



**MALLA REDDY ENGINEERING COLLEGE**  
(A UGC Autonomous Institution, Approved by AICTE, New Delhi & Affiliated to JNTUH,  
Hyderabad). Accredited 2<sup>nd</sup> time by NAAC with 'A<sup>+</sup>' Grade,  
Maisammaguda (H), Medchal-Malkajgiri District, Secunderabad- 500100.  
Telangana State. [www.mrec.ac.in](http://www.mrec.ac.in)

## REQUISITION LETTER

Date: 02/04/2022

To

The Principal,  
Malla Reddy Engineering College (Autonomous),  
Maisammaguda, Dhulapally,  
Secunderabad – 500100.

Respected Sir,

**Sub.: Seeking – Permission for conducting five Days Value added Course on Microsoft Technology Associate - Multimedia.**

We would like to bring to your kind notice that, we are planning to conducting a value Added Course on  
“Microsoft Technology Associate - Multimedia from 18.04.2022 to 23.04.2022. In this regard, I  
request you to kindly request you to give approval with support for the logistics and other requirements in  
order to conduct the event.

Thank you Sir,

Yours sincerely,

**HOD CSE (AIML)**

**Principal**

**Malla Reddy Engineering College  
Maisammaguda, Dhulapally,  
(Post Via Kompally), Sec'bad-500100.**



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(An UGC Autonomous Institution, Approved by AICTE and  
Affiliated to JNTUH, Hyderabad)  
Accredited 3<sup>rd</sup> time by NAAC with 'A++' Grade,  
Maisammaguda (H), Medchal - Malkajgiri District, Secunderabad--.  
Telangana State-500100.Website: www.mrec.ac.in

Date: 13/04/2022

## CIRCULAR

All the Students are here by informed that value Added Course on “Microsoft Technology Associate on Multimedia” is being organized by the department of Computer Science & Engineering (AIML) on 18.04.2022 to 23.04.2022. The resource person for this course is Ms N Hemalatha, Skiltemate Technologies.

Students are advised to register their names to the program coordinator Mr D Krishna Kishore, Associate Professor, CSE-AIML Department, on or before 16/04/2022 and utilize this opportunity to enhance their skills by attending the programme.

The detailed schedule of the programme will be displayed in the notice board

  
HOD CSE-AIML

Copy to:

1. Circulation in students class room

2. All HoD's

3. Notice Board

4. PA to Principal for filling

  
Principal  
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### About Institute

Malla Reddy Engineering College (Autonomous) is one of the reputed engineering colleges in Hyderabad, Telangana established in 2002. MREC (A) is part of Malla Reddy Group of Institutions (MRGI), founded by Sri. Ch. Malla Reddy Gaaru, currently Hon'ble Minister of Labor & Employment, Factories, Govt. of Telangana State. The college is situated in a serene, lush green environment in Maisammaguda, Gundlapochampally, Medchal (M), Medchal I- Malkajgiri District Telangana-500100.

MREC (A) is skillfully and smartly guided by Dr. A. Ramaswami Reddy, Principal, MREC (A) which is affiliated to JNTUH and an autonomous institution approved by UGC & JNTU Hyderabad first in Telangana state in 2014 for a period of 6 years from 2014-2020. The college is re-accredited by NAAC with 'A' Grade (II Cycle). Our eligible UG and PG programs received NBA accreditation twice. The college caters to wide ranging aspirations and goals of student communities by offering regular programs in various streams of Engineering and Management.

It provides world-class infrastructure facilities like R&D, Incubation Centre, EDC, IIC, IPR, Start ups, Centre of Excellence, Innovation Council, many clubs for Faculty & Students and well-equipped laboratories in all departments

### CHIEF PATRON

**Sri.Ch.Malla Reddy, M.L.A**

Minister of Labour, Employment, Women and Child Development

Founder Chairman, CMR Educational Society

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### CO-PATRON

**Dr.A. Ramaswami Reddy**

Principal, MREC(A), Hyderabad.

### CONVENER

**Dr.R Ramesh Kumar**

Professor, HOD

Department of Computer Science and Engineering – AIML

### RESOURCE PERSON

**Ms N Hemalatha,**  
**Skiltemate Technologies**

**Five Day Value added Course**  
**On**

**Microsoft Technology**  
**Associate - Multimedia**  
**18.04.2022 to 23.04.2022**



Organized by  
**Department of Computer**  
**Science and Engineering –**  
**AIML**

**MALLA REDDY ENGINEERING COLLEGE**

**(AUTONOMOUS)**

(An UGC Autonomous Institution, Approved by  
AICTE and Affiliated to JNTUH Hyderabad,  
Recognized under section 2(f) & 12 (B) of UGC Act  
1956, Accredited by NAAC with 'A++' Grade (III  
Cycle) and NBA) Maisammaguda,  
Secunderabad-500100

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## UNIT - III

### Introduction to Multimedia

#### Aims and 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

#### 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.

#### Definition

**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.

#### Elements of Multimedia System

Multimedia means that computer information can be represented through audio, graphics, image, video and animation in addition to traditional media(text and graphics). Hypermedia can be considered as one type of particular multimedia application.

#### 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.

#### 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 web sites like photo galleries with both images (pictures) and title (text) user-updated, to simulations whose co-efficient, events, illustrations, animations or videos are modifiable, allowing the multimedia "experience" to be altered without reprogramming.

### **Applications 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:

#### **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.

#### **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 live-up training. Commercial multimedia developers may be hired to design for governmental services and nonprofit services applications as well.

#### **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*.

#### **Education**

In Education, multimedia is used to produce computer-based training courses (popularly called CBTs) and reference books like encyclopaedia 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.

#### **Engineering**

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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.

#### **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.

#### **Mathematical and 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.

#### **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.

#### **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.

### **Convergence of Multimedia (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 Creek, 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.

### **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.

**Let us sum up**

In this lesson we have discussed the following points:


- i) Multimedia is a woven combination of text, audio, video, images and animation.
- ii) Multimedia systems finds a wide variety of applications in different areas such as education, entertainment etc.
- iii) The categories of multimedia are linear and non-linear.
- iv) The stages for multimedia application development are Planning and costing, designing and producing, testing and delivery.

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### **Text**

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**Aims and Objectives**

  
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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

## 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.

## 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 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.
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.

## 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.

  
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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.

(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 type faces can be used in a single presentation, this concept of using many fonts in a single page is called ransom-note typography.

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.

### Computers and text:

#### 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.

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 anti-aliasing. 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.

### 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.

### 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

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

### 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 |

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

3D Studio Max

Flash

AnimationPro

  
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## **Video**

### **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 post-production houses remain greatly invested in analog video hardware (according to Sony, there are more than 350,000 Betacam 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.

### **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.

#### **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  $1/30^{\text{th}}$  of a second by a fast-moving electron beam.

#### **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.

#### **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.

#### **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.

  
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## 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.

### Video Tips

A useful tool easily implemented in most digital video editing applications is "blue screen," "Ultimate," or "chroma 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.

### Recording Formats

#### 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.


#### 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."

### 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, videodisk 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.

  
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## 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, P\*64, 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.

### 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, multiresolution scalability, and multichannel audio features.

### DVI/Indeo

DVI is a proprietary, 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.

### 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. CD-ROM players offer slow data transfer rates, but adequate video transfer can be achieved by taking care to properly prepare your digital video files.

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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.

### Let us sum up .

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

- Animation is created from drawn pictures and video is created using real time visuals.

- Animation is possible because of a biological phenomenon known as *persistence of vision*

- 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.

  
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## **Character set and alphabets:**

### **ASCII Character set**

The American standard code for information interchange (ASCII) 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.

### **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 8<sup>th</sup> 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.

### **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.

## **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, truetype 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.

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### 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 consist 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.

### Let us sum up.

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.

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## Lesson 3      Audio

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### Aims and 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

### Introduction

  
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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 mood-setting background. Sound is the terminology used in the analog form, and the digitized form of sound is called as audio.

### **Power of Sound**

When something vibrates in the air 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.

### **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.

### **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  $n^{\text{th}}$  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.

#### **3.4.1 Preparing Digital Audio Files**

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

The first step is to digitize the analog material and recording it onto a computer readable digital media.

It is necessary to focus on two crucial aspects of preparing digital audio files:

- Balancing the need for sound quality against your available RAM and Hard disk resources.
- Setting proper recording levels to get a good, clean recording.

Remember that 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.

#### 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.

### **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 wordly 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.

  
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## 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 simplify 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.

## 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 both 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

Red Book Standard

  
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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.

### **Software used for Audio**

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

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

### **Let us sum up**

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

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## **Lesson 4      Images**

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### **Aims and 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

### **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

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

## 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).

## 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.

### Captured Image Format

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

### 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.

## 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.

### 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.

### 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.

### 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.

### 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.

  
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***Figure: The Windows Paint accessory provides rudimentary bitmap editing***

  
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## 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.

## 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.

## 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

## 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.

## 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.

### 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

### 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).

### Image File Formats

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

| Format                   | Extension       |
|--------------------------|-----------------|
| Microsoft Windows DIB    | .bmp .dib .rle  |
| Microsoft Palette        | .pal            |
| Autocad format 2D        | .dxf            |
| JPEG                     | .jpg            |
| Windows Meta file        | .wmf            |
| Portable network graphic | .png            |
| Compuserve gif           | .gif            |
| Apple Macintosh          | .pict .pic .pct |

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## Lesson 5      Animation and Video

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### 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.

### 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






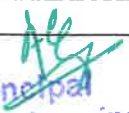
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| 20   | 20J41A6620   | GAJJALA SHASHANK REDDY   | II - UG     | MREC    |

  
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| 33 | 20J41A6633 | MANIKONDA SHASHMITH              | II - UG | MREC |
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| 39 | 20J41A6639 | O ABIJAY REDDY                   | II - UG | MREC |
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| 44 | 20J41A6644 | PADMA ANJANI KUMAR               | II - UG | MREC |
| 45 | 20J41A6645 | PATAN MANSOOR KHAN               | II - UG | MREC |
| 46 | 20J41A6646 | PATLOLLA VIKAS KUMAR             | II - UG | MREC |
| 47 | 20J41A6647 | POTABATTUNI BHRAMARA             | II - UG | MREC |
| 48 | 20J41A6648 | PUSULURI SHIVARAMA KRISHNA       | II - UG | MREC |

  
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**Malla Reddy Engineering College**  
**Malsammaguda, Dhulepally,**  
**(Post Via Kompally), Sec'bad-500100.**

|    |            |                           |         |      |
|----|------------|---------------------------|---------|------|
| 49 | 20J41A6649 | RAVI YASHASWI             | II - UG | MREC |
| 50 | 20J41A6650 | SALIPELA KUSHWANTH REDDY  | II - UG | MREC |
| 51 | 20J41A6651 | SARUGU DEVI VARA PRASAD   | II - UG | MREC |
| 52 | 20J41A6652 | SURA PREETHAM             | II - UG | MREC |
| 53 | 20J41A6653 | TANNA RAGHAV SANJAY       | II - UG | MREC |
| 54 | 20J41A6654 | TEJAVOTH RAJKUMAR         | II - UG | MREC |
| 55 | 20J41A6655 | THANNIRU ABHILASH         | II - UG | MREC |
| 56 | 20J41A6656 | TIRTHANGKAR ROY           | II - UG | MREC |
| 57 | 20J41A6657 | TIRUKOVELA MADHAV SAI     | II - UG | MREC |
| 58 | 20J41A6658 | VELAGALA SUMANTH REDDY    | II - UG | MREC |
| 59 | 20J41A6659 | VADNALA SAGAR             | II - UG | MREC |
| 60 | 20J41A6660 | Y HRUSHIKESH REDDY        | II - UG | MREC |
| 61 | 21J45A6601 | HARI PRASAD               | II - UG | MREC |
| 62 | 21J45A6602 | HARIHARAN BRAHMANDLAPALLY | II - UG | MREC |
| 63 | 21J45A6603 | KORAVENA ANIL KUMAR       | II - UG | MREC |
| 64 | 21J45A6604 | MANDIGI SRIKANTH          | II - UG | MREC |
| 65 | 21J45A6605 | NANIPALLI VENKATA GANESH  | II - UG | MREC |
| 66 | 21J45A6606 | VIPPARTHI VAMSI           | II - UG | MREC |

  
**Co-Ordinator**

  
**HOD CSE - AIML**

  
**Principal**  
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Maisammaguda (H), Medchal - Malkajgiri District, Secunderabad--.  
Telangana State-500100.Website: www.mrec.ac.in

**Five Day value added Course**  
**on**  
**"Microsoft Technology Associate - Multimedia"**  
**Certified students List**

| S.No | Student Name | Roll No                 | Student yr. | Certified |
|------|--------------|-------------------------|-------------|-----------|
| 1    | 20J41A6601   | ADDULA SHASHIDHAR REDDY | II - UG     | Yes       |
| 2    | 20J41A6602   | ALTHAF JAFFERY MD       | II - UG     | Yes       |
| 3    | 20J41A6603   | ALUKONDA NIKITHA        | II - UG     | Yes       |
| 4    | 20J41A6604   | ALWAL DHANA SHREE       | II - UG     | Yes       |
| 5    | 20J41A6605   | ANANTHANENI MOUNIKA     | II - UG     | Yes       |
| 6    | 20J41A6606   | AVUNOORI RAJEEV         | II - UG     | Yes       |
| 7    | 20J41A6607   | BODAPOTHULA VINUTHNA    | II - UG     | Yes       |
| 8    | 20J41A6608   | BURLA SAI NIHAL         | II - UG     | Yes       |
| 9    | 20J41A6609   | CHOPPAKATLA SRI HARSHA  | II - UG     | Yes       |
| 10   | 20J41A6610   | CHADA AKSHAYA           | II - UG     | Yes       |
| 11   | 20J41A6611   | CHANDA SRINIDHI         | II - UG     | Yes       |
| 12   | 20J41A6612   | CHEGIREDY CHERISH REDDY | II - UG     | Yes       |
| 13   | 20J41A6613   | CHINTALAPUDI ANANDHINI  | II - UG     | Yes       |
| 14   | 20J41A6614   | CHINTHAM SAI RISHI      | II - UG     | Yes       |
| 15   | 20J41A6615   | CHIPPADA SNEHA MANASA   | II - UG     | Yes       |
| 16   | 20J41A6616   | D MARK PREETHAM         | II - UG     | Yes       |
| 17   | 20J41A6617   | DASARI SAIPRANAV        | II - UG     | Yes       |
| 18   | 20J41A6618   | DUSSA VIGNAN SAI RAM    | II - UG     | Yes       |
| 19   | 20J41A6619   | ENJAM ABHIRAM REDDY     | II - UG     | Yes       |
| 20   | 20J41A6620   | GAJJALA SHASHANK REDDY  | II - UG     | Yes       |

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|    |            |                                  |         |     |
|----|------------|----------------------------------|---------|-----|
| 21 | 20J41A6621 | GANGARAPU DIVYA JYOTHI           | II - UG | Yes |
| 22 | 20J41A6622 | GANTA NIKHIL RAJ                 | II - UG | Yes |
| 23 | 20J41A6623 | GK SHASHIDHAR REDDY              | II - UG | Yes |
| 24 | 20J41A6624 | JADHAV SHIVAJI RAO               | II - UG | Yes |
| 25 | 20J41A6625 | JAPATHI SAHITH                   | II - UG | Yes |
| 26 | 20J41A6626 | KANDI TANUJ ROHAN                | II - UG | Yes |
| 27 | 20J41A6627 | KATIKEY REVATHI RUCHITHA         | II - UG | Yes |
| 28 | 20J41A6628 | KATRAGADDA SRI GOWTAMI           | II - UG | Yes |
| 29 | 20J41A6629 | KAVALAGARI DIVYA TEJ REDDY       | II - UG | Yes |
| 30 | 20J41A6630 | KOMMARI MALLIKARJUN              | II - UG | Yes |
| 31 | 20J41A6631 | MACHERLA BHAVYA SRI              | II - UG | Yes |
| 32 | 20J41A6632 | MAJETI SAI SRI RAM               | II - UG | Yes |
| 33 | 20J41A6633 | MANIKONDA SHASHMITH              | II - UG | Yes |
| 34 | 20J41A6634 | MANOJNA BALA BHUVANAGIRI         | II - UG | Yes |
| 35 | 20J41A6635 | MITTAPALLI MOHAN KRISHNA         | II - UG | Yes |
| 36 | 20J41A6636 | MOHD ISMAIL                      | II - UG | No  |
| 37 | 20J41A6637 | NAGULA CHANDANA                  | II - UG | Yes |
| 38 | 20J41A6638 | NOMULA SAICHANDANA               | II - UG | Yes |
| 39 | 20J41A6639 | O ABIJAY REDDY                   | II - UG | Yes |
| 40 | 20J41A6640 | ORAMPATI GAYATHRI REDDY          | II - UG | Yes |
| 41 | 20J41A6641 | PEDDIGARI VARDHAN                | II - UG | Yes |
| 42 | 20J41A6642 | PADALA LAKSHMI NARASIMHA ROHITHA | II - UG | Yes |
| 43 | 20J41A6643 | PADARTHI GAGAN SAI               | II - UG | Yes |
| 44 | 20J41A6644 | PADMA ANJANI KUMAR               | II - UG | Yes |
| 45 | 20J41A6645 | PATAN MANSOOR KHAN               | II - UG | Yes |
| 46 | 20J41A6646 | PATLOLLA VIKAS KUMAR             | II - UG | Yes |
| 47 | 20J41A6647 | POTABATTUNI BHARAMARA            | II - UG | Yes |

|    |            |                            |         |     |
|----|------------|----------------------------|---------|-----|
| 48 | 20J41A6648 | PUSULURI SHIVARAMA KRISHNA | II - UG | Yes |
| 49 | 20J41A6649 | RAVI YASHASWI              | II - UG | Yes |
| 50 | 20J41A6650 | SALIPELA KUSHWANTH REDDY   | II - UG | Yes |
| 51 | 20J41A6651 | SARUGU DEVI VARA PRASAD    | II - UG | Yes |
| 52 | 20J41A6652 | SURA PREETHAM              | II - UG | Yes |
| 53 | 20J41A6653 | TANNA RAGHAV SANJAY        | II - UG | Yes |
| 54 | 20J41A6654 | TEJAVOTH RAJKUMAR          | II - UG | Yes |
| 55 | 20J41A6655 | THANNIRU ABHILASH          | II - UG | Yes |
| 56 | 20J41A6656 | TIRTHANGKAR ROY            | II - UG | Yes |
| 57 | 20J41A6657 | TIRUKOVELA MADHAV SAI      | II - UG | Yes |
| 58 | 20J41A6658 | VELAGALA SUMANTH REDDY     | II - UG | Yes |
| 59 | 20J41A6659 | VADNALA SAGAR              | II - UG | Yes |
| 60 | 20J41A6660 | Y HRUSHIKESH REDDY         | II - UG | Yes |
| 61 | 21J45A6601 | HARI PRASAD                | II - UG | Yes |
| 62 | 21J45A6602 | HARIHARAN BRAHMANDLAPALLY  | II - UG | Yes |
| 63 | 21J45A6603 | KORAVENA ANIL KUMAR        | II - UG | Yes |
| 64 | 21J45A6604 | MANDIGI SRIKANTH           | II - UG | Yes |
| 65 | 21J45A6605 | NANIPALLI VENKATA GANESH   | II - UG | Yes |
| 66 | 21J45A6606 | VIPPARTHI VAMSI            | II - UG | Yes |

  
 Co-Ordinator

  
 HOD CSE - AIML

  
 Principal  
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### Certificate

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