateurish, or flat and uninteresting, both the creator and the users will be disappointed.

Painting software, such as Photoshop, Fireworks, and Painter, is dedicated to producing crafted bitmap images. Drawing software, such as CorelDraw, FreeHand, Illustrator, Designer, and Canvas, is dedicated to producing vector-based line art easily printed to paper at high resolution.

Some software applications combine drawing and painting capabilities, but many authoring systems can import only bitmapped images. Typically, bitmapped images provide the greatest choice and power to the artist for rendering fine
detail and effects, and today bitmaps are used in multimedia more often than drawn objects. Some vector based packages such as Macromedia’s Flash are aimed at reducing file download times on the Web, and may contain both bitmaps and drawn art. The anti-aliased character shown in the bitmap of Color Plate 5 is an example of the fine touches that improve the look of an image.

Look for these features in a drawing or painting packages:

- An intuitive graphical user interface with pull-down menus, status bars, palette control, and dialog boxes for quick, logical selection
- Scalable dimensions, so you can resize, stretch, and distort both large and small bitmaps
- Paint tools to create geometric shapes, from squares to circles and from curves to complex polygons
- Ability to pour a color, pattern, or gradient into any area
- Ability to paint with patterns and clip art
- Customizable pen and brush shapes and sizes
- Eyedropper tool that samples colors
- Auto trace tool that turns bitmap shapes into vector-based outlines
- Support for scalable text fonts and drop shadows
- Multiple undo capabilities, to let you try again
- Painting features such as smoothing coarse-edged objects into the background with anti-aliasing, airbrushing in variable sizes, shapes, densities, and patterns; washing colors in gradients; blending; and masking.
- Support for third-party special effect plug-ins
- Object and layering capabilities that allow you to treat separate elements independently.
- Zooming, for magnified pixel editing
- All common color depths: 1-, 4-, 8-, and 16-, X34-, or 3X3- bit color, and grayscale.
- Good color management and dithering capability among color depths using various color models such as RGB, HSB, and CMYK.
- Good palette management when in 8-bit mode
• Good file importing and exporting capability for image formats such as PIC, GIF, TGA, TIF, WMF, JPG, PCX, EPS, PTN, and BMP.

(e) Sound Editing Tools

Sound editing tools for both digitized and MIDI sound let’s hear music as well as create it. By drawing a representation of a sound in fine increments, whether a score or a waveform, it is possible to cut, copy, paste and otherwise edit segments of it with great precision.

System sounds are shipped both Macintosh and Windows systems and they are available as soon the Operating system is installed. For MIDI sound, a MIDI synthesizer is required to play and record sounds from musical instruments. For ordinary sound there are varieties of software such as Soundedit, MP3cutter, Wavestudio.

(f) Animation, Video and Digital Movie Tools

Animation and digital movies are sequences of bitmapped graphic scenes (frames, rapidly played back. Most authoring tools adapt either a frame or object oriented approach to animation.

Moviemaking tools typically take advantage of QuickTime for Macintosh and Microsoft Video for Windows and lets the content developer to create, edit and present digitized motion video segments.

7.5 Video formats

A video format describes how one device sends video pictures to another device, such as the way that a DVD player sends pictures to a television or a computer to a monitor. More formally, the video format describes the sequence and structure of frames that create the moving video image.

Video formats are commonly known in the domain of commercial broadcast and consumer devices; most notably to date, these are the analog video formats of NTSC, PAL, and SECAM. However, video formats also describe the digital equivalents of the commercial formats, the aging custom military uses of analog video (such as RS-170 and RS-343), the increasingly important video formats used with computers, and even such offbeat formats such as color field sequential.

Video formats were originally designed for display devices such as CRTs. However, because other kinds of displays have common source material and because video formats enjoy wide adoption and have convenient organization, video formats are a common means to describe the structure of displayed visual information for a variety of graphical output devices.
Common Organization of Video Formats

A video format describes a rectangular image carried within an envelope containing information about the image. Although video formats vary greatly in organization, there is a common taxonomy:

• A frame can consist of two or more fields, sent sequentially, that are displayed over time to form a complete frame. This kind of assembly is known as interlace. An interlaced video frame is distinguished from a progressive scan frame, where the entire frame is sent as a single intact entity.

• A frame consists of a series of lines, known as scan lines. Scan lines have a regular and consistent length in order to produce a rectangular image. This is because in analog formats, a line lasts for a given period of time; in digital formats, the line consists of a given number of pixels. When a device sends a frame, the video format specifies that devices send each line independently from any others and that all lines are sent in top-to-bottom order.

• As above, a frame may be split into fields – odd and even (by line “numbers”) or upper and lower, respectively. In NTSC, the lower field comes first, then the upper field, and that’s the whole frame. The basics of a format are Aspect Ratio,

• Frame Rate, and Interlacing with field order if applicable: Video formats use a sequence of frames in a specified order. In some formats, a single frame is independent of any other (such as those used in computer video formats), so the sequence is only one frame. In other video formats, frames have an ordered position. Individual frames within a sequence typically have similar construction.

• However, depending on its position in the sequence, frames may vary small elements within them to represent additional information. For example, MPEG-X3 compression may eliminate the information that is redundant frame-to-frame in order to reduce the data size, preserving the information relating to changes between frames.

Analog video formats

√ NTSC
√ PAL
√ SECAM
Digital Video Formats

These are MPEGX3 based terrestrial broadcast video formats

- ATSC Standards
- DVB
- ISDB

These are strictly the format of the video itself, and not for the modulation used for transmission.

Broadcast video formats

Analog broadcast

5X35 lines: NTSC • NTSC-J • PAL-M

6X35 lines: PAL • PAL-N • PALplus • SECAM

Multichannel audio: BTSC (MTS) • NICAM-7X38 • Zweiton (AX3, IGR)

Digital broadcast

Interlaced: SDTV (480i, 576i) • HDTV (1080i)

Progressive: LDTV (X340p, X388p, 1seg) • EDTV (480p, 576p) • HDTV (7X30p, 1080p)

Digital TV standards (MPEG-X3): ATSC, DVB, ISDB, DMB-T/H

Digital TV standards (MPEG-4 AVC): DMB-T/H, DVB, SBTVD, ISDB (1seg)

Multichannel audio: AAC (5.1) • Musicam • PCM • LPCM

Digital cinema: UHDV (X3540p, 43X30p) • DCI

X3.7.3 QuickTime

QuickTime is a multimedia framework developed by Apple Inc. capable of handling various formats of digital video, media clips, sound, text, animation, music, and several types of interactive panoramic images.

Available for Classic Mac OS, Mac OS X and Microsoft Windows operating systems, it provides essential support for software packages including iTunes, QuickTime Player (which can also serve as a helper application for web browsers to play media files that might otherwise fail to open) and Safari.
The QuickTime technology consists of the following:

1. The QuickTime Player application created by Apple, which is a media player.

2. The QuickTime framework, which provides a common set of APIs for encoding and decoding audio and video.

3. The QuickTime Movie (.mov) file format, an openly-documented media container.

QuickTime is integral to Mac OS X, as it was with earlier versions of Mac OS. All Apple systems ship with QuickTime already installed, as it represents the core media framework for Mac OS X. QuickTime is optional for Windows systems, although many software applications require it. Apple bundles it with each iTunes for Windows download, but it is also available as a stand-alone installation.

**QuickTime players**

QuickTime is distributed free of charge, and includes the QuickTime Player application. Some other free player applications that rely on the QuickTime framework provide features not available in the basic QuickTime Player. For example:

- iTunes can export audio in WAV, AIFF, MP3, AAC, and Apple Lossless.

- In Mac OS X, a simple AppleScript can be used to play a movie in full-screen mode. However, since version 7.13 the QuickTime Player now also supports for full screen viewing in the non-pro version.

**QuickTime framework**

The QuickTime framework provides the following:

- Encoding and transcoding video and audio from one format to another.

- Decoding video and audio, and then sending the decoded stream to the graphics or audio subsystem for playback. In Mac OS X, QuickTime sends video playback to the Quartz Extreme (OpenGL) Compositor.

- A plug-in architecture for supporting additional codecs (such as DivX). The framework supports the following file types and codecs natively:

**Audio**

- Apple Lossless
• Audio Interchange (AIFF)
• Digital Audio: Audio CD - 16-bit (CDDA), X34-bit, 3X3-bit integer & floating point, and 64-bit floating point
• MIDI
• MPEG-1 Layer 3 Audio (.mp3)
• MPEG-4 AAC Audio (.m4a, .m4b, .m4p)
• Sun AU Audio
• ULA W and ALAW Audio
• Waveform Audio (WAV)

Video
• 3GPP & 3GPPX3 file formats
• AVI file format
• Bitmap (BMP) codec and file format
• DV file (DV NTSC/PAL and DVC Pro NTSC/PAL codecs)
• Flash & FlashPix files
• GIF and Animated GIF files
• H.X361, H.X363, and H.X364 codecs
• JPEG, Photo JPEG, and JPEG-X3000 codecs and file formats
• MPEG-1, MPEG-X3, and MPEG-4 Video file formats and associated codecs (such as AVC)
• QuickTime Movie (.mov) and QTVR movies
• Other video codecs: Apple Video, Cinepak, Component Video, Graphics, and Planar RGB
• Other still image formats: PNG, TIFF, and TGA

Specification for QuickTime file format

QuickTime Movie File extension: .mov .qt
MIME type: video/quicktime
Type code: MooV
**Uniform Type Identifier:** com.apple.quicktime-movie

**Developed by:** Apple Inc.

**Type of format:** Media container

**Container for:** Audio, video, text

The QuickTime (.mov) file format functions as a multimedia container file that contains one or more tracks, each of which stores a particular type of data: audio, video, effects, or text (for subtitles, for example). Other file formats that QuickTime supports natively (to varying degrees) include AIFF, WAV, DV, MP3, and MPEG-1. With additional QuickTime Extensions, it can also support Ogg, ASF, FLV, MKV, DivX Media Format, and others.

**Summary**

In this lesson we have learnt the details about input devices, connecting devices and output devices. We have discussed the following key points in this lesson:

- Input Devices and Output devices provide interactivity.
- Communication devices enables data transfer.

**Short Answer Type Questions**

1. What is creativity.
2. What is keyboard and pointing devices.
3. What is flat bed scanners.
4. What is touch screens.
5. Define modems and ISDN.
6. What is OCR software.
7. What are sound editing tools.
8. What is Quick Time Framework.

**Long Answer Type Questions**

1. Explain about Hardware.
2. Explain about output devices.
3. Explain about Software.
4. Explain various video formats.
UNIT 8

Jobs in Multimedia Industry

Structure

8.1 Introduction
8.2 Publishing Industry
8.3 Entertainment Industry
8.4 Interactive Multimedia and Web industry
8.5 Fashion and Interior Design Industry
8.6 Animation Industry
8.7 Gaming Industry
8.8 Summary

Learning Objectives

This lesson aims at introducing the Job arena relating to multimedia industry. This lesson covers almost all branches of Multimedia industry and respective job roles associated with this industry.

At the end of the lesson the learner will be able to:

i) Know the Job Scope in this industry

ii) Various functions performed by Multimedia professionals
iii) How to reach your desired position in this industry

we have various applications software to work with, it also requires distinctive professionals to perform certain functions at different levels of the project. In this lesson the student is going to get in depth insight of various multimedia job roles along with brief descriptions.

8.1 Introduction

“Multimedia is any combination of text, graphic art, sound, animation, and video delivered to you by computer or other electronic means. It is richly presented sensation. When you weave together the sensual elements of multimedia-dazzling pictures and animations, engaging sounds, compelling video clips, and raw textual information-you can electrify the thought and action centers of people’s minds. When you give them interactive control or the process, they can be enchanted. Multimedia excites eyes, ears, fingertips, and, most importantly, the head.” (Multimedia making it work 5th edition)

The world of multimedia is a gold mine of career opportunities for those who have an aptitude for combining their creative talent with technological skills.

It is a world in which such creative people use text, graphics, animation, audio and video with computer interactivity to create new visual and virtual worlds. And work could be fun aplenty if you simply lose track of time while conjuring up those worlds on your PC. Multimedia tools span a wide spectrum - from video and sound editing to special effects, virtual reality, animation, games and interactive multimedia programming.

Learning multimedia and working as a professional in this challenging field could be an enjoyable experience. But it requires hard work, ability to visualise and understand the concept of design logically, and implement it with a clear head. Be prepared to persevere. The different areas where you could plan a career in multimedia are:

8.2 Publishing industry

Print media is one of the oldest areas of work and forms the biggest chunk of the Indian, Asian and global media market. And it is likely to remain dominant for years to come. Publishing has acquired newer and broader dimensions owing to networking. There are lots of Government and private institutions in India where one could learn the art of design and printing technology, and digital print media.
8.3 Entertainment industry

The boom in the IT industry and the emergence of cable TV and convergent entertainment segments have made this a medium with a lot of potential for growth and creativity, particularly taking the emerging international markets into consideration. Graphic designers, cameramen, sound recordists, compositors, games design specialists and animators are an integral part of this happening sector.

A number of Government and private institutions offer training in media and mass communication. A beginner could easily earn up to Rs. 20,000 per month within two years and the sky is the limit if you can make the grade.

8.4 Interactive Multimedia and Web Industry

Talk of multimedia and it is often the Internet that springs to one’s mind. Apart from the Internet, creation of interactive CDs has contributed significantly to the growth of the multimedia industry. Career opportunities are aplenty.

There are plenty of institutions that provide training in web design and engineering. But one must be cautious and choose an institute that has credibility in the industry, and which can assist you in finding a suitable job. A fresher in this area could earn approximately Rs. 7,000 per month and after a year or two it could go up to Rs. 15,000. An entrepreneur could earn a lot more.

8.5 Fashion and interior designing industry

Fashion industry in India is supported by the Department of Textiles under the Government of India and also by various garments and textile organisations. Although there are a plethora of institutes that claim to be teaching fashion designing, one must choose an institution that is closely linked with the fashion industry. Experts in the field should be associated with the training. This is a lucrative career and a talented trainee could earn Rs.15,000 per month.

Interior designing

With the advent of design tools, interior designing has captured the imagination of one and all. Static 3-D, modelling of objects and scene designing through computer graphics have given a boost to this segment.

8.6 Animation industry

Animation is one of the fastest growing IT-enabled services in India. About 3,00,000 professionals are expected to be in this industry by 2008. Animation
application areas include entertainment (films and television), business (marketing demonstrations, product promotions), sales (presentations), education, tourism, publishing (graphics and printing), web design and virtual reality for simulation in defence, engineering, advertising (commercials and advertisements), interiors and fashion design. Visualizes, ink-and-paint artists, people specializing in special effects, character animators and modeling artists are some of the professionals required in this industry. The starting salary of an animator may be around Rs. 6,000.

8.6.1 Special effects

Although special effects (SFX) may be part of other industries such as entertainment, advertising and animation, its increasing use in all forms of interactive presentation has earned it a special place in today’s multimedia-savvy world. Advertisement films, games, CBTs and a plethora of other media use special effects to spice up their content.

You could learn SFX from good high-end animation institutes. Those who are talented can make it big in this industry. Think of any film, be it ‘Matrix Reloaded’ or ‘Shrek’, or Hindi films such as ‘Raju Chacha’, ‘Devdas’ and ‘Mohabattein’, special effects form an integral part of. For a SFX person, salaries could be between Rs. 3,000 and Rs. 10,000.

8.7 Gaming industry

India has a huge potential for developing games for domestic and international markets. There are five main departments in the average game company: art, design, programming, sound, and support. Many companies divide each into sub-categories. Given the huge demand for trained games developers in India, salaries for trainees may range from Rs. 6,000 to Rs. 10,000.

8.8 Advertising industry

The field of advertising, both on-line and off-line, has been one of the key beneficiaries of multimedia technology, and digital advertising is being used extensively by organizations today.

Multimedia specialists use multiple types of media, text, graphics, sound, animation, and video, in various combinations in advertisements.

Salary for beginners ranges from Rs. 5,000 to Rs. 8,000 and could go up to Rs. 20,000 with a couple of years of experience.
What do you need to succeed in Multimedia?

How do you get there?

- Clearly define what you want to be or do. (i.e. a Graphic Designer, Authoring Specialist, Art director, Animator)
- Define the skills you need to succeed in your chosen field. (Make a list)
- Create a plan to acquire the skills you do not possess.
- A great resume. Generating 3 to 4 versions of your resume is a good idea. (Different versions for different jobs) The cover letter is what will get you the interview it needs to be your best work. (A dozen different versions are
Start your resume the day you register for classes at COM and have it finished and in hand the day you get your certificate.

- A professional looking, polished portfolio. Keep it short. Keep it focused
- Work experience. Every Human Resources manager looks for this. Get it, find it, and create it! It may be volunteer or part time, no matter, you need some.

**Short Answer Type Questions**

1. What is Multimedia.
2. What is Entertainment industry.
3. What is publishing industry.
4. What is gaming industry.

**Long Answer Type Questions**

1. Explain about Animation industry.
2. Explain about Advertising industry.
3. Explain about special effects.
UNIT 9

Planning and Costing

Structure

9.1 Introduction
9.2 Idea analysis
9.3 Pre-testing
9.4 Task planning
9.5 Development
9.6 Delivery
9.7 Summary

Learning Objectives

At the end of this lesson student will learn the following:

- Process of making a multimedia project (preproduction, production, postproduction)
- Planning
- Idea analysis
- Cost estimating
- Revision
- Testing etc. in brief.
9.1 Introduction

Even though we have all the required elements of multimedia to start and finish a full fledged multimedia project, it also requires a plan of action relating to project handling that includes planning, budgeting, analysis, provisioning etc., so, this lesson gives a brief introduction to multimedia project handling stages.

The process of making multimedia.

- Scheduling.
- Estimating.
- RFPs and bid proposals.

Planning and costing involves the following stages:

They are

- Idea analysis.
- Pre-testing.
- Task planning.
- Development.
- Delivery.

Before beginning a multimedia project, it is necessary to determine its scope and content.

- Balance is the key principle in idea analysis.
- The aim is to generate a plan of action that will become the road map for production.
- It is necessary to continually weigh the purpose or goal against the feasibility and the cost of production and delivery.
- This can be done dynamically by adding elements to or subtracting elements from a project.
- Additive process involves starting with minimal capabilities and gradually adding elements.
- Subtractive process involves discarding unnecessary Idea Analysis elements from a fully developed project.
9.2 Idea Analysis

Idea analysis involves finding answers to questions like:

- Who is the intended audience? What are their needs?
- What multimedia elements will best deliver the message?
- What hardware, software, and storage capacity would be required?
- How much time, effort, and money would be needed?
- How will the final product be distributed?

Idea Analysis Project management software includes:

- Microsoft Project.
- Designer’s Edge.
- Screenplay System’s Screenwriter and StoryView.
- Outlining programs.
- Spreadsheets.

9.3 Pre-Testing

- Involves defining project goals in fine detail and spelling out what it will take in terms of skills, content, and money to meet these goals.

- Work up a prototype of the project on paper to help you relate your ideas to the real world.

9.4 Task Planning

- Task planning involves:
• Designing the instructional framework.
• Holding creative idea sessions.
• Determining the delivery platform and authoring platform.
• Assembling the team.
• Building a prototype, producing audio and video, testing the functionality, and delivering the final product. Development

Prototype development
• Also known as a proof-of-concept or feasibility study.
• Involves testing of the initial implementation of ideas, building mock-up interfaces, and exercising the hardware platform.
• Trial calculations are possible after prototyping.
• A written report and an analysis of budgets allow the client some flexibility and also provide a reality check for developers.

9.5 Development
• Alpha development – At this stage, the investment of effort increases and becomes more focused. More people get involved.
• Beta development – At this stage, most of the features of a project are functional. Testing is done by a wider arena of testers.

9.6 Delivery
• In the delivery stage, the project is said to be “going gold.”
• The concerns shift towards the scalability of the project in the marketplace.

Scheduling
• Milestones are decided at this stage.
• The time required for each deliverable, that is the work products delivered to the client, is estimated and allocated.
• Scheduling is difficult for multimedia projects because multimedia creation is basically artistic trial and error.
• Scheduling is also difficult because computer hardware and software technology are in constant flux.
• At this stage, clients need to approve or sign off on the work created.

• Any revisions of previously approved material would require a change order.

• A change order stipulates that the additional cost of revising previously approved material should be borne by the client.

• When negotiating with a client, limit the number of revisions allowed.

**Estimating**

• Cost estimation is done by analyzing the tasks involved in a project and the people who build it.

• The hidden costs of administration and management are also included in the cost estimates.

• A contingency rate of 10 to 15 percent of the total cost should be added to the estimated costs.

• Time, money, and people are the three elements that can vary in project estimates.

• The time at which payments are to be made is determined and are usually made in three stages.

**Estimating**

• The billing rate should be equal to the total cost plus a reasonable profit margin.

• Typical billing rates for multimedia projects range from $60 to $150 an hour.

• Lower rates do not necessarily imply poor quality of work; they could rather mean lower overheads.

• The demand-supply mechanisms determine the prices.

• Contractors and consultants can be hired, but they should be billed at a lower rate.

• Ensure that contractors perform the majority of their work off-site and use their own equipment to avoid classifying them as employees. The categories of expenses incurred for producing multimedia are:

• Project development costs.
Production costs.
Testing costs.
Distribution costs.

Project Development Costs

These include:
- Salaries.
- Client meetings.
- Acquisition of content.
- Communication.

Project Development Costs
These include:
- Travel.
- Research.
- Proposal and contract prep.
- Overheads.

Production Costs

Production costs can further be classified as:
- Management costs.
- Content acquisition costs.
- Content creation costs.
- Graphics production costs.
- Audio production costs.
- Video production costs.
- Authoring costs.

Testing Costs

These include:
Distribution Costs

These include:

• Salaries
• Documentation
• Packaging
• Manufacturing
• Marketing
• Advertising
• Shipping

Estimating Hardware

• Hardware is the most common limiting factor for realizing a multimedia idea.
• List the hardware capabilities of the end-user’s platform.
• Examine the cost of enhancing the delivery platform.

The most common delivery platforms require a monitor resolution of 800X600 pixels and at least 16-bit color depth.

RFPs and Bid Proposals

Request for Proposals (RFPs)

• These are formal and detailed documents from large corporations who are “outsourcing” their multimedia development work.
• They provide information about the scope of work and the bidding process.
• They are generally not very detailed and specific.

RFPs and Bid Proposals

Bid proposals

• Should contain an executive summary or an overview.
• The backbone of the proposal is the estimate and project plan, which describes the scope of the work.
The cost estimates for each phase or deliverable milestone and the payment schedules should also be included.

Should contain the graphic and interactive goals of the project.

Prepare a brief synopsis if a project is complicated. RFPs and Bid Proposals.

Lists the terms and conditions of the contract.

The terms of a contract should include a description of the billing rates, invoicing policy, third-party licensing fees, and a disclaimer for liability and damages.

Design the proposal according to a client’s expectations. A proposal should appear plain and simple, yet business like.

A table of contents or an index is a straightforward way to present the elements of a proposal in condensed overview.

Need analysis and description describes the reasons the project is being put forward.

It is necessary to describe the target audience and the target platform.

Creative strategy – This section describes the look and feel of a project. This is useful if the reviewing executives were not present for the preliminary discussions.

Project implementation – This section contains a detailed calendar, PERT and Gantt charts, and lists of specific tasks with associated completion dates, deliverables, and work hours.

9.7 Summary

Before beginning a project, determine its scope and content.

The process of making multimedia involves idea analysis, pre-testing, task planning, development, and delivery.

Costs related to multimedia creation are categorized as project development costs, production costs, testing costs, and distribution costs.

Short Answer Type Questions

1. List out the stages of planning and costing.

2. What is Pre-testing.
3. What is task planning.

4. What is development.

**Long Answer Type Questions**

1. Explain briefly different stages of planning and costing.

2. Explain RFPs and Bid proposals.
10.1 Introduction

Multimedia technology is very important in today’s business world, not only just because of general communication, but also for effective communication. And in this lesson students are going to learn all the major areas that are completely influenced by multimedia technology in the cyber world.
### 10.2 Multimedia

Multimedia, or mixed-media, systems offer presentations that integrate effects existing in a variety of formats, including text, graphics, animation, audio, and video. Such presentations first became commercially available in very primitive form in the early 1980s, as a result of advances that have been made in digital compression technology particularly the difficult area of image compression. Multimedia online services are obtainable through telephone/computer or television links, multimedia hardware and software exist for personal computers, networks, the internet, interactive kiosks and multimedia presentations are available on CD-ROMs and various other mediums. The use of multimedia in our society has it benefits and it’s drawbacks, most defiantly. Some of the more computer-related uses of multimedia, such as electronic publishing, the internet, and computers in education will be discussed in depth thought this paper.

Electronic publishing is the publishing of material in a computer-accessible medium, such as on a CD-ROM or on the Internet. In a broader sense of the term it could also include paper products published with the aid of a desktop publishing program, or any form of printing that involves the use of a computer.

Reference works became available in the mid-1980s both in CD-ROM format and online. Increasingly, in the 1990s, magazines, journals, books, and newspapers have become available in an electronic format, and some are appearing in that format only. Companies that publish technical manuals to accompany their other products have also been turning to electronic publishing.

Electronic books have been recently introduced to the world as a whole. This new concept is the use of internet or otherwise computer technology to electronically convert books to a digital, readable format viewed on a television set or computer screen. This would most likely be done by scanning in individual pages in a book, arrange them in orderly fashion, and have users be able to cycle back and forth between the photo-identical pages. This method would be very quick, and very easy to accomplish that is scanning pages as opposed to re-typing millions of words is preferred. This brings us to another method in electronic book production- the interactive method. In digital format, the book’s pages can only be viewed, just like a book. If a reader would want to take notes from a book, he/she would have to write down the notes by hand, or would be forced to photo-copy the page(s). If the book was typed out entirely as would be done by an electronic word processor such as Microsoft Word, users would greatly benefit. The ability for the computer to recognize the words on the screen as actual words as opposed to mere bitmaps is often unrealized to the computer non-familiar.
This recognition allows the page to be edited with complete interactivity and ease again like Microsoft Word. Books can be updated or corrected in real time, without having to re-upload corrected pages, or compensate for unalignment in words and page breaks. Perhaps the most beneficial to the user is the interactivity - the ability to interact with the words in the book. By highlighting letters on the page, copying them, and pasting them in personal clipboards or other word processing programs, the tedious task of note-taking can be eliminated. This idea, on the other hand, can raise issues with the author and publisher of the book. Plagiarism, already a problem, would run wild in this area. Users would theoretically be able to copy entire books or magazines to their personal files, and be able to use them as their own reports or writings. Additionally, the ability to view a book and its contents at no charge obviously will not agree with some publishers. This also brings up the idea of charging people for time “online.” Users could be charged money for use of electronic books/magazines on a time basis. This, however, will not go over well in the public domain. We would rather take on the trouble of taking manual notes than be charged for something that is otherwise free at a library.

10.3 Internet and Multimedia

In a very short time the Internet has become a major vehicle of worldwide communication and an unrivaled source of information. One of the Internet’s fascinations is that its resources are limited only by the number of computers participating in the World Wide Web and the imaginations of their users.

The Internet is an international web of interconnected government, education, and business computer networks - in essence, a network of networks. From a thousand or so networks in the mid-1980s, the Internet had grown to about 30,000 connected networks in mid-1994. By mid-1995 the number of networks had doubled to more than 60,000, making the Internet available to an estimated 40 million people worldwide.

The Internet owes its unusual design and architecture to its origins in the US Defense Department’s ARPANET project in 1969. Military planners wanted to design a computer network that could withstand partial destruction (as from a nuclear attack) yet still function as a network. They reasoned that centralized control of the data flow through one or a few hub computers would leave the system too open to attack. Every computer on the network should be able to communicate, as a peer, with every other computer on the network.

Thus if part of the network was destroyed, the surviving parts would automatically reroute communications through different pathways. Because many factors - power outages, overtaxed telecommunications lines, equipment failure-
can degrade a network’s performance, the ARPANET solution was also attractive to networkers outside the military.

The Internet is also a repository of information for businesses. Thousands of discussion groups with specialized interests—in topics ranging from aeronautics to molecular biology—share data across the Internet. The US government posts more and more information, such as Commerce Department data and new patent filings, on the Internet. Additionally, many universities are converting large libraries to electronic form for distribution on the Internet. One of the most ambitious examples is Cornell University’s ongoing project to convert 100,000 books, printed over the past century, on the development of American infrastructure—books on bridges, roads, and other public works.

Some businesses have also begun to explore advertising and marketing on the Internet. Thus far results have been mixed. Protection of copyrighted material is a problem, because anyone can download data from the Internet.

Some companies have explored encrypting data for sale on the Internet, providing decoding keys only to buyers of the data, but this scheme will not prevent the buyers from repackaging and reselling the data. However, the companies are very reluctant to deny the lure the Internet generates. Any customer from around the world could log on to a company site, get information in seconds, and even order directly through the company’s server.

The recent development in modem speeds have also allowed businesses to elaborately cram web sites with spectacular multimedia effects, drawing surfers in young and old. Advertising on the internet is relatively cheap (compared to television) and is very specialized and often more effective.

Companies can choose to advertise on certain high hit rate sites that pertain to that company’s field. This makes the advertisement seen by more of it’s target audience, and as a result, the advertisement will be more effective.

The explosive growth of the Internet has been fueled by individual users with modem-equipped personal computers. Most of these users subscribe to local networks that provide a connection to the wider Internet. As well, a lot of users (including myself) choose to use direct-connection service providers. Unlike separate networks like AOL, the direct service providers often have less users, thus increases the speed of the T1 connection. Many users, as well as businesses, can create their own “home pages”—points of access that allow anyone on the Internet to download information from the personal computer. The prime cause of the Internet explosion, however, has been the development of the World Wide Web service: a collection of several thousand independently owned computers, called Web servers, that are scattered worldwide. Using software
programs such as Mosaic and Netscape, individuals can enter the World Wide Web and “browse” or “surf” the Internet with increasing ease and rapidity through a system of hypertext links. This is perhaps the most exiting part about the internet. You can visit any website you like, wherever it is located at no extra charge, and download files and view great multimedia effects at any time. Though greatly over-hyped as the “Information Superhighway,” the Internet will become increasingly more interactive and will play a much more significant role in the future.

Since their introduction in schools in the early 1980s computers and computer software have been increasingly accessible to students and teachers in classrooms, computer labs, school libraries, and outside of school. By the mid-1990s there were about 4.5 million computers in elementary and secondary schools throughout the United States. Schools buy Macintosh and IBM-compatible computers almost exclusively (though mostly Macs, dang it!!), although nearly half of their computers are based on older designs such as the Apple IIe. Students spend on the average an hour per week using school computers. Though this depends on the student

Computers can be used for learning and teaching in school in at least four ways. First, learning involves acquiring information. Computers- especially linked to CD-ROMs and video disks that electronically store thousands of articles, visual images, and sounds- enable students to search the electronic equivalent of an encyclopedia or a video library to answer their own questions or simply to browse through fascinating and visually appealing information.

Second, learning involves the development of skills like reading and mathematics skills that are greatly learned on computers in basic forms. Software called computer-assisted instruction, or CAI, asks questions to students and compares each answer with the single correct answer a very basic program. Typically, such programs respond to wrong answers with an explanation and another, similar problem. Sometimes CAI programs are embedded in an entertaining game that holds student interest and yet keeps student attention on academic work. Most CAI programs cover quite limited material, but some larger-scale reading and mathematics programs have been developed.

Third, learning involves the development of a wide variety of analytic understandings. Computers help students reach these goals through software such as word processors, graphing and construction tools, electronic painting and CAD programs, music composition programs, simulations of social environments, and programs that collect data from science laboratory equipment and aid in analysis.
Finally, a large topic in learning is communicating with others finding and engaging an audience with one’s ideas and questions. Several types of computer software can be used in schools for communications: desktop publishing and image-editing software for making professional quality printed materials, computer programming languages such as BASIC or Pascal or C for creating interactive computer exercises, and telecommunications software for exchanging ideas at electronic speeds with students in other classrooms all over the world.

The computer in education can pose great benefits to the student, but to a limited extent. The computer must be used as a tool, and not as a teacher. It should be thought of as an educational assistant (in the school setting) and not a game machine. Computers have unlimited possibilities, and we should incorporate them into our schools. But in doing this, we must realize that computers should not be the main focus, education and the quality of the teachers should be. For any case, without solid teaching and instruction, computers and other such resources become useless.

**Short Answer Type Questions**

1. What is Multimedia.
2. What is Internet.

**Long Answer Type Questions**

1. Explain briefly about Multimedia
2. Explain briefly about Internet.