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INTRODUCTION TO MULTIMEDIA

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BLOCK INTRODUCTION

This block introduces Multimedia technologies. Multimedia is one of the most important technologies since significant number of years. There are three units in this block.

Unit 1- provides An Overview of Multimedia. It introduces the concept of Multimedia, hardware and software that is required for a Multimedia computer, components of Multimedia as well as the three basic principles of development of Multimedia based projects.

Unit 2 – discusses various Applications of Multimedia. Different application areas such as entertainment, business communications etc. are discussed in this unit. Also, included in this unit are the concepts for Distributed Learning Environment.

Unit 3 – focuses on Multimedia Authoring Tools. The features that need to be supported by authoring software are given. Also, various authoring tools are discussed.



UNIT 1 AN OVERVIEW OF MULTIMEDIA

Structure

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1.0 INTRODUCTION

Multimedia has become a popular technology in the ever-changing world of computers. Since last few years, it seems to be much sought after and talked about not only in the world of Information Technology, but also in various functional fields like advertisement, corporate sector, cinema, fashion design and education to name a few. More and more research work on this new technology of sound animation and text, is making it better and better with, every passing day. It is one of the most realistic way of working even for people having no knowledge of computers. It targets people from almost all ages of life from a toddler to an aged one. In fact, it does not have any lower or upper limit for its target audience.

1.1 OBJECTIVES

After going through this unit, you will be able to:

- define the basic concept of multimedia;
- appreciate multimedia as a new chapter in information technology;
- identify and describe various components of multimedia like, sound, animation and graphics;
- discuss various hardware requirement for multimedia; and
- describe how images and sound works in multimedia.

1.2 MULTIMEDIA: THE CONCEPT

With the fast growing technology the computational speed and data communication media are enhancing rapidly. Thus it is not surprising that many multimedia-related applications are emerging. But what is Multimedia? How is it related to computer and communication speed? Let us try to answer these questions.

The term multimedia is often associated with the information superhighway, or with interactive TV that can produce videos (information on demand) or with hypermedia. In fact, there is a lot of confusion about the definition of multimedia. However, multimedia can be considered as text, graphics, images, video and audio in computer. One of the key feature of multimedia is Interactively. It may, convey enriched interactive information to its users.

Some people visualise multimedia as a combination of computer and TV, whereas, another definition considers it as a new generation of computer application where newer hardware and software architectures are needed.

About the above definitions no body is sure, whether multimedia is a computer itself or a computer software product. In practical sense, it is the combination of both. The fact remains that it has the best potential to be one of the most powerful form of communicating ideas, searching for information and experiencing new concept of common media ever developed.

The basic advantage of multimedia over the conventional form of media which uses sound, graphics and text for example TV, audio etc. is the interactive feature of multimedia. For example, a multimedia version of news bulletin would be the situation where you can request the broadcaster the type of news you are interested in, when you want to hear it, and with the press of a button or click of the mouse You can hear the news.

Non-availability of a wide range of multimedia products in the market was one of the strong reason that it remained a mystery to the general public. However, as the costs have reduced and product functionality increasing, the multimedia is here to stay. It may become part of our everyday life just like the PCs. For achieving these goals, several important technologies are being developed to solve, the problems associated with multimedia applications and interactive TV services to the home.

Some of these technologies are video servers, multimedia groupware, network resource management, and hypermedia courseware etc. Some of the new products are being equipped with real-time video-compression system. A newer broadband systems based on MPEG (Moving Picture Expert Group) standard, will allow transmission of several video signals using a single satellite transponder. Flow communication terminals, also known as digital set-top boxes, are equipped with computer capabilities offering features such as on-screen interactive program guides, near movie on-demand capability, and personalised information channels. These home communication terminals will soon feature robust graphics and full user interactivity as well as MPEG-based video, all controlled and managed by an open architecture operating system running on a set-top box.

But if you think a bit seriously, you can see one way or the other, multimedia has started creeping into our day to day life in various forms, and information has started becoming available; in the digital format. Please note, when the information is stored in the digital format we get a lot of flexibility in handling it. It can be edited according to specific requirement processed and produced in various style and taste.

Multimedia is interactive, non-linear media in comparison to broadcast television. In addition, it may provide a user with several meaningful paths. Thus, it is the interaction between user and information that makes it a very powerful media for activities that require the process of communicating information, such as education and training, reference material, business presentations, manuals, multimedia databases, geographic information system, advertising, documentaries and so on. The basic component of multimedia can be used for:

- The text can be used for adding emphasis
- Graphics provides a visual impact. It is generally said that a picture is worth a thousands words. Thus, graphics can be used for enhancing a presentation.
- Voice tries to enhance a presentation to the extent that a presentation moves on to the form of persuasion. Many people wants to listen about a particular topic rather than reading about it.
- The animation can be used effectively for attracting attention. Animation also makes a presentation light, thus, can be used for presentation of several complex subjects. It is also a tool which helps in focussing attention, for example, a chart if drawn through animation may be focussed on to quickly.
- The video part of multimedia can be used as a powerful communicator providing clear cut instructions.

Use of multimedia in various applications can be justified by the levels of user friendliness, it provides (to its) user with its interactivity and customisation. Multimedia is widely used now a days in various applications and business is one of them. As the market competition is increasing with the introduction of better products in the market everyday, it has become absolutely necessary to provide better service and timely information to your client in a brief, precise and more understandable manner in a short time. Multimedia provides various ways to maintain a competitive edge for a company specially in training, market speculation and public relation.

The interactive feature of multimedia brings life to the business presentations, where one call present various aspects of a business such as, marketing plan for a new product. its impact in the market consumer reaction etc. simultaneously or even you can combine all these to make the assessment of the consumer feedback on the product launching. The information which is digitised in makes it more assessible as compared to the conventional ways of presentation using video, chart etc., where you can't edit or modify whatever is already video taped. Even if you do it, the cost involved will be high. Now a days, business organisations have already started creating powerful databases that can store and distribute digital media as easily as text.

Another critical application of multimedia is educational sector. It enchaces the quality of education. It provides new way for teacher to encourage one of the most rare and important element of learning i.e., curiosity to know and explore. Topics can be linked with other, related information. Linking is possible with graphics, text and sound (may be a lecture session from the subject teacher and so on).

With a large screen projector and a multimedia playback system, teachers can use multimedia as a way to enhance their standard lesson plan and stimulate questions. On the other hand students will be able to further explore the topics using standard multimedia platform. The assignments which require students to make their own interpretation of facts, can be represented in the multimedia topics. There are several applications possible in the area of education using multimedia. The use of multimedia in education would go a long way. We will discuss more about its applications in the next unit.

In a complete sense pictures, graphics, text and sound is the essence of multimedia and it provides the user friendly environment with most flexible interactive facilities.

1.3 HARDWARE FOR MULTIMEDIA COMPUTER

As discussed in the previous section a multimedia system consist of several media. The computer manufacturer have brought the Multimedia Computer technology to the forefront.

A typical multimedia computer usually include devices like CD-ROM player, sound card such as Sound Blaster, Master Blaster and some times a microphone and a range of multimedia software. And probably with either MIDI (Musical Instrument Digital Interface) a standard interface can be in hardware or software which is used for playing a digital instrument through PC interface on the card as an add on utility. Let us look into the requirements of hardware for a multimedia PC. Figure 1 gives the diagram of such requirements.

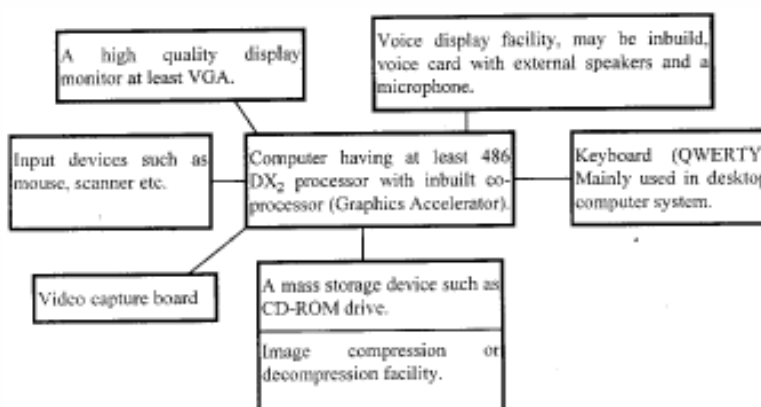


Figure 1: Requirements of Multimedia Computer

One cannot record video using such a system. For doing recording one require additional equipments such as video camera. However, once various components of multimedia are recorded in the required format, this machine can be used to put various pieces together to form a multimedia information systems. The software tools required for such production are discussed in the next unit. Many multimedia machines however are equipped to record sound. Let us explore more about the hardware related to multimedia technology

1.3.1 The CPU

The CPU which is recommended for a multimedia computer should be Pentium processor on a PC or other advanced chips such as PowerPC etc. Apple Macintosh and Silicon graphics have their own set of powerful processors for multimedia. However, the CPU of multimedia computer should be at least 486 with math co-processor attached otherwise the response time of multimedia will be poor. The co-processor chip greatly reduces the load of the CPU. The powerful co-processor chip added for supporting graphics is called graphics accelerator. The memory capacity for such a machine should be 8 MB or above. A 16 MB memory enhances the performance of a Multimedia machine by 50% over 8 MB machines.

1.3.2 The Monitor

The multimedia PC should be equipped with a monitor having Super Video Graphics Arrays (SVGA) card. The basic advantage of having SVGA is that it has a better resolution, thus, the display will be of better quality for the graphics and pictures. A typical representation which may be used in multimedia can be 720x640 or 1200x680 etc.

1.3.3 Input-Output Devices

Keyboard and Mouse are two important components for any multimedia PC. Since multimedia computers are accessed using a graphical user interface, therefore, mouse is an essential input device for it. Here special mention is to be made about two important input-output devices. These are the sound speakers which produces sound output and microphones which are used for on-line recording of sound using various multimedia software. In addition to this, multimedia also supports MIDI interface, thus, a digital musical instrument can be connected to it on the socket provided for it. This audio interface normally allows data transmission using DMA channels, that is, it does not require the intervention of the CPU while transferring digital data to memory.

Some of the newer machines are coming up with a TV board which is installed inside the computer and allows connection of VCR/Video Camera/Cable connection. This TV board can be operated with the help of software which are normally provided with this board. Thus, you can watch TV programmes on the multimedia machine. However, please note that this interface does not allow digital recording of video on to your computer. This interface is meant only for the purpose of display. If you want to capture these video frames a video capture board is to be added in the multimedia PC.

CD-ROM is a very important storage device which has become an essential component of a multimedia computer because of its mass storage capacity and portability. A CD-ROM drive is a common hardware component of a multimedia computer. We will be providing more details on it in the next subsection. A scanner can also be used along with a multimedia PC for scanning the pictures and putting them in digitised form in the computer.

1.3.4 CD-ROM

Multimedia uses digitised audio and video which not only take huge amount of storage space, but also required high speed storage media, which can send large amount of data back and forth quickly to keep audio and video playing and recording smoothly.

Because of this requirement most of multimedia packages uses hard disk drive which offer high speed, high data throughput and plenty of storage devices like 1 GB or more. Sometimes, two or more hard disk drive are used as an array to work together so that they act like a single hard drive.

However using a disk array of two or more disk for multimedia storage, can no doubt boost the processing speed for the multimedia element, but these are not durable in nature. Magnetic optical disk media offer large amount of storage in a durable package. CD-ROM is now widely used for multimedia storage as it has an amazing amount of flexibility and potential as a multimedia storage and distribution medium. One CD-ROM can hold up to one and half hour of digital audio or around 700 to 750 MB of computer data for that matter.

To install a CD-ROM drive, there must be a free drive bay and the computer system also have a sound card installed or a square slot into which either a sound card or CD-ROM drive can be placed. Before installation all the jumper settings should be properly done according to the specification. Once the CD-ROM drive is fitted in the drive bay with proper jumper settings, necessary software can be installed to make the CD-ROM drive work.

As far as CD-ROM is concerned, the main feature of it is the huge storage space and very high immunity from damage. It is easy to locate different pieces of data in CD-

ROMS, so that comparatively simple software can be used to guide the laser beam to find what is required.

1.3.5 Sound Card

Sound output from a computer has been a feature of machines usually used for sending warning error message or games. If better quality and capabilities for sound output or inputs are required, then there must be a device which can be added to the basic machine. This device is known as Sound Card which is added to the basic machine by inserting it in free slot. The most common reason for adding a sound card to a PC is to be able to use multimedia fully by recording and playing back the digital audio. While selecting an add on sound card, quality of sound from the loudspeaker has to be taken into consideration and the software provided with a sound card should be adequate enough to suit your requirements for handling sound effects in multimedia.

While installing a sound card one should keep in mind that it should not conflict with any other external devices installed in the computer system. Installation of sound card might require some default settings to be changed to make it compatible with the computer system.

Once all the settings are done correctly, place the card in a free slot and check all the connected cables to ensure that all connections are fitted properly. After this task is over, run the designated installation software to install the sound card i.e. to make necessary changes in the computer software settings.

The most common element of software is the install program which install drivers to work with the sound card. In addition to adding drivers, the installation program modify the AUTOEXEC.BAT and CONFIG.SYS so as to activate the sound card when the computer is switched on.

1.3.6 Laser Disc

Like CD-ROM, a laser disc uses the same recording media. It can record and play back high quality digital audio files. As compared to the CD-ROM, a laser disc can play back four channels at a time (two digital and two analog channels) whereas CD-ROM can play only two channel at a time. But the biggest difference between them is that laser disc stores video in analog form.

The disadvantages of using a laser disc is like any other video source. The only plus point being that you can access video from any location on the disk. The older multimedia systems used to have a laser disc under computer control for playing video, they used to have a separate TV screen in addition to a computer screen.

CD-ROM stores digital data on only one side of the disc, whereas the laser disc stores an analog video signal on both sides of the disc

Check Your Progress 1

State True or False:

- 1) Interactive Video does not fit in the category of Multimedia. True False
- 2) MPEG is a standard used for compression of audio in multimedia. True False

- 3) Graphics accelerators in a 80386 chip is external to the CPU, while in 80486 DX2 it is internal to the CPU. True False
- 4) CD-ROM is an optical storage device, which is portable, however, have the capacity equivalent to a hard disk. True False
- 5) SVGA monitor is a digital display technology. True False
- 6) The minimum requirements for a digital multimedia display workstation are:
- 486 DX2 processor + graphics accelerator
 - 8 or 16 MB RAM
 - Keyboard, Mouse, CD-ROM drive
 - 512 or 2 GB harddisk
 - SVGA display
 - 16 bit sound card (for stereo sound)

1.4 SOFTWARE FOR MULTIMEDIA

By now it must have been clear to you that movies, sound, text animation and graphics are the integral part of a multimedia software. To produce these media elements, there are various software available in the market. such as Paint Brush. Photo Finish. Animator, Photo Shop. 3D Studio, Coral Draw. Sound Blaster. Master Blaster etc. Software also available in the market to combine these independently created media elements. Some of these software are IMAGINET, Apple Hyper Card, Authoware Professional Icon author, Multimedia Director etc.

Software for Multimedia among various types also include software for creation of graphics, animation etc. Designer, Corel Draw, Picture Publisher, Photo Magic, Animator pro etc. are most commonly used programs.

Designer is one of the professional rating drawing and graphics package for windows which is also available in OS/2 system. It is specially meant for graphic artists and technical illustrators. It has a wide range of drawing tools and powerful text handling features. Similarly Photo Publisher is a professional photo retouching or image editing package designed to enable retouching and enhancing photos faster. It has powerful masking and retouching tools and more than 30 special effects and filters. It has an image browser, processor, scanner, printer calibration, a stitching tool and over 50 ready to use textures and images.

Similarly other multimedia related software also work on the same type of working environment, but they have their own features to experiment upon.

Multimedia Extension in Windows

All these software do not have a standard platform. To provide all PC the same standard to multimedia, Microsoft developed multimedia extension for Windows operating environment. This feature add several multimedia capabilities to the Windows operating system, including Resource Interchange File Format (RIFF), a standard format for multimedia data. including Bitmap, graphics, animation, digital video and audio recording and playback facility for digital audio. It also include MIDI (Musical Instrument Digital Interface) files and MCI (Media Control Interface) to interface one's work with external devices such as CD-ROM, Sound card, laser disc

players etc. Most of the multimedia extension software for windows works in the background. The utilities like MIDI mapper, sound recorder and media player are the direct interface to the software the multimedia extension for windows.

Most standard window graphics are limited to 256 colours if it is not interfaced with any external custom software and graphic card, All external device outside the multimedia extension for windows are controlled by MCI for windows. The main interface to MCI is the media player which in turns control any external devices such as CD-ROM, Video Player, Laser Disc Player etc. Whereas sound recorder utility provides facility to playback and record digital audio as ".WAV" files, directly into the PC with the external sound device such as sound card. It has the function like start, record, stop, play etc. Similarly MIDI mapper makes sure that events that are specified in the MIDI file are sent to the correct MIDI instruments.

The video for windows is an external set of software works along with multimedia extension for windows. It has the feature for digitised video recording, playback and editing. The videocap utility of this software is used to capture the video and audio clips using external hardware. The captured sequence can be viewed in a number of different size and speed and also different colour palates can be created for individual frame. Video for windows has four different types of editing features named as VidEdit, PalEdit, WavEdit and BitEdit. As the name suggests VidEdit is used to cut and paste captured video segments together, WavEdit is the feature which work with the recorded digital audio and helps you to edit it. Where as PalEdit is the work with the colour plates within the captured video to improve the colour, BitEdit helps clean up the rough patches in the images. It also has the interface to the media control panel to control digital video files.

1.5 COMPONENTS OF MULTIMEDIA

After discussing about the definition, hardware and basic software requirements for multimedia, we still face a question: "What are the various components of multimedia in computer and how to create them?" Let us try to answer this question in this section.

1.5.1 Textual Information

All multimedia productions contain some amount of text, and even some might contain a large amount of textual matter. The text can have various types of fonts and type sizes to suit the professional presentation of the multimedia software. The standard software interface which is now a days provided on multimedia is the windows interface. This interface allow large amount of fonts to be stored in multimedia.

1.5.2 Images

Another important and interesting components of multimedia is graphics. One of the basic fact in multimedia production is that, people do not like reading large amount of textual matter on the screen. Also, it is a myth about human nature that a subject is better explained to them when represented in pictorial or graphical form, instead of textual matter i.e. graphics are used more often than text to explain a concept, present background information etc.

Unlike text which is represented in universal ASCII format, graphics does not have any single agreed format. To start with these are two different ways in which graphs or images can be described, Bitmap and Vectors.

Bitmap Images

A bitmap image assumes an image to consist of two dimensional squares which are called the pixel or dots on the screen. The size and the quality of such a image depends on the pixel density and number of colours it uses. For example, a standard VGA screen uses 640x480 i.e. a total of 307200 dots or pixel to display an image. If your image is in black and white, then only one digital bit is required to store this information about the image for each dot (0 for black and 1 for white), and the position to the dots can be taken as the order in which they are produced. As a byte consists of 8 bits, one can store a black and white image of this type in $((640 \times 480) / 8) = 38400$ bytes = 37.5 KB, so imagine the storage place required to store all the images involved in multimedia production. If you are using colours for the images then the size of the bitmap images become larger depending upon the number of colour used. A standard VGA which uses 16 colours needs 4 bit of storage to store the information, so only two dots can be coded in a single byte. Hence $((640 \times 480) / 2) = 153600$ bytes of space is required to store a single image with 16 colours. Similarly for a image with 256 colours (8 bit per dot), 32000 colours (16 bits per dot) or 16,000,000 colours (24 bit per dot) storage requirement will be very high. So a standard image with 16 colours will be ideal solution for a low cost multimedia package. These bit map files can be edited easily, however, require large memory space for editing purposes.

As bitmap images are stored as large files and you require large amount of disk space to deal with it. To avoid this constraint, the images can be compressed, which make the use of the fact that many entries in a bitmap file has repeated information or contain very little information. But there is no single standard compression method for image files. There are various formats such as PCX, TIF, BMP, GIF etc., in which images are stored.

The software packages which normally are used for creation of bitmap images are called Painting programs. These program allows drawing of object using a paintbrush. Free hand drawings can easily be produced using these packages. One such package is the Paintbrush program available in Windows.

Vector Images

Other formats for storing images is vector or object oriented format. In this format, an images is formed as a set of straight or curved lines instead of dots. A line can be represented by a mathematical equation, whose number can be stored as a set of binary codes. This form of coding is potentially more economical for disk storage space. The drawback is that it requires software to produce the image which is time consuming. CAD package use this type of images. A vector image file is always of the same size no matter how large a image is. Thus, for display clarity this type of images should be projected on better resolution display units.

There are several technology and sources available to produce images or graphics for multimedia package. Image can be created by using a Paint program, by scanning photographs using a scanner and by drawing artwork. You can generate 3D graphics and animation using various sophisticated software. You can combine these images using image manipulation programs which can combine many different types of graphics files, to create new images.

1.5.3 Animation

Animation also plays vital part in the multimedia program. The dedicated hardware and software built into the system increases the animation speed. An animation is just a continuous series of still images that are displayed in a sequence. There are mainly

two types of animation used in multimedia, namely 2D and 3D animation. 2D animation, also known as cel (pixel based) animation.. is the most common kind of animation, where flat images are drawn one frame at a time. This process is very time consuming but result obtained is spectacular in nature. Computer animation has increased the efficiency, and enhanced the results of cel animation with introduction of wide ranges of colour and speed. Many animation packages are now equipped with tweening facility, that is, automatic creation of a series of graphics frames between two previously created frames. Thus, many steps required for cel based animation can be eliminated making it very simple to do. The animation packages also involve some special effects. Morphing and Warping are two commonly used special effects. Morphing takes two images and seamlessly changes one images to another. The second image actually seems to grow out of the first one. Morphing can also be used to show the pace of changes more clearly than photos. Warping is variation of the morphing where one images is used to show various changes that take place. It uses the key points of one images to create different effects, instead of mixing up two images.

In 3-D animation mathematical model of 3-D object is created to realistically portray with depth. Now it has become a common media element in film, video and multimedia packages. A 3-D animation follow mainly three steps; modelling, animation and rendering. Of these three first two are crucial and take long time to finish. Modelling is the design phase where a 3-D object is created. In a 2-D animation an object can move up (called Y axis) and sideways (called X axis). But in the case of a 3-D model, a third axis is used; depth or the Z axis. Once an object is created along these three axis, colour, shading and light source can be added to the image to make it more realistic.

In the second phase, the 3-D images is moved along a motion path, which is defined using key frames of the animation sequence. These key frames are used to create the in-between frames in the sequence automatically.

And in the final stage, the entire sequence is rendered to create a 3-D animation. Blending texture maps into the model to add realism causes one of the main slow downs during rendering. A texture map is a wall paper for 3-D models, in which a graphics image is wrapped over the surface of a model. When a 3-D animation program renders an images, it mix up intimately all the colour, texture maps, light source and surface attributes in each frame of the 3-D animation sequence. The rendering process is computationally intensive step.

1.5.4 Digital Audio

The most common reason for using digital audio in computer is to be able to use multimedia in its full potential. The most common requirement is to be able to input sound such as a spoken commentary on an image or a document.

The sound is a repeated pattern of pressure in the air and a microphone converts a sound wave into an electrical wave. The shape and frequency of the electrical wave is identical to the shape and frequency of the sound wave and the clarity of what we hear is entirely dependent on the shape and frequency of the sound wave. Sound can also be recorded and reproduced using digital signals and the errors can be reduce drastically in digital recording of the sound.

Audio has to be converted into digital form to produce digital audio in order to use it in the multimedia. And the digital audio system will then reconvert the entire digitised audio into analog form, which can be heard on the speaker. This two way transformation of audio is known as analog-to-digital conversion and digital to analog conversion respectively. But the storage space required for digital audio is huge,

somewhere around more than 1 MB for one minute of audio. The entire process of digitisation is a simple process of converting analog or electrical signal of audio to computer data file in the digital format. The microphone (which is normally used for recording) converts the voice into electrical signal or analog audio signal. Then the analog signal is passed into the audio input of a digital card or sound card. Once inside, the signal is fed into the analog to digital converter, which convert the analog audio signal to digital form and store it as computer data file. Playing back a digital audio data file is just the reverse process of converting analog to digital. Once the digital audio file is send to the sound card for playback the file is channelled through a converter and the digitised version of the original file is converted into analog and put into the speaker. As constant or frequent conversions can reduce the sound quality, it is always advisable to keep all audio in digital format while working on a multimedia program.

A Digital signal processor is always embedded in the sound card to provide additional capabilities without affecting the CPU. A simple recording of digital sound can be done and may be compressed if desired. A common digital sound file existing in personal computers are known as .WAV files. The MIDI sound saves disk space as it only stores the instructions about how to play a musical instruments. It prestores the sound relating to the sound notes of various instruments and reproduces it when a voice signal ask for it. Several software which are used for creation of digital sound files (may be as WAV file) are media player for windows.

1.5.5 Digital Video

Digitised video is one of the many technologies used in the development of interactive multimedia. It is one of the way to play back and record video in multimedia program. It offers a wide range of flexibility as compared to standard video signal.

Unlike regular video, quality of image would not degrade from copy to copy as digital video is made up of a digital code and not an electrical analog signal. However the final output depends on how the video images are converted to digital form during the development phase. Video signal comes from an external source such as TV or VCR or camera to the video-digitiser-card inside the system. Some systems use a digitiser card which has dual function for both audio and video conversion. The process of converting analog video signal to digital format is called sampling. Using this process the converter card in the system converts the analog video signals into digital data streams so that these signals can be stored in the binary data structure format of 1s and 0s. The digital data file is then compressed to a considerable amount using some compression program. During this process the digitiser fuses the digital video into a digital movie format and saves all the sections of the compressed movie in the hard disk. Once the conversion and compression process is complete, the file can be played back on the computer screen. These digitised files can also be edited according to requirement using various video editing software. However, you may find that the video if used as full screen video may be jerky in certain machines. The main reason for this is that to present a moving picture, we have to store and process enormous amount of data. As we got to show 30 frames of continuous pictures per second considering one frame itself requires lot of data a moving picture requires 30 times of it per second. However. standards such as Moving Pictures Expert Group (MPEG) have specified compression standards which have enabled a full screen video. MPEG compression only records the key frames and tries to predict the remaining frames from this key frame by comparing the changes of missing frames from key frames. Another technology which is currently using these kind of compression is video conferencing. ".AVI" files in windows basically contains interleaved data for audio/video. This compressed data can be decompressed and passed through an digital to analog converter to produce the video. These components of a multimedia system are integrated after they have been stored digitally by using Authoring software which

provide the necessary interactivity in the overall mix of information. These software are discussed in unit 3.

1.6 MULTIMEDIA: DESIGN, PRODUCTION AND DISTRIBUTION

All the development works are based on three basic principles; planning and design, production and distribution of the final product, this is also true for multimedia development.

Planning/Design → Production → Distribution

1.6.1 Planning/Design of Multimedia

During the initial design phase all the aspects of the related multimedia project is carefully thought about and planned, well before the production start. Every key element involved is discussed. There are various tools available to plan the project. A flowchart is one of them. It is one of the commonly used tools to prepare a blue print of the plan during the design phase. It shows how all the elements involved in the project are related to each other, with adequate information about their controlling features.

Like any other video program or movie, multimedia programs requires a script on the subject involved. The script and flowchart works together to provide a printed version of text, graphics and sound to be used in the production of the multimedia program.

1.6.2 Production of Multimedia

The process of creating the related media elements in a multimedia project including graphics, sound, animation and digital video is called production. In multimedia all these creation of media elements, can even be independent in terms of tools used to produce them. For example, graphics elements are created independently using various computer graphic package such as Paintbrush, 3D studio etc.

These are created and modified accordingly so as to work under various multimedia platforms. All the video scenes of the project are digitised and edited into various sequences and when the digitised video sequences has all the required scenes, titles and transitions, they are compressed to playback in the required speed and pre-defined sequence. The sound and music effects relevant to the project, and digitised scene sequences are created using digital recording system and MIDI (Musical Instrument Design Interface) equipment in a music studio, edited and recorded in the computer as a digital audio file. All textual matter in project are edited and converted into ASCII format and then modified later and placed at the appropriate location within the scene sequences. One of the most important production task in a multimedia project is regular checking of all the sequences.

Once, all the related media elements are created and digitised according to the specifications, then comes the final stage of the production process i.e. joining or combining these media elements which is also known as authoring. This process is used to join all the independent media elements such as graphics, text, animation and sound to produce an interactive framework. The testing and debugging of the entire package is done at the stage before putting them into distribution media.

The first step of authoring is to bring all the independent media elements used in the multimedia project, as each of them are developed using various graphics, audio, video and animation tools.

Once all graphics, text, animation and digital video are combined together, different relationship and actions with each of the media element can be worked out by adding interactive control. When multimedia program is executed, the interpreter part of the authoring program takes all necessary commands and relationships that has been defined for each media elements and convert them into binary code or machine code that computer operating system can understand. The converted program is then executed by the CPU of the computer system, which send out instructions to the system to play the music or audio, display the text, video and animation.

1.6.3 Distribution of Multimedia

Once all the media elements are combined together using authoring software they are bundled into a package and stored in various storage media for distribution. Creating multimedia package for various platforms is one of the most crucial stage that multimedia development procedure face today. There are many platforms available for multimedia. each of which has their own advantages and disadvantages. To work with full potential, multimedia packages need to be available in as many platform as possible. The main storage media used to store multimedia package is the CD- ROM.

Check Your Progress 2

State True or False:

- 1) Windows extensions of Multimedia provide a standard platform for multimedia programs. True False
- 2) Object linking and Embedding in Windows does not allow to combine video or audio clips. True False
- 3) The file size for Bitmap images is smaller than the file size for vector images. True False
- 4) Morphing and Warping are two special effects which can be performed with bit mapped images only. True False
- 5) Digital Audio as well as digital video both are dependent on the type of frame sampling. Based on this sampling the quality of audio or video can be good or bad. True False
- 6) Multimedia production process involves not only the production of individual components but also integration of those components using an authoring tool. True False

1.7 SUMMARY

This unit has introduced you to a new concept in information technology; Multimedia, slowly but steadily it has started to creep into our life in one or the other way. The basic hardware components of multimedia were explained to you. In addition, you were also explained various components of multimedia like graphics, sound, animation, digital audio and video. We have also mentioned about their characteristics and various storage formats they use. It also introduces you to various stages used for multimedia development.

1.8 ANSWERS/SOLUTIONS

Check Your Progress 1

- | | | |
|----------|----------|---------|
| 1. False | 2. False | 3. True |
| 4. True | 5. False | 6. True |

Check Your Progress 2

- | | | |
|----------|----------|----------|
| 1. True | 2. False | 3. False |
| 4. False | 5. True | 6. True |



UNIT 2 APPLICATIONS OF MULTIMEDIA

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2.0 INTRODUCTION

In the First unit of this block, we have discussed about the digital multimedia system technology that is, hardware and software for multimedia. We have also presented, in brief, the development methodology for multimedia packages, and given you hints about the applications of multimedia. The multimedia technology as a standalone technology is quite useful, however, the use of multimedia system is only partial if we do not integrate it with communication technology. The integration of multimedia and communication technology have resulted in bringing down the geographical distances.

In this unit, we will present various scenario where multimedia technology is used along with communication technology to form powerful applications. Please note that all the applications mentioned in this unit involves multimedia. However, you may find many similar kind of application which do not use multimedia technology.

In fact, boundary between multimedia and non-multimedia products is getting blurred and will cease to exist in near future become then all the applications will have multimedia facility. We have not covered all the applications of multimedia in this unit, only a representative sample is presented.

2.1 OBJECTIVES

After going through this unit, you will be able to:

- define the term collaboration;
- define various utilities provided on networked multimedia system;
- define the multimedia facilities needed by business and distributed learning environments; and
- propose new multimedia applications based on the examples presented.

2.2 APPLICATION AREAS FOR MULTIMEDIA

With the advancement of technology many applications are evident for the multimedia technology. The advancement of technology have opened up newer fields for the application development. One such fields which is having tremendous potential and falls under the broad perview of multimedia is virtual reality, may be the tool of tomorrow. Today, virtual reality is primarily used in applications in entertainment industry but is going to be very useful tool for performing simulative, remote control applications. Virtual reality will have a tremendous impact on on-job training sector. In the following sections we will present a broad categorisation of multimedia applications.

2.2.1 Entertainment

The entertainment industry has used this technology the most to create real life like games. Several developers have used graphics, sound, animation of multimedia to create variety of games. The special technologies such as virtual reality have made these game just like experiences of real life. Our such example is flight simulator which creates a real-life imaging.

Many multimedia games are now available on computers. The children can enjoy these experiences, for example, they can drive cars of different variety, fly aircraft, play any musical instrument, play golf etc.

2.2.2 Edutainment

Edutainment is nothing but educational entertainment. Many computer games with focus on education are now available. A simple example, in this case is an educational game which plays various rhymes for little kids. In addition to playing rhymes, the child can paint the pictures, increase reduce size of various objects etc. Similarly many other edutainment packages which provide a lot of detailed information to kids are available. Microsoft has produced many such CD- based multimedia such as Sierra, Knowledge Adventure etc. which in addition to play provide some sort of learning component. The latest in this series is a package which teaches about the computer using games playing.

2.2.3 Business Communications

Multimedia is a very powerful tool for enhancing the quality of business communications. The business communications such as employee related communications, product promotions, customer information and reports for investors can be presented in multimedia form. All these business communications are required to be structured such that a formal level of content structure exist in the communication.

Other common business application involving multimedia requires access to database of multimedia information about a company. The multimedia technology of today can easily support this application as natural language enquiry systems do exist for making queries.

2.2.4 Knowledge Transfer

This kind of application involve transmission of a piece of information with the maximum impact, that is, the transfer of information in such a fashion that it facilitates the retention. This application is meant for academia and business both.

In academies, the knowledge transfer is used as the building block, whereas, in business it is the effective transfer of information which might be essential for the survival of a business. Multimedia based teaching is gaining momentum and will become a powerful teaching aid in the near future. Multimedia is one of the best ways to provide short term training to the workers in a business house. It gives lot of flexibility in providing training.

2.2.5 Public Access

Public Access is an area of application where many multimedia applications will soon be available. One such application may be the tourist information system, where a person who wants to go for a sight seeing trip may have the glimpse of places he has selected for visiting. Using Multimedia. many such applications may be developed providing a repository of information. For example, for a very simple public information, that is, the Railway Time table enquiry, a multimedia based system may not only display the trains and time but also the route map of the destination from the source you have desired.

In the subsequent sections we will discuss many applications of multimedia technology in several important areas.

2.3 PUBLISHING INDUSTRY AND MULTIMEDIA

The publishing industry can be classified according to the market it caters for. One of the classification is based on the information which is presented in published text, for example; a publication may be for reference purposes or archival purposes or tutorials. It can also be grouped on the basis of the community for which a particular publication is meant, such as, for the family, or the school children or professional persons or the academics. The publication media for all above categories, traditionally, was printed texts.

But today the publishing industry has changed drastically because of availability of Multimedia. The publications which are meant for family such as newspapers, family magazines etc. are readily available on-line, that is in multimedia form giving real life experiences. For example, the on-line- news clippings are not only read but can also be experienced by seeing the video film associated with it. Example in this category are: Microsoft Multimedia. The life and composition of Bethovan etc. where a rich mix of sound, visuals and movies are provided for publication.

The publishing meant for children has changed tremendously with the advent of multimedia. Today many encyclopedia and books providing a sort of edutainment are available. The advantage of using multimedia on these books are evident from the type of media rich experiences these CD-ROM based product provide. For example, an atlas encyclopedia may not only allow you to pinpoint the location of Delhi in

India but also shows you a Road map of Delhi showing several historical sites. A dictionary meant for children not only shows the meaning of the words but can also show its characteristics for example a tiger may be defined as a wild animal and along with that a movie in which tiger is shown in his natural habitat can be shown. Thus this kind of media rich experiences are much more entertaining and provide better learning environment for children.

In fact, we believe that for increasing general awareness of a child, multimedia is the best tool available to us today. However, still the reading habits, listening habits, paying ,attention etc. are the capabilities on which the education will rely upon.

For professionals, today many a products are available in the market. For example, how to tackle many management oriented issues, can be presented in multimedia form. Professionals, however, can use multimedia technology for on-line video-conferencing. on-line document editing etc. functions.

As far as academics are concerned multimedia publishing is a boon. Today, if a researcher wants to refer to a conference proceedings all he has to do is buy a CD produced for it. This CD normally contains abstracts, paper presentations, reports presentation etc. The other advantage an Academician gets by having such a detail on CD is that his search through the material can be faster, as in general, several indexes are being provided in the CDs. Thus, Multimedia publishing has a great potential and will be the technology which has tremendous potential.

The multimedia technology also supports the process of collaborative development of documents for printing, thus, makes process of publishing faster and better.

2.4 COMMUNICATION TECHNOLOGY AND MULTIMEDIA SERVICES

The advances of computing, communication and creation of relevant standards have lead to the beginning of an era where you will be provided with the multimedia facilities at home. May be in the form of an Interactive T.V.

These services may include:

- Basic Television Services
- Interactive entertainment
- Digital Audio
- Video on demand
- Home shopping
- Financial transactions
- Interactive single and multiuser games
- Digital multimedia libraries
- Electronic versions of newspapers, magazines etc.

Cable TV and telephone companies are the main infrastructure providers for these facilities. The networking technology along with the improved compiling and compression technologies will soon be delivering interactive services profitably. The entertainment cable, telephone, companies are trying to design wide variety of such multimedia services.

Today PCs are the tool that promote collaboration. They are essential to any multimedia workstations. Many high speed networks are in place that allow multimedia conferencing, or electronic conferencing. Today, we have to depend on

our telephone to link us with others, whether it is a phone call or a group audio conference. However, tomorrow it will be PCs that link us with others. A PC-based multimedia conference allow us to exchange audio, text, image, and even video information. The PC will also facilitate group development of documents and other information products. Let us discuss more about these concepts in greater details.

2.5 MULTIMEDIA IN BUSINESS

Multimedia can be used in many applications in a business. In this section we will focus on the facilities which might change the outlook of the whole business.

The Global Team

The multimedia technology along with communication technology has opened the door for formation of global work groups. Today, the team members may be working anywhere, and can work for various companies. These team member may:

- be in different cities or countries,
- speak different languages.

Thus, the work place will become global. If such is the future of a business then the multimedia network should support the following facilities:

Voice Mail

Voice mail is a tool which communication voice over a line. A recorded voice is better than having no voice. A voice mail based system is not person dependent. The voice mail however, has the obvious limitation that it can handle only audio information, however audio information is sufficient for quick and simple exchange of information.

Please note that voice mail is time-and location-independent. However, a voice mail system is non- interactive, that is, if you want to get a reply then you have to wait, however, you can send and receive voice mail quickly.

Electronic Mail

Electronic mail is preferred than the voice mail to exchange information for the cases which require wider distribution of complex information. In general the written word leaves less room for misinterpretation. In addition the word files are easier to store and retrieve.

The future electronic mail software must handle voice and video, FAX, and graphic information. In addition the user interface for e-mail should be very easy. Electronic mail is also time-and location- independent, however it is non-interactive.

Multimedia based FAX

FAX, in general, is better accepted than electronic mail because:

- it can be used to send detailed information
- is easier to use
- handles graphic information
- provides a printed copy of information.

FAX provides a non-interactive interface to the user. Today's multimedia PCs are equipped with FAX-modem cards and the FAX message gets stored electronically in these machines. On development of newer multimedia based e-mail, the distinction will gradually become blurred and will gradually fade out.

Office Needs

The activities in an office such as meetings, group discussions, trainings are some areas where we need the concepts such as brainstorming, sharing of idea, problem solving etc. For real-time meetings which involve geographically disperse group of people we can avail the choices as:

- Audio conferencing
- Video conferencing, or
- Document conferencing.

Audio Conferencing

This technology allows 'out-of-town' people to participate in a formal meeting. This technology can also be used by a group of people to meet frequently whatsoever is the physical distance among them. Audio conferencing is an effective means of communication for reporting about a project status. It can be used to solve problems quickly. One of the disadvantage of audio conferencing is that such conferences are restricted to only voice, so this conference can be preceded by sending email of documents that are to be used during the conference. The second disadvantage is that the person who is not proficient in spoken words cannot participate well in such conference.

Audio conferencing technology was first available only in the conference room but is now available on desktop machines.

Video Conferencing

Video conferencing is being used successfully by several organisations abroad. Video conferencing resembles an office meeting, thus, require setting of time, preparing rooms and place, agenda etc. However the biggest drawback is the cost of the equipment.

Video conferencing brings people together naturally and tries to simulate a real life meeting environment. Today video conferencing has been brought to the computer however, it is not easy to use as the participant has to continuously look at the camera on the top of his machine.

Document Conferencing

Document conferencing also called audio-graphic conferencing technology allows people to meet using their PCs and telephone lines. The telephone lines connect the participants so they can share audio information and the data they have stored in their PC. In addition, it allows on line editing of a document by several participating people in the conference. This conferencing technology has been used in the education field. It extends the boundaries of the classroom and reach out into the community. A document which can be used in the conference may consist of text, graphics, sound or even video clippings.

2.6 MULTIMEDIA PEDAGOGUES: INTERACTIVE SYSTEMS FOR TEACHING AND LEARNING

Pedagogues are useful teaching aids only if they stimulate and motivate the students. The audio-visual support to a pedagogue can actually help in doing so. A multimedia tutor can provide multiple number of challenges to the student to stimulate his interest in a topic. The instruction provided by pedagogue have moved beyond providing only button level control to intelligent simulations, dynamic creation of links, composition and collaboration and system testing of the user interactions. Let us look into some of the examples of pedagogues:

2.6.1 Simulations

This is an important area of pedagogy where a student is engaged in situations of problem solving. Simulations are mainly categorised in two main forms:

- Scenarios based simulations
- Knowledge based simulations.

Scenario based simulations, which are multimedia based use video, graphics and sound to engage the student in a particular problem situation. However, these scenario based tutors have limited answers and suggestions to offer.

Knowledge based simulations are more intelligent as far as behaviour is concerned and are adaptive to student needs, however, are difficult to design. Let us discuss about some good examples in this area.

The Cardiac Tutor

This tutor has been developed by Chus Eliot, at the University of Massachusetts, Computer Science Department. It is a knowledge based simulation which teaches the student about the cardiac resuscitation. The knowledge about cardiac resuscitation was collected iteratively from various experts in the area. This tutor has been designed to present a graphical view of an emergency patient. The goal for the student is to save the patient. The tutor also provide clues to the students. These clues can be:

- spoken advice
- emergency room sounds
- graphical indications such as Electro Cardiogram (ECG) trace, blood pressure and vital signs.

Thus, providing a sort of real life operative situations where mistake cost nothing but bad score. This tutor in fact goes to the extent that it provides different levels of teaching for different kinds of students and assists the learning process dynamically.

2.6.2 Multimedia Composition

A composition created by a student on Multimedia platform require lot many activities to perform. These activities may include aspects like:

- creation of text, drawings or digitised pictures.
- organisation that is marking and classifying the items.

- access of documents which involves searching of patterns, and indexing or filtering certain types of items.
- communication which helps in basically sharing the work and ideas.

The skills required to create and use multimedia will become essential in near future. Today many platforms are available for the development of multimedia communications even for an inexperienced students. These developments can be done either at a standalone stations or through distributed networks.

A well connected multimedia interface allows integration of several media forms for a particular piece of information. Several media presentations such as text, process descriptions or graphics etc. about a single topic can be combined.

2.6.3 Multimedia and Explanatory Systems

The multimedia systems also show a very important property that is they adapt their responses to the student needs. Thus, providing explanation to various situations which have been put for the pedagogue to solve. These types of system will become common place in near future.

In explanatory systems the students who are using it can select the media for displaying information. A typical example, in such a category is the explanation planner. This system is developed at the University of Massachusetts. This planner responds to the queries of the students in real time. On the basis of a students query this tutor selects the appropriate text and graphical information. The students may end up seeing several media form on a topic depending on his queries. It is not the system which only present information but it adapts itself to the needs of a student based on the question asked by the student.

The advantages of this planner over a normal hypertext based presentations are:

- The students can themselves choose the media to display information. Some of the types of information which is present is animation, text, graphics etc.
- A piece of information can be reused for answering different question as the objects are defined in the forms of a shared base of information.
- Capabilities of having natural links still exist.

Another example in this category is the Microcosm system. This system, however, uses different approach. This system provide explicit and implicit links through hypertext. These links are maintained in Database which is separate from the document. Thus, in this database newer links for a user can be defined and maintained. In this system explicit links are used for defining relationships between two multimedia objects. Implicit links are utilised for creation of run time links which result in presentation of information in a way desired by the user.

2.6.4 Technological Challenge for Developers

Today, if we want to use the potential of multimedia technology and wants to use it in day to day life of the students then we have to deal with the following challenges:

- We have to move to a knowledge based multimedia systems which will customise the presentations based on the curriculum or student or the situation they are responding to.
- In future, there will have to be trends of having network based multimedia systems which will allow an application to reside at several sites. The people making these sites will be responsible for updating the information relating to the

field of information they are holding. Thus, having collaboration of work. The concept is further discussed in the next section.

- More advanced authoring tools need to be developed which provide easy representation for implementing thinking pedagogues.

2.7 CONCEPTS FOR DISTRIBUTED LEARNING ENVIRONMENT

The process of learning and motivation for learning are influenced by a variety of factors, which are not necessarily accessible to analysis. However, these factors are in the semiconscious or subconscious area of the human cognition. One of the essential component of the learning process is social interaction. The informal peer learning is as important as formal teaching.

Collaboration and Multimedia Learning: Benefits and Pitfalls

Today, multimedia learning materials are available on various platforms. Just like multimedia a collaborative learning environment integrates text, graphs, audio and video. However, the traditional CBT systems operate in standalone mode that is user interactivity is restricted to the CBT only, whereas the possibility to interact with instructors and peers is offered by collaboration using multimedia communication. Thus, by using a communication network and collaborative learning in groups is possible.

The main elements of such kind of environment of learning are:

Collaboration: The traditional CBTs require the student to work in self study mode. But work without a tutor may be ineffective. Thus, instead of offering courses on CD-ROM or video-tape a new learning environment is needed which focuses on bringing several learners together for better attainment of learning goal. Communication should be possible in any direction, learners can ask their tutors or talk to other learners.

Distance Cooperation: The collaboration of such kind have no geographical boundaries. The only mean required is the availability of telecommunication facility. The availability of telecommunication facility is a must for any collaborative environment.

Deferred or Real Time Communication: This system will provide possibility to communicate with the colleagues and tutors in a time frame which is not immediate. For example, a learner may be allowed to answer a question at a later time i.e. not on the spot. A new type of learning process may take place with benefits for some learning situations. Thus, students can learn in a group situation not in real time but later, thus, allowing more contemplation and depth.

Distributed Data: Learning data, such as learning material, videos, graphics, text files etc. are no longer needed to be stored on the local computer, but can be distributed over the network. All participants may share the same information, which can be modified at a common place. However, a student should not be allowed to modify the data. Thus, proper data security measures need to be incorporated for such learning.

Multimedia Interface: A usual way to communicate is to talk to and see our communication partner. This natural way of interfacing may be provided by multimedia environment using audio and video communication technology.

2.8 A MEDICAL APPLICATION: MEDNET – A MEDICAL COLLABORATION AND CONSULTATION SYSTEM

The basic properties of multimedia that is delivery through multiple media with the use of Communication technology make us realise that this application is a distributed, collaborative application. Since a medical consultation system is extremely critical as decision taken by doctors are life critical, therefore, the data manipulations and user interaction in such a system are extremely broad and quite demanding.

This application is an distributed multimedia based project which is being developed at University of Pittsburgh medical centre. At present this system is used at seven hospitals and many diagnostic and research laboratories. Mednet provides the following services:

- A real-time monitoring and multiparty consultation
- Collaboration during brain surgery.

The intra-operative monitoring places a real-time control about the condition of the patient. Mednet is different from the other picture taking teleconferencing systems as it provide real time monitoring and collaboration.

The term "collaboration" is one of the commonly used term in multimedia applications today. The verbal meaning of this word is the actual meaning in the context of multimedia, that is collectively doing a particular work but for this collaborative work physical presence may not be required. How can it be achieved by Mednet as in most of the surgeries the anesthesiologist, the surgeon and other supporting staff have to be present, however, the consulting neurophysiologist (who are normally difficult to find) whose presence is not a necessity may remotely monitor the case along with few other cases. He can see and listen the responses of the monitoring equipments on his screen and in case of any problem that is, when the nervous system of a patient is being damaged, informs the surgeon who is performing the surgery.

Thus, with the limited expertise available a lot of activities can be performed. However, the cost effectiveness of such a system cannot be ignored.

2.9 REVIEW QUESTIONS

- 1) At Escorts heart centre a multimedia information system is being used. Explore this system.
- 2) Propose a multimedia based Airlines promotional system.
- 3) Propose a multimedia based documentation/promotion system for any big industry.
- 4) IGNOU wants to deliver CIT programme in multimedia form. Design a CIT block in multimedia form.

Hint: Assume a section of a unit to be smallest entity. Then propose text, graphics, audio, video, animation required for that section. You can also think of linking several non-linear sections.

- 5) Design a high tech centre of IGNOU which provide counselling to the student without counsellor being physically present.

2.10 SUMMARY

In this unit, we have given you a broad overview of various types of applications that may be available on a networked or standalone multimedia platforms. Our discussions are focussed on only few applications, but it does not means that these are the only applications currently available. Many people are working in this area for bringing out more and more applications. The areas of application may be very different, however, they may be incorporating some of the concepts discussed in this unit. You should also keep on exploring about newer applications and newer ideas.



UNIT 3 MULTIMEDIA AUTHORIZING TOOLS

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3.0 INTRODUCTION

In the previous two units, we have discussed about the definition and components of multimedia and its applications. A multimedia production need to be interactive. In this unit, we will try to answer the question how multimedia production can be made interactive. Please note that discussions on the software used for development of each component of multimedia have not been discussed here. Several tools are used for developing interactive multimedia. These are:

- authoring systems
- authoring languages
- generic languages (e.g., Fortran, Pascal, C)

The term authoring results from the fact that the person creating the learning material on the computer is often called the author.

Authoring systems are generally menu-driven systems intended to be easy to use by the multimedia developer. They do not require the trainer to get involved with program code. Such systems endeavour to provide a complete, comprehensive

authoring environment where whatever multimedia developer wishes to do is either selected from a menu or entered into the computer in a straight forward, well-prompted way.

Authoring languages are specially designed programming languages, and have some distinct advantages over generic languages. They have been created specifically for the training/educational field, and as such provide appropriate commands and structures to cater for the types of presentation and interaction involved in CBT.

In this unit, our main focus shall be on the authoring systems.

3.1 OBJECTIVES

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

- categorize the various multimedia development tools;
- discuss in detail the various multimedia authoring tools;
- describe the working and importance of QuickTime and its relationship with other authoring tools;
- discuss the need of hypertext and how it is accomplished in multimedia; and
- discuss the various elements and applications of hypertext.

3.2 MULTIMEDIA DEVELOPMENT TOOLS

A multimedia development environment is the glue that combines different media elements-images, sounds, text and animation into a coherent project that the user can explore. Although programs such as Photoshop and Infini-D enable the user to create bit-mapped graphics or three-dimensional illustrations, they don't allow to add buttons or data fields. This really limits the productions created by the user, and that's why he'll nearly always want to have access to some kind of development environment such as HyperCard, Director. etc.

The presentation tools available for multimedia development can be divided into three categories:

- 1) Slide Presentation Environments
- 2) Interactive Presentation Environments
- 3) Authoring, Environment

Programs such as HyperCard, Director etc. add another element to be multimedia developer's arsenal i.e. scripting. Scripting really means programming, because you write "scripts" using a programming languages that the development environment understands. The scripts, or programs perform various functions such as importing a text file or sorting a list of words.

With scripting it is possible to create very complex interactions between the user and the presentation. For example, by clicking. a single button, the user might inquire about a subject and then find all the information available on that subject in the presentation.

The authoring, environments can be used to create slide presentation or simple interactive presentations but what sets them apart from the other classes of programs is the ability to write scripts and create complex interfaces.

3.3 FEATURES OF AUTHORING SOFTWARE

An Authoring Software is the main production tool for multimedia. Just a layout program for printing, an authoring software brings all media elements together and compose them so that they look, and sound right. The main features of an authoring software are:

- 1) Integrated Multimedia Elements
- 2) Script language programs
- 3) Icon based programs
- 4) DLLs for extending features
- 5) Supporting CD-ROM or laser disc sources
- 6) Supporting Video for Windows
- 7) Hypertext
- 8) Cross-Platform Capability
- 9) Runtime Player for Distribution

3.3.1 Integrating Multimedia Elements

It is essential for an authoring software to support a wide area of format with different media elements. The authoring software must be supported by add-on boards and peripheral devices to play multimedia. The final feature of authoring is to build interactivity.

- 1) Authoring programs provide developers with a greater degree of control over each multimedia element than presentation programs.
- 2) Authoring programs are geared towards education and training applications as well as business presentations.

3.3.2 Script Language Programs

Authoring Software offers the ability to write scripts for software to build features that are not supported by the software itself. Script language programs create multimedia presentations from a series of programming style commands linked together in a word processing type script.

The script language programs are powerful programs but can be difficult to learn. These programs are not readily transported to other hardware platforms.

3.3.3 Icon-based Programs

Although a multimedia project is a big task, makers of authoring software try to make it easy by using Graphical Icons as the control features of the authoring package program. The main features of Icon based programs are:

- i) Icon-based programs are easier to learn than scripting programs:
- ii) Editing individual elements in a presentation requires only clicking on its icon.

Icon-based authoring. programs are object oriented development programs where individual multimedia elements are represented by icons rather than script commands.

3.3.4 DLLs for Extending Features

In order to author a software, we talked of all multimedia devices becoming available. Scripts can be written to provide compatibility between hardware and software. Script programs are a powerful option in authoring needs to go beyond the software built-in features.

Advanced authoring programs can call on special features included in the windows Dynamic Linking Libraries (DLLs). Many add-on boards and peripheral devices include specialized DLLs upon installation. They can be called on for special functions that may not be available in the authoring software program. Specialized programming languages such as C++ allows users to create their own DLLs for enhanced functions.

3.3.5 Supporting CD-ROM or Laser Disc Sources

Storing arrays of audio and video on hardware is often not practical to get the quality and speed as might be desired. Authoring software allows full control of Laserdisc and CD-drives to integrate audio, video and computer files.

Authoring programs support direct control of CD-ROM drives, video and laserdisc sources. This is provided through the MCI command language.

Multimedia presentations that depend on large amounts of sound or video clips require excessive amounts of hard disk space. The presentation system can be configured by having a CD-ROM drive as the sound source and a laserdisc player as a video source. Both the pieces of hardware are controlled by the authoring software in a seamless manner.

3.3.6 Supporting Video for Windows

Video stored on hard disk is sometimes the right media for your project. Authoring software has the capability to support most multimedia elements like video for windows.

The latest version of Authorware Professional from Macromedia permits the loading of video clips from video for windows and animation clips from Autodesk.

3.3.7 Hypertext

Words can be made into buttons that will take you to cross-reference in a program. Hypertext capabilities can be used to link graphics, some animation and offcourse other text.

Hypertext programming interfaces allows users to select individual "Hot Words" on a screen which are then linked to additional pages and layers of text. The help system of windows is an example of hypertext.

Hypertext systems are useful when presenting and referencing large amounts of textual information. Some hypertext authoring programs provide graphical links for animation, sound and video as well as text.

3.3.8 Cross-Platform Capability

Authoring software can even package a multimedia project to play on other computer types with appropriate planning. This works successfully to broaden your potential audience.

An important consideration with authoring programs in their capability to be altered for presentations on Macintosh or other hardware platforms. Some authoring programs are available on several platforms and provide tools for transforming and converting files and programs from one to the other.

Care should be taken when considering cross-platform development because of significant performance differences in hardware peripherals and devices.

3.3.9 Run-time Player for Distribution

Run-time software is often included in authoring software to explain the distribution of your final product by packaging playback software with your content. Advanced authoring programs provide specialized packaging and run-time distribution for use with devices such as CD-ROMs.

Care must be taken when using run-time players for advanced authoring systems that all specialized DLLs, run-time modules for other programs and non-system fonts used in the presentation are packaged together when the final product is distributed.

3.4 AUTHORIZING TOOLS

Authoring can be described as creating highly interactive applications in which the information can flow in both the directions i.e. from application to user and from user to application. Multimedia authoring tools has helped in creating higher-quality audio and video applications with very little expertise.

Authoring does not require a team of programmers. Instructors, corporate communications, and content specialists with no previous programming experience should be able to learn and use the authoring environment.

At large, authoring programs could be grouped into the following two distinct types:

- i) Those that relied entirely on point and click, and
- ii) Those that required simple scripting.

Multimedia authoring tools can be evaluated by performing certain tests which include the creation of non-interactive multimedia, computer-based training (CBT) applications, catalog creation and even authoring for the world wide web. The advantage of using object-oriented programming has been inculcated in the authoring products like Everest Authoring System offers object instancing, while Media Verse and Oracle Media Objects allows to add new methods and events to existing objects. Supplied templates in Authorware and Media Verse saves the time in implementing specific functionality.

In order to create effective multimedia, one needs tools that can handle a wide range of authoring tasks, including interactive title development, CBT, interactive catalogs/kiosks and web authoring.

The CD-ROM's interactive title development task focuses on the flexibility and power of screen design tools and support for managing memory requirements and playback data rates. Also the ability to create cross-platform applications looked for.

Creation of Computer-based training (CBT) stresses wizards, templates, and other tools designed to make it easier for non programmers to generate applications. Other features included the ability to interface with a database either proprietary or via ODBC for tracking student performance, and special tools designed for creating exercises.

As the ultimate goal of interactive catalogs/kiosks is to sell things, so the products that offer robust database-handling tools would be best suited for processing sales transactions.

The Web authoring task involves generating an application that can be played by a helper application from within a web browser, or something as complex as a stand alone application designed to stream data from the server over TCP/IP connections and onto the user's browser without making the user download the application.

The following subsections discuss a few important authoring tools:

3.4.1 Authorware

Macromedia's Authorware is a dependable industrial-strength environment that allows multiple people to contribute to an application. Artists can load a library with media, programmers can provide templates for complex interactions, and interface designers can put everything together. And one non-programming designer can even do the entire job alone.

Authorware 3 allows authoring of programs in identical environments on either the PC or the Macintosh and produce runtimes for either. Authorware's icons hold a wealth of programming information that never requires the user to think like a programmer.

Some icons in Authorware can manipulate media on the screen. They can display and erase graphics, move or animate objects, play AVI and Quick Time digital movies as well as WAV sound files, and access videodisk and videotape players.

The new framework icon automates hypermedia interactions and provides a default navigation structure. With a 10-page document in rich text format (RTF), it is easy to import it into the first "page" of framework using Authorware. Authorware can create a new display page for each hard page break in a RTF (Rich Text Format) file. Eight buttons are used to move between pages, pop up a pick list of pages, search documents and exit the framework.

Authorware 3 has added text styles that you can apply to any text (labels, menu options, scrolling text boxes).

Designing in Authorware is also allowed. Authorware elegantly provides full data integrity for its naming of icons and variables. Change a variable name and it changes everywhere it's used.

Authorware can run timers, change the flow in response to a user, keep score, and access laserdisc players via dialog box.

Although Authorware includes ODBC to enable connectivity to and from databases, it falls short of enabling proper database interactivity and reduces each fetched record to a single text string.

Also, even though, Authorware ships with a full assortment of buttons, dialog boxes, sliders, gauges, scrolling text boxes, and data entry boxes, it lacks such features as the critical list and combo boxes that are used in the other programs to create the order screens.

Authorware rewards an open mind and a willingness to tackle its different approaches by giving non-programmers accessibility and allowing them to produce complex interactivity with a minimum of programmer like thinking. Authorware's built-in knowledge of interaction, testing and scoring makes it a mature and bullet proof environment for creating kiosks or CBTS.

3.4.2 Everest Authoring System

Everest Authoring System 1.5 is best suited for the developers of CBT applications who seek a powerful but easy-to-use windows-based authoring environment. As far as CBT environments go, Everest (a Windows 3.1 application that also plays back on Windows 95) features strong multimedia support, enough object orientation to improve the productivity over competing products, and great tech support.

Everest's nearly seamless multi-paradigmatic approach includes such features as visual programming with icons, direct manipulation of interface elements and procedural programming. Everest has successfully integrated these elements making applications development easier.

The Everest development environment opens with multiple views of an application. In Everest's application creation, the user starts off with a library and name an initial screen. Dragging a layout object icon from the toolset onto that screen provides the basis for the first screen. The layout object, visible as an icon on the Icon Script, also occupies the Attributes Window, in which the user can choose a background colour on bitmap, select a screen size, and specify upto 34 more properties.

Also interface and media object icons can be dragged onto the screen; like list and combo boxes, edit boxes, text displays, bitmap placeholders, sliders and gauges, buttons of all types, video and audio, OLE and animation.

These objects can be made to move around, visually resize them and their properties set by clicking on them in either the Visual-Screen or the Icon Script. The placeholder objects can be left empty or their contents can be specified immediately.

Everest's object orientation, which supports object instancing but not subclassing, increases developer's productivity. For example, if suppose we dragged a button object, dropped it in the Visual Screen and sized it for use as a Back control button to return to previous screens. In the Attributes window, we name it, set the bitmap used for pressed and released, and assigned it an "event code" - in this case, 33-that it would generate when pressed. And we did all this simply with drag-and-drop, point-and-click, and fill-in-the-blank. Then comes the fun part. In the Attributes Window, we set save as object to true. On the next screen, we dragged in another button off the Toolset. With one simple choice of a pull-down menu in the Attributes window, we made this new button an instance of the Back button that we saved as object, and the newly created button inherited all its properties.

Once the screen design satisfies the user, Everest has provided an easy method of scripting navigation and control flow.

Overall, Everest offers a charming environment in which to create CBT applications. Additional modules from third-party vendors can infuse Everest with data handling facilities to access databases and utilize rich text format. The base product can access only its proprietary database, which can read to and write text files.

3.4.3 Icon Author

Icon Author, an authoring tool requires the use of an icon-based flowchart for building an application. It still maintains a strict separation between an application's structure and the actual content and still ships with a number of ancillary programs that help to edit and manage content.

The role of Smart Object editor, has become central to the creation of Icon Author applications. Smart Object Editor assembles individual object such as imported pictures, sound files, video clips, animations, database links, text push buttons, tables and list boxes into coherent pages layouts. The appearance and behaviour of these objects can be controlled by changing the properties associated with each one.

Icon Author handles multimedia objects with aplomb. The sound, movie and animation files are not only easy to be imported but it also takes less effort to control them. For example, adding VCR start and stop buttons to a movie object requires just activating the control bar property in Smart Object Editor.

Creation of CBT application or authoring a CD/Kiosk presentation requires importing and manipulation of data. Icon Author has the ability to access databases via Microsoft Open Database

Connectivity (ODBC) drivers. Once the connection to a database is established externally (via the ODBC Administrator), the database object is simply inserted into a Smart Object Page.

3.4.4 ImageQ

ImageQ is another multimedia authoring software package. Although, it is a windows 3.1 application but it can also play back on windows 95, create slide show presentations well and provides a way to distribute them easily. It lacks the intuitive programming language and strong interface necessary for truly productive multimedia applications development.

ImageQ presentations comprise a series of background images and associated control scripts that add user interface controls, overlay images, and underlying programming to each slide. It uses a multiple-document interface to manage one or more presentations simultaneously.

The slide strip window for each presentation contains either thumb nails or file information for each slide image and provide the means of navigating through the presentation at design time. Although the images in the slide strip are, miniature versions of the background images they do not show any of the user interface element that the user has added such as button and list boxes. The user must create these through code, which ImageQ will interpret only at runtime-a major deficiency that other authoring system (such as Icon Author and Director) avoid by offering design tools to arrange interface controls visually without code.

While ImageQ does not provide the robust slide design tools that competing products include, it does import a wide variety of graphics formats.

Once the images have been imported into an ImageQ presentation, they can then kept in their native formats or saved as .BMP or .HKF files.

Whenever images are imported into an ImageQ presentation, it involves only creation of thumb nails and slide references, the images themselves remain as separate files. The list of filenames and the control and transition settings are stored in a file with an IMQ extension, which serves as the main file for the presentation.

ImageQ's programming language is awkward to work with, because it uses unconventional syntax and event handlers. For example, ImageQ uses lines like "add X to Y", put 150 into X for adding the two values in a single statement and assigning the value to 150 to X, respectively.

Though ImageQ lacks design and programming tools, it does well with distribution. It is easy to build portable presentations as stand alone .EXE files that includes the ImageQ runtime. ImageQ is really a presentation package in an authoring system's clothing. Its real strength lies in ability to create traditional slide shows with prebuilt images and distribute them with no royalty. Yet the product's lack of interactive design tools and its clumsy programming languages ultimately make it a poor choice for robust multimedia applications development.

3.4.5 Macromedia Director

Macromedia Director 4.04 is better suited to multimedia presentations and kiosk applications than CBT or interactive catalogs that require more database work. This product offers a lot:

- i) a central scoring component that provides precise timing control
- ii) cross-platform compatibility
- iii) strong yet intuitive animation features
- iv) and an extensive architecture to add functionality.

The application in Director's user interface is a movie, the playback screen is the stages, and the various elements in the movie are cast members. A Director movie consists of frames that comprise many separate, individual channels, each of which can hold a sprite or sound, custom palette, and the like. Each sprite is an instance of a cast member, such as a piece of text, a bit-mapped image, or a digital video clip.

As all of the sprites can be accessed during each frame of the movie, so an ultimate time-based control can be achieved.

Director has 48 separate sprite channels available in each frame. Sprites are only copies of the cast members so their look can be modified in a particular frame without affecting the original cast member. Each channel number represents a stage layer so the sprites can be moved between layers by simply suffering them up and down. Some special channels exist to refer to each frame; transition, palette, tempo, script and two sound channels.

One of Director's strongest features is its cross-platform compatibility. The Windows and Macintosh versions of the products are binary compatible so the Director movies can be transferred between them by simply moving the file.

Director imports an impressively broad range of graphics formats. When a file is imported, it automatically becomes a cast member and receives a number. Version 4.04 has the ability to mix sound files sampled at different rates and sizes but it is not possible to mix AIF and WAV files with the audio in digital movie clips.

Animation features which is one of Director's strongest suit allows to set the sprites in motion differently.

Director lets the non-programmer arrange cast members frequently and put them in motion, but robust movies need some coding. (Director's language, Lingo, uses English like phrases for commands, but getting used to it takes some time). Director has been proved to be very useful for implementing linear presentations but weak for complex programming.

Though Director can create complex multimedia events such as CBT, a bit of programming experience is still required to pull them off. For time line-based interactive titles and demo CDs, however, Director is an exceptionally useful tool that exploits a logical metaphor to achieve spectacular results.

3.5 QUICK TIME

Quicktime is a software, developed by Apple, that supports time-based media on the Macintosh. It has also been ported for windows environment. An example of time based media is video-a sequence of images that are displayed on screen to create the illusion of motion. The images are time based because to retain synchronization with a sound track, the images must be displayed at the correct time in relation to the sound track.

The Figure-1 show how the different development environments relate to one another, to Quicktime and to programming an application form scratch.

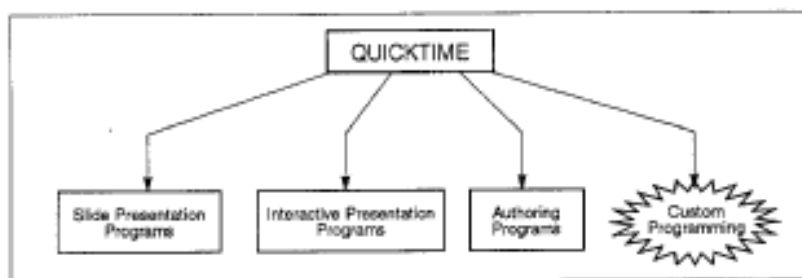


Figure 1: Relationship of QuickTime with different multimedia developments environments

It is probably noticeable from the figure that the QuickTime is off on its own with a circle pointing to each of the other areas. That's because QuickTime is not really a development environment like the others. It more closely resembles a data type, just as PICT is a data type for graphics, and AIFF is a data type for sound.

Though QuickTime can be used to create movies and may even replace the slide presentation programs for some job, it is far more likely that QuickTime will be used to provide animation or video from within one of the development environment.

Importance of QuickTime

QuickTime adds support for time-based media to the basic Macintosh system architecture. The most common media that require this kind of support are video, animation and sound. Sound has been supported on the Macintosh since its introduction, but it's important that QuickTime supports sound because QuickTime can synchronize sound tracks with video tracks.

QuickTime provides a synchronization between the animations that would otherwise play at different speeds when played on different machines.

QuickTime stores video digitally-that is, it converts the frames of video to digital images that are stored on the computer's hard disk. When the video is "played" these images are read from disk and displayed on the computer screen. The advantage of storing the video this way is that the computer can very quickly and easily access other information on a hard disk.

Another advantage is that once the frames are stored on the hard disk they can be manipulated using a number of different editing applications.

The disadvantage of storing video this way is that the computer has to do a lot of work to display the video sequences.

How does QuickTime Work?

To achieve digital video, the computer needs two things:

- 1) The computer must be capable of handling video's large amounts of data. This is accomplished by streaming in which the computer displays one frame as it reads the following frame from the disk.
- 2) The computer needs some kind of timing mechanism that keeps video and sound synchronized. Timing is particularly important when the people are displayed

speaking on the screen as without synchronization their lips won't move in synch with the sound. QuickTime fulfills both needs. QuickTime has many features but the two most important are its Compressors and its timing mechanism. The compressors enable the program to reduce the frames to a manageable size, so the computer can stream the information from the disk. The timing mechanism ensures that multiple tracks maintain synchronization.

Without compression, the large amount of data would prevent even the fastest hard disk from playing a movie-by the time the computer had read the first from the disk, the same for displaying the frame would have passed. Even with compression, QuickTime may not be capable of playing all the frames in the movie. QuickTime handles this problem by dropping frames. A 20-frame movie might play at only 10 frames per second on a LC, in which case QuickTime plays every second frames in the movie. QuickTime always tries to maintain the quality of the sound.

3.6 HYPERTEXT

Although the term "hypertext" is relatively new to many of us, it was actually coined in 1965 and an article predicting hypertext was published in 1945.

Hypertext is nonlinear or nonsequential text; there is no single order that determines the sequence in which the text is to be read. That is, the text is organized so that one can easily jump around from topic to topic.

Although, hypertext is best brought to life on a computer, it can be found in simple paper documents too. A paperback novel and the front page of a newspaper are the two examples of text out of which the newspaper page is hypertext because one can easily jump from topic to topic if one wants more depth on any one topic. While, the novel, on the flip side, does not encourage to skip around. The novelist assures he will be reading in a fixed sequence reading one page right after another. Figure-2 illustrates hypertext with an example.

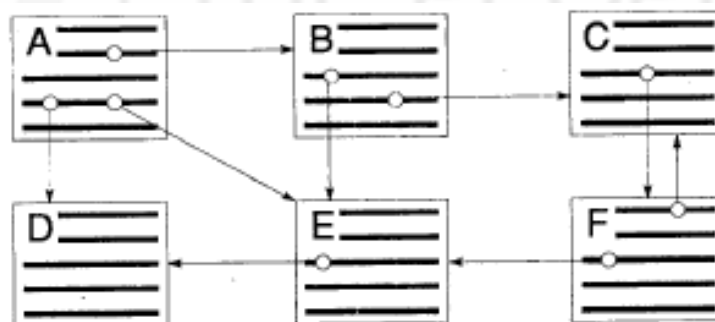


Figure 2: Hypertext Structure

Assumes that one starts reading the piece of text marked A. Instead of a single next place to go, this hypertext structure has three options for the reader: Go to B, D or E.

Assuming that one decides to go to B, then to C or to E, C and from E, one can go to D. Since it is also possible to go directly from A to D, this example shows that these may be several different paths that connect two elements in a hypertext structure.

Hypertext presents several different options to the readers, and the individual reader determines which of them to follow at the time of reading the text. This means that the author of the text has set up a number of alternatives for readers to explore rather than a single stream of information.

The same is true of footnotes in traditional printed texts, since readers have to determine upon reaching the footnote marker whether to continue reading the primary stream of text or to branch off to pursue the footnote. Therefore, hypertext is sometimes called the "generalized footnote".

When hypertext is implemented on a computer system there is potential for giving readers more flexibility in jumping around from topic to topic. The text for each topic may be stored in a special area of computer memory and then easily accessed. In the hypertext literature, these "areas of computer memory" are referred to as "notecards", "cards" or "nodes". Whatever be the size of these nodes, each of them may have pointers to other units, and these pointers are called links. The number of links is normally not fixed in advance but will depend upon the content of each node. Some nodes are related to many others and will therefore have many links, but have no outgoing links of their own. Sometimes, such nodes without further links are called leaf nodes.

Figure 1 also shows that the entire hypertext structure forms a network of nodes and links. Readers move about this network in an activity that is often referred to as browsing or navigating rather than just "reading" to emphasize that users must actively determine the order in which they read the nodes.

A hypertext link connects two nodes and is normally directed in the sense that it points from one node (called the anchor node) to another (called the destination node).

In the early days of hypertext, nodes contained only textual data. Now nodes can contain various kinds of data: graphics, audio, video, computer-animated images, film clips of animated scenes, digital sound or other kind of information. The term hypermedia may be used, when referring to systems that include a wide variety of node types.

Hypertext is now being used in more and more areas. Educators are making good use of hypertext and making learning difficult subjects more and more accessible. While reading some instructional material on a computer screen, the user may come across several technical terms on the screen that are highlighted (shown in a different colour, say, yellow letters on a green background or black letters on a white background). One can instantly branch off to a new window of information a definition or elaboration of any of these highlighted words. This enables a comfortable learning with a well-designed hypertext system.

3.7 APPLICATIONS OF HYPERTEXT

This section highlights some of the current applications of hypertext.

3.7.1 Computer Applications

Since hypertext is a computer medium, it is natural to use it in connection with computer oriented applications. Hypertext can be used to prototype the user interface for almost any other computer program as most initial prototyping consists of linking together screen designs and presenting them to the user in an order determined by simple user actions.

a) Online documentation

Online documentation may be the most natural of all hypertext applications. Hypertext is the obvious method for helping users in the situation when they require

good access tools to help them retrieve the sections of the manual that are relevant to their current needs.

b) User Assistance

Hypertext provides a mechanism for integrating several forms of user assistance, including the online manual, an introductory tutorial, an online help system, and even the error messages. Because users only get error messages when they are in some kind of trouble, the error messages are a prime candidate for providing users with assistance.

In an integrated user assistance facility based on hypertext, it would be possible for the user to link from an error message to the location in the help system that gives further assistance on the problem. Suppose if the user's difficulty is not the error situation in general but a single incomprehensible word in the online message, it may become possible to link from that word to the location in the online manual where it is defined with the help of hypertext. Also if the user wanted further assistance than could be provided by the help system or the manual then it may become possible to link further, to the appropriate location in the tutorial component, to get a computer-aided instruction lesson.

This type of integrated user interface does not exist in current computer systems and can be made possible with the hypertext facility.

c) Software Engineering

The hypertext has a great potential for providing links among the large number of specification and implementation documents that are produced during the software development life cycle. For example, it would be possible to start from a requirements document and link to that part of the design specification that meets a given requirement. One could then link from the design specification to the actual code to see how that design is implemented.

A development organization would require to follow a software engineering methodology supported by an integrated set of computerized tools in a complete CASE (Computer Aided Software Engineering) environment, in order to derive full benefits from this form of hypertext links among the various documents in the software lifecycle.

It is also possible to use hypertext in a less lifecycle-oriented approach by including linking facilities in structure-oriented editors for program code. For example, it is possible to click on a variable to get to see its definition and associated comments, or to link from a procedure call to opening a window with the text of the procedure. The Smalltalk code browser links related pieces of code in somewhat this manner.

3.7.2 Business Applications

This section concentrates on "mainstream business", but quite frankly there are not yet all that many business applications of hypertext in place to be used every day for real profit. But there are potential applications that are currently being investigated by several companies, and there are also some systems in real use.

a) Dictionaries and Reference Books

Several dictionaries and large reference books have been converted from a traditional paper form to a hypertext format. A hypertext dictionary from scratch has been generated for the children's dictionary shown in Figure-3.



Figure 3: Children's dictionary with hypertext features

For pure environment the user can click on the picture of the dog to have it replaced by another kind of dog. There are hypertext links to "dog words" and to other pets, as well as the links to other words from the definition. All these features encourage the child to explore the dictionary and learn new words.

One of the biggest advantages of hypertext encyclopedias and dictionaries, compared to a printed work, is that they can show moving images and play sound. For example, Microsoft Bookshelf contains a dictionary with sound recordings of how the words are actually pronounced.

Printed dictionaries for deaf users portray hand and facial gestures through line drawings with arrows to show movement, so multimedia dictionaries are clearly a superior format for communicating this dynamic language. Also, the computer format has added benefits such as the ability for less experienced users to view a sign at much slower speeds than normal conversation.

b) Law

Hypertext has two main applications in the legal field. The first is to support legal research and is mainly used by professional lawyers. The second is support of legal document creation and management and is used by both lawyers and people who wish to avoid paying legal fees.

Legal texts are filled with cross-references and are therefore well suited for hypertext support. Typically, a lawyer's brief might refer to several court rulings, each of which would refer to further rulings and to the applicable statutes. Having each of these references available online saves the lawyer much time in researching the law. A special aspect of law is that new statutes or higher court ruling may invalidate earlier decisions, meaning that something may be legal one day but illegal the next.

This time varying nature of the law has two consequences for legal hypertext systems. The first is that a lawyer who accesses one of these overruled cases would better be informed that it is no longer a valid law. Legal information services achieve this purpose by inserting bi-directional links from the new law to any earlier nodes referring to the same issue. Lawyers can then follow the links in the opposite direction in a process known as Shepardizing after the printed books that originally supplied

these inverse links. The second implication is that lawyers will sometimes need temporal scrolling of the law to discover what the rules were at some earlier point in time when the action under consideration took place. For example, if a client is taken to court over an old income tax return, the defense should be based on the tax rules for the year in question.

Another legal application is the use of multimedia visualizations by trial lawyers to illustrate their version of events during a trial. Since visualizations are so compelling, juries can often be convinced that something has really happened because they saw it happen (on the computer).

c) Trade Shows, Product Catalogs and Advertising

Many kinds of advertising and communication to customers can be improved by hypertext. For example, one can attract attention at trade shows by having a computer with hypertext information about one's products.

Hypertext can also be used to provide information about an entire trade show and help people find those exhibitors that would interest them.

One of the intrinsic advantages of hypertext in an advertising context is the general ability of hypertext to provide access to large amounts of information but to show the user only those small parts that interest him or her. This property of hypertext is important for applications like product catalogs. A hypertext product catalog can reduce the complexity of choosing among a large number of options by showing only those that are relevant for the individual customer. It can also offer help in placing the order and might even place it by an online connection to the vendor. A hypertext catalog could also include an option to remember what products the user ordered the previous time, thus making them especially easy to reorder.

Traditional types of advertising are certainly possible in hypertext, either by sending customers a disk or by making promotional materials available on the internet. Compared with paper publishing, where a majority of the pages in many newspapers consist of advertising, hypertext provides great potential for saving resources while making more advertising content available to those readers who express an interest in a certain ad and follow its link to the supplementary materials.

3.7.3 Educational Applications

Many hypertext systems have been produced specifically for educational use. Hypertext is well suited for open learning applications where, the student is allowed freedom of action and encouraged to take the initiative. For example, the Interactive NOVA hypertext allows the student to browse through a set of biology information and see those parts that interest the student or make sense in the context of a current assignment. On the other hand, hypertext may be less well suited for the drill-and-practice type learning that is still necessary in some situations.

Foreign Languages

The linking abilities of hypertext are ideal for the learning of foreign languages. Hypertext can provide automatic access to dictionaries through implicit links from any text. A student who does not know English very well might still be able to understand material in Intermedia because of its ability to link to an explanation of any word. Hypertext also enables students to view two parallel versions of the same text: An original version and a translation.

The Video Linguist is a hypermedia system that teaches a language by showing clips of television broadcasts from a country speaking that language. The advantage of this approach are that TV shows are fun and motivating and that they reach the culture of the country in addition to the language. One major problem with learning languages is that native speakers of many languages tend to speak in a very agitated and fast manner which makes their utterances hard to understand for foreigners. But of course the goal of learning French is to understand the way the language is actually spoken in France and not the way a teacher may speak it in class. Therefore the Video Linguist initially plays the original sound track from the broadcast version of the show.

If there is a part of sound track that students do not understand they can utilize the hypertext facilities and link to a version where the same words are spoken more slowly. If they still don't understand it, they can follow a link to a version where each word is spoken v-e-r-y s-l-o-w-l-y and clearly. A final hypertext feature in the Video, Linguist allows the student to click on any word in the subtitles and get its dictionary definition.

3.7.4 Entertainment and Leisure Applications

Hypertext provides several opportunities for pure enjoyment. Although, there has been very little research conducted in this area, but still there has been some pioneering research as well as the first few commercial examples.

News, Newspapers, and Magazines

News delivery is an obvious candidate for online services since events can be reported as they occur instead of having to wait for the scheduled publication time of a newspaper or magazine. Online versions of large newspapers help the articles to be accessed around the clock. Some added value derives from search capabilities where one can find, for example, all news stories about a certain company over the last month before deciding whether to invest in it or how to solicit it as a customer. Also information filtering can be used to design personalized electronic newspapers with exactly those newsstories that are of interest to the individual reader.

The ability to link between articles from several magazines is a value-added feature of the hypertext versions of the magazines. Even the discussions between readers is a value-added feature for the hypermedia versions of the magazines: if somebody is reading, say, an article about an upgrade to a spreadsheet application. that person is likely to be interested in the experience other readers have had when installing the upgrade.

3.8 ELEMENTS OF HYPERTEXT

This sections gives a quick overview of the basic elements of hypertext which are as follows:

- 1) Nodes
- 2) Links
- 3) Annotations
- 4) Buttons
- 5) Editors
- 6) Browsers
- 7) Trails

Built-in programming languages

1) Nodes

Hypertext is a network of nodes. A node is a collection of data organized around a specific topic and related or linked to another body of information. In a network, each node is linked to some other node.

In different hypertext systems, different terms are used for nodes. In HyperCard, a card is a node. In HyperPAD, the node is a Pad.

In many hypertext systems, a node is a screenful of data. Nodes can be categorized in different ways and there can be different kinds of nodes.

The Figure-4 illustrates the node reference within the screens.

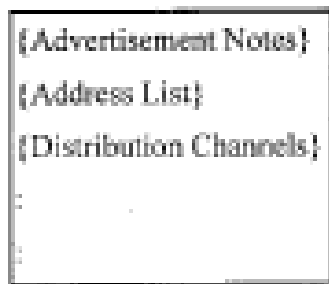


Figure 4A

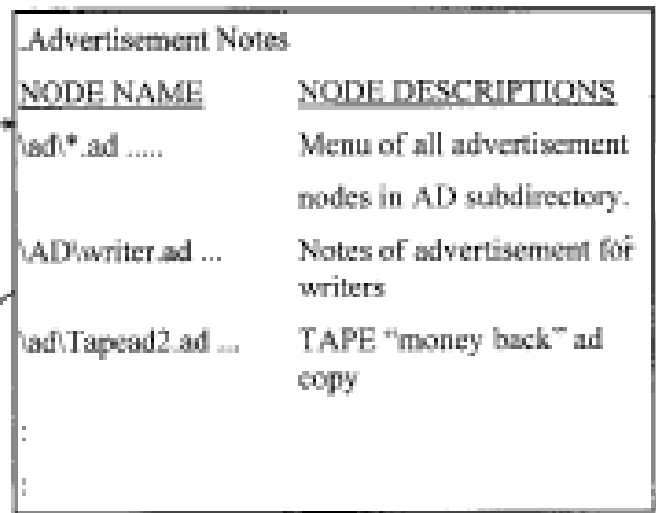


Figure 4B

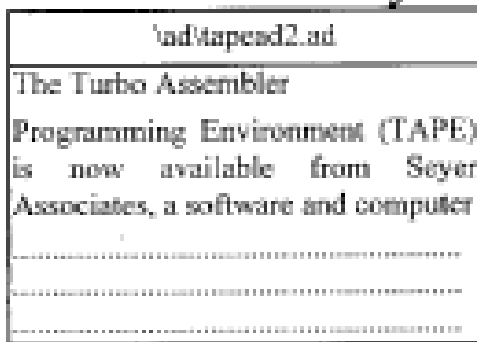


Figure 4C

Figure 4: Network of Nodes

This first node reference is {Advertisement Notes} in Figure 4A. It is called the top-level control text because it contains only references and pointers to other node and it is always enclosed in braces. That is, each item in braces is a pointer to another node. By moving the cursor to an opening brace and pressing F10, the user can instantly branch to the corresponding node in the network as shown in Figure 4B. The second level node in this figure also contains reference to other nodes rather than the content information. So, in this case, it is also a control node-it only allows the users to control their navigation through the network.

Placing the cursor on a backslash and pressing F10 instantly displays the contents of that node as shown in Figure 4C. Here each node is shown as a separate text file.

2) Links

Links are the other fundamental unit of hypertext besides nodes. A link is information embedded in a node that connects it in some way to another node. Links are almost always anchored at their departure point to provide the user with some explicit object

to activate in order to follow the link. The result of activating the anchor is to follow the link to its destination node.

Most links are explicit in the sense that they have been defined by somebody as connecting the departure node with the destination node. Some systems also provide implicit links which are not defined as such but follow from various properties of the information.

A hypertext link has two ends. Even if a link is not bidirectional, there may still be a need to anchor it explicitly at the destination node. Hypertext systems also have plain links, which are just connections between nodes. The advantage of that approach is of course the simplicity of both authoring and reading. There is nothing to do with links excepts to follow them, and that one action can be achieved by a click of the mouse.

In addition to the standard links connecting two nodes, some hypertext systems also have "super- links" to connect a larger number of nodes. There are several possibilities for dealing with having a single anchor connected to several destinations. The two simplest options are either to show a menu of the links or go to all the destinations at the same time. Intermedia uses the menu option and allow users to choose only a single destination. This approach requires good names for the links or destination nodes in order for users to be able to understand their options. Some users of NoteCards have implemented a "fat link" type that opens windows on the screen for all the destination nodes.

3) Annotations

A special link type is the annotation link to a small, additional amount of information. The reading of an annotation typically takes the form of a temporary excursion from the primary material to which the reader returns after having finished with the annotation. Annotations are quite similar to footnotes in traditional text and can be implemented, as Guide pop-up windows that disappear as soon as the user releases the mouse button. Annotations can be accessed through an icon.

Hypertext writers can use annotations in the same way they would use footnotes in traditional text with the exception that hypertext annotations are less intrusive because they are not shown unless the readers asks for them. Many hypertext systems allow readers to add new links to the primary material even if they do not always allow the reader to change the original nodes.

4) Button

A button is a visual cue in a node that alerts a user that a link exists. In other words, a button is a visual representation of a link in a node. By pressing a mouse button, or appropriate function key, the user can cause the system to activate a link to display a different node. Some literature describes a button as a "hot spot" on the screen-a spot that is sensitive. If the cursor (or pointer) is moved over a "hot spot", it will change shape indicating the type of button present.

The buttons in BlackMagic (a hypertext word processor) appear in different colors on screen. There are different kinds of buttons and links. The different buttons are labelled in the annotated screen shown in Figure 5.

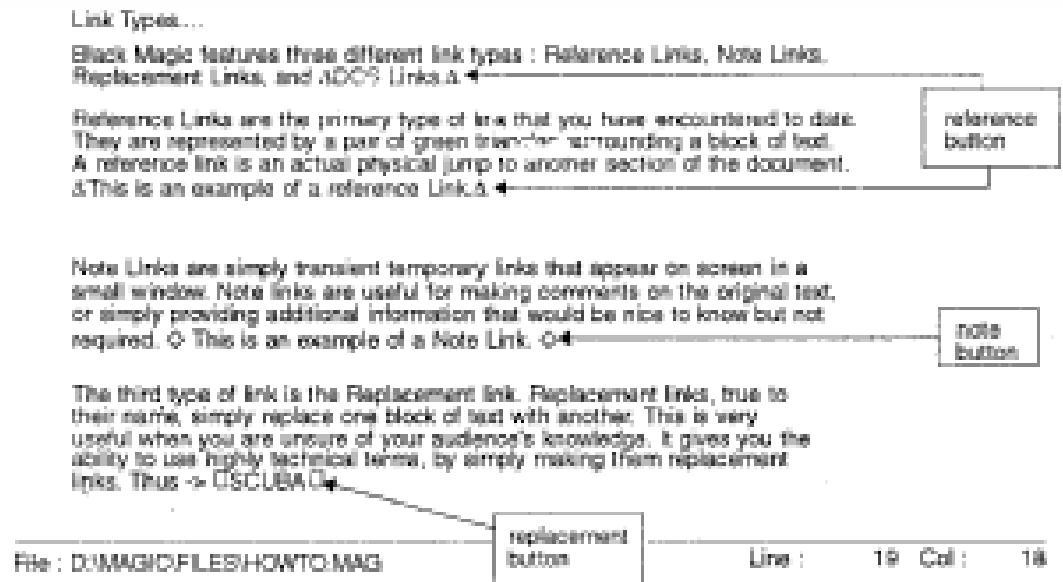


Figure 5: BlackMagic screen with note button

In this discussion, the button includes the diamonds and the text in between the diamonds. When you move the cursor is moved on to a diamond (or on to a text delimited by the diamonds) and F1 is a note node appears in a small window in the upper right corner of the screen as shown in the Figure 6.

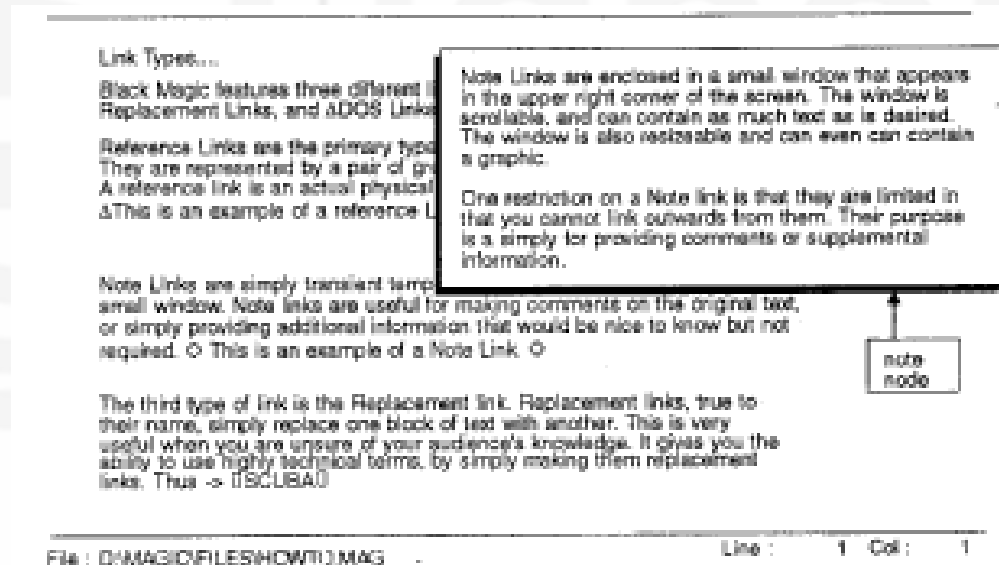


Figure 6: BlackMagic screen with note node

5) Editors

An editor is the part of the hypertext systems that enables a user to create a node and link it into the network. Some hypertext system are net distributed with the editors because they are intended as "presentation-only systems".

6) Browsers

A hypertext browser is a program or subprogram that can display a diagram of a network of nodes. Few hypertext systems for personal computers currently have browsers.

A hierarchical browser has some nodes that are regarded as "parent" nodes which are at a higher level than nodes beneath them. They are sometimes regarded as "child" nodes.

In a hierarchical browser, each of the child nodes are linked to each parent node. That is, one can see what child nodes spring from any given node. If the same child node is connected to two different parent nodes, the child node is repeated under each parent node. In a hypertext network, however, there may not be a hierarchical relationship among nodes. Nodes may be equal and just linked together. In such a case a network browser might be more appropriate. In a network browser each node would be designated only once and lines would be drawn to show all of the links between all of the nodes.

7) Trails

A trail is a record of the nodes that a user has accessed in viewing a hypertext network. Ideally the trail would include "note nodes" created by the user in the process. Some hypothesize that users will blaze exciting, useful or enjoyable trails for others. It might be enjoyable for example, to follow a trail made by others (famous or otherwise) and read their comments on various stories, illustrations, new items and so on.

Trail recording can be a useful tool for refining hypertext networks. If one can study the trails that users take in searching for information or in studying an instructional network, he can spot problems and refine the network.

8) Built-in programming languages

Some hypertext systems have built-in programming languages, so one can customize the system to fit one's specific needs.

A good example of a program that has a built-in programming language is KnowledgePro. KnowledgePro enables to build expert system, systems that can emulate the behavior of human experts within a limited subject area. KnowledgePro allows store a number of rules in a file called a knowledge base using special Knowledge-Pro commands. One can program KnowledgePro to present information and ask questions to help users solve complex problems. KnowledgePro differs from many expert systems in that any word in question or response can serve as a hypertext button. One can program KnowledgePro so that when the user selects a hypertext button, a built-in subprogram is activated. The subprogram may go off on its own tangent-ask questions, branch to other subprograms and so on. Eventually, though, when the user finishes the subprogram, control will return to the node that contained the hypertext button.

Several other hypertext systems have built-in programming languages. HyperCard on the Macintosh is a language called HyperTalk.

IBM LinkWay also has its own script language, as does HyperPAD. With such a language one can do more than just create a network of nodes and create special visual effects, prompt the user for specific input, and process the input-for example, perform mathematical calculations.

Languages like HyperTalk and PADtalk, which works with HyperPAD, are not computer languages in a traditional sense; they are scripts that the hypertext application program reads, interprets and then executes. Still, they qualify as programming languages because they enable you to store a series of instructions that can be activated at the touch of a button.

3.9 REVIEW QUESTIONS

- 1) Which authoring tools is most suitable for online help system on a computer?
- 2) Which multimedia software is best suited for synchronizing sound tracks with video tracks?
- 3) Explain any one business application (other than that specified in the unit) which is an example of applications of Hypertext.

3.10 SUMMARY

In this unit, you have learnt the need for multimedia authoring. (why it is required), features of the authoring tools:

- Authorware
- Everest Authoring System
- Icon Author
- ImageQ
- Macromedia Director

You have seen how is QuickTime related to these relating programs. In addition, you have learnt the working of QuickTime.

By now you have a good background of the fundamentals of hypertext and why is it valuable. In addition, you've learned about typed links and how you might use them for more intelligent processing of hypertext networks. It has also explained about the various applications areas to which the hypertext can be used.

3.11 ANSWERS/SOLUTIONS

- 1) Hypertext
- 2) QuickTime
- 3) Auditing is another natural application for hypertext because it is based on relating information from various sources and checking for consistency. The audit task includes gathering and producing large numbers of documents and linking them together to substantiate the accuracy of the information they contain and huge amount of information get distilled into a single financial statement, so links are needed between the conclusions and the source data. Further more, the audit of an international company involves a large audit team distributed over several countries, leading to several advantages for various forms of computer support like electronic mail and hypertext links among documents produced in different areas of the world.

The hypertext system links the information produced during the audit process and makes it possible to track information from a final financial statement back to where it originated. It is possible to scan original documents from the clients, and it might conceivably the possible in the future to link directly into the client's own computer system.