**COM 416 - MULTIMEDIA**

**OVERVIEW OF MULTIMEDIA**

We perceive the universe through our senses. These senses—sight and hearing among them are brought into play as soon as we interact with our surroundings. Our sensory organs send signals to the brain, which constructs an interpretation of this interaction. The process of communication, of sending messages from one person to another, is dependent on our understanding of the senses. In general, the more information that is perceived by the receiver,

the more likely it is that an effective communication will take place. For example, suppose you are talking to a friend on the telephone. What is missing from this conversation, as opposed to a regular face-to-face conversation? For one thing, you cannot see the other person's face. The expressions, and the gestures that accompany what we say, have a lot to do with communication. Now consider a letter you have written describing a fun trip you took. Here your friend only gets to read the text that you have written and cannot hear your voice saying the things you have written. Besides, the communication is just one way. You have to wait a while before finding out what your friend wishes to reply to you. Now suppose you send a picture of yourself to your friend, along with the letter. Now you are sending some more visual information and your friend can visualize the fun you are having. However, the impact would have been tremendous if you had sent a video shot during the trip. As you can see, the more information you send, the greater the impact of the communication. The medium of communication—for example, a letter or a telephone call—restricts the usage of the various elements. Indeed, the development of communication devices is aimed at increasing the amount of information that can be transmitted. From the early letters involving just text, to the telephone where we could speak, we now are seeing the development of video telephony. The development of computers is also moving in this direction. Earlier, the computer was capable of giving only simple text as output, now we can get sound, pictures, and more. At present, the multimedia computer—a personal computer that has the capability to play sounds, accurately reproduce pictures, and play videos—is easily available and widely in use.

DEFINITION

Digital Multimedia is the field concerned with computer-controlled integration of text, graphics, images, videos, audio, and any other medium where every type of information can be represented, transmitted and processed digitally.

The development of powerful multimedia computers and the evolution of the Internet have

led to an explosion of applications of multimedia worldwide. These days multimedia systems

are used for education, in presentations, as information kiosks, and in the gaming industry. In

fact, multimedia has applications everywhere: in businesses, at schools and universities, at

home, and even in public places.

The word multimedia is a combination derived from multiple and media. The word medium

(the singular of media) means a transmission channel. For example, sound is transmitted through the medium of air, or electricity is transmitted through the medium of wires. Similarly, poetry could be considered a medium for transmitting our thoughts. Or for that matter, a painting is a medium for conveying what we observe. Similarly, a Hollywood director uses the medium of movies to tell a story. Multimedia is also a medium. To use it effectively, we have to understand not only how to create specific elements of multimedia, but also to design our multimedia system so that the messages we wish to convey are conveyed effectively. To be able to create effective multimedia, it is important for us to be sensitive to other multiplemedia— such as TV and films. Nevertheless, it is also necessary to keep in mind that the two are different in many ways. We will understand the differences and similarities between the two as we go along. The most important difference between traditional multiple media such as radio and television and digital multimedia is the notion of interactivity. The power of computers allows users to interact with the programs. Since interactivity is such a powerful concept, many experts in the field of multimedia consider interactivity to be an integral part of multimedia. We will also follow this convention. Thus, whenever we say the word multimedia, you should understand that we are referring to digital, interactive multimedia.

**INTERACTIVITY**

In a multimedia system, if the user has the ability to control what elements are delivered and

when, the system is called an interactive system. Traditional mass media include television, film, radio, and newspapers. These are called mass media, since the communication processes are one way, originating from a source and being delivered to a mass audience. These technologies also combine audio, video, graphics, and text, but in a way that is inflexible. For example, a film has a predefined beginning, middle, and end, irrespective of the audience watching it. With the power of the computer, the same media could be manipulated by the audience. In this manner, the audience does not need to remain passive, but becomes the user of the system. Thus, the key difference between mass media and multimedia is the shift from audience to users, and one-way communication to two-way communication. This is accomplished through interactivity. To communicate with the system, the user can use a variety of devices such as the keyboard, mouse, tracking ball, touch screen, and pen-based mouse. Thus while designing a multimedia application, we have to decide the level of interactivity we wish to provide to the user of the

system. For example, in a direct-sales application, you can give different choices for a single

product with different schemes. The buyers can select the products they wish to buy. One important thing to notice is that well-designed products always give feedback to the user once the user interacts with the computer. In our example, once the user selects the products to buy, the program can provide feedback to the user, such as, "you will get your requested product within S6 hours from now."

**Multimedia Building Blocks**

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

1. Text : Text and symbols are very important for communication in any medium. With the

recent explosion of the Internet and World Wide Web, text has become more the important than ever. Web is HTML (Hyper text Markup language) originally designed to display simple text documents on computer screens, with occasional graphic images thrown in as illustrations.

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

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

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

5. Video : Digital video has supplanted analog video as the method of choice for making video

for multimedia use. Video in multimedia are used to portray real time moving pictures in a

multimedia project.

**Text in Multimedia**

Words and symbols in any form, spoken or written, are the most common system of communication. They deliver the most widely understood meaning to the greatest number of

people. Most academic related text such as journals, e-magazines are available in the Web Browser readable form.

**About Fonts and Faces**

A typeface is family of graphic characters that usually includes many type sizes and styles. A font is a collection of characters of a single size and style belonging to a particular typeface family. Typical font styles are bold face and italic. Other style attributes such as underlining and outlining of characters, may be added at the users choice. The size of a text is usually measured in points. One point is approximately 1/72 of an inch i.e. 0.0138. The size of a font does not exactly describe the height or width of its characters. This is because the x-height (the height of lower case character x) of two fonts may differ.

Typefaces of fonts can be described in many ways, but the most common characterization of a typeface is **serif** and **sans serif.** The serif is the little decoration at the end of a letter stroke. Times, Times New Roman, Bookman are some fonts which comes under serif category. Arial, Optima, Verdana are some examples of sans serif font. Serif fonts are generally used for body of the text for better readability and sans serif fonts are generally used for headings. The following fonts shows a few categories of serif and sans serif fonts.

F F

(Serif Font) (Sans serif font)

**Selecting Text fonts**

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

 As many number of type faces can be used in a single presentation, this concept

of using many fonts in a single page is called ransom-note topography.

 For small type, it is advisable to use the most legible font.

 In large size headlines, the kerning (spacing between the letters) can be adjusted

 In text blocks, the leading for the most pleasing line can be adjusted.

 Drop caps and initial caps can be used to accent the words.

 The different effects and colors of a font can be chosen in order to make the text

look in a distinct manner.

 Anti aliased can be used to make a text look gentle and blended.

 For special attention to the text the words can be wrapped onto a sphere or bent like a wave.

 Meaningful words and phrases can be used for links and menu items.

 In case of text links(anchors) on web pages the messages can be accented.

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

**Exercise**

List a few fonts available in your computer.

**Computers and text:**

**Fonts :**

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

**Character set and alphabets:**

* **ASCII Character set**

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

tab and form feed.

* **The Extended Character set**

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

including frequently used symbols.

* **Unicode**

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

**Font Editing and Design tools**

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

In some multimedia projects it may be required to create special characters. Using the

font editing tools it is possible to create a special symbols and use it in the entire text.

Following is the list of software that can be used for editing and creating fonts:

 Fontographer

 Fontmonger

 Cool 3D text

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

1. Fontographer:

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

2. Making Pretty Text:

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

graphic image.

3. Hypermedia and Hypertext:

Multimedia is the combination of text, graphic, and audio elements into a single collection or presentation – becomes interactive multimedia when you give the user some control over what information is viewed and when it is viewed. When a hypermedia project includes large amounts of text or symbolic content, this content can be indexed and its element then linked together to afford rapid electronic retrieval of the associated information. When text is stored in a computer instead of on printed pages the computer’s powerful processing capabilities can be applied to make the text more accessible and meaningful. This text can be called as hypertext.

4. Hypermedia Structures:

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

5. Searching for words:

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

**Exercise**

Create a new document in a word processor. Type a line of text in the word processor and copy it five times and change each line into a different font. Finally change the size of each line to 10 pt, 12pt, 14pt etc. Now distinguish each font family and the typeface used in each font.

**Multimedia Applications**

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

* **Creative industries**

Creative industries use multimedia for a variety of purposes ranging from fine arts, to entertainment, to commercial art, to journalism, to media and software services provided for

any of the industries listed below. An individual multimedia designer may cover the spectrum

throughout their career. Request for their skills range from technical, to analytical and to creative.

* **Commercial**

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

* **Entertainment and Fine Arts**

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

of just sitting by as passive recipients of information are called Interactive Multimedia.

* **Education**

In Education, multimedia is used to produce computer-based training courses (popularly called CBTs) and reference books like encyclopaedia and almanacs. A CBT lets the user go through a series of presentations, text about a particular topic, and associated illustrations in various information formats. Edutainment is an informal term used to describe combining education with entertainment, especially multimedia entertainment.

* **Engineering**

Software engineers may use multimedia in Computer Simulations for anything fromentertainment to training such as military or industrial training. Multimedia for software

interfaces are often done as collaboration between creative professionals and software engineers.

* **Industry**

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

* **Mathematical and Scientific Research**

In Mathematical and Scientific Research, multimedia is mainly used for modeling and simulation. For example, a scientist can look at a molecular model of a particular substance

and manipulate it to arrive at a new substance. Representative research can be found in journals such as the Journal of Multimedia.

* **Medicine**

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

**VISUALISATION AND CREATIVE PROCESS**

Visualization is the process of representing abstract business or scientific data as images that can aid in understanding the meaning of the data.

Creative visualization is a mental technique that uses the imagination to make dreams and goals come true. Used in the right way, creative visualization can improve your life and attract to you success and prosperity. It is a power that can alter your environment and circumstances, cause events to happen, and attract money, possessions, work, people and love into your life.

**Five stages of creativity**

1. PREPARATION

The first stage is the idea of PREPARATION, the idea that you are immersing yourself in the domain. If you are a musician you are absorbing a lot of the music that is inspiring you to create this new piece. If you’re a writer you are reading other writers in this area. If you are an artist you are looking at other artist’s work in the area that you are looking at creating something in. If you are a scientist you are looking at all the background research. And if you are an entrepreneur or marketer you are looking at all the previous market research and what other companies have done before.

So this stage is normally best carried out in a quiet environment. It’s really this stage that you are trying to absorb as much information as possible because this information will go into your sub-consciousness where it is very important for the second stage, or second level.

2. INCUBATION

The second stage is what we call the INCUBATION stage. In incubation this is when all the information that you have gathered in the PREPARATION stage really goes back. It starts to churn in the back of your mind, in the sub-consciousness. This is an extremely important stage because sometimes it can takes days, or weeks, or months or sometimes even years. That idea that you’ll think about writing about a book or piece of music, and you’re writing about it and you just leave it to the side for a while and then you come back to it. Now the interesting thing about the incubation stages it that to a certain extent it is not really under your control how long that stage will take. It is something you cannot really rush because what it leads to is the third stage.

3. INSIGHT

The third stage is what most of the public think is a classic signal or sign of a creative person, what is called the INSIGHT stage or the insight step. With insight it is really the idea of the ‘Aha’ moment, the ‘Eureka’ moment. Although it is probably the smallest part of the five steps, it is possible one of the most important parts. On one of my subsequent videos I’ll take you more into how to increase your chances of having those ‘Aha’ moments, those insights. A quick thing I would say here is that they most often happen when you are doing some kind of low-level physical activity; going for a shower, driving a car, having a walk. This is because your subconsciousness in the previous stages is bubbling away and this insight stage really allows the mind to work on something else. And then bring these ideas to the forefront of your mind. So that’s the third stage, the insight’s stage. And now we go on to the fourth stage.

4. EVALUATION

It is an area that a lot of creative people struggle with because often you have so many ideas and you have a limited amount of time. So the evaluation stage is important because this is where it requires self-criticism and reflection. It is asking yourself questions like:

“Is this a novel or new idea or is it one that is just re-hashed and has been done before?”

It’s the idea of going out to a small group of trusted friends and saying:

“I’ve had this idea, what do you think about this?”

It is very important part because we only have a limited amount of time to do certain things. Often you find that people who are called the most ‘creative people’ are often very good at this stage, the evaluation stage. They have all these ideas but they can use self-criticism and reflection to say “these are the ones that have the most merit and that I’m going to work on”.

5. ELABORATION

And then we have the final stage. This is called ELABORATION. This is where Edison said that it’s “1% inspiration and 99% perspiration”. Now the elaboration stage is the 99% perspiration stage. This is where you are actually doing the work. So many people out there think that the creative process is that insight, that ‘Aha’ moment, or the preparation part. But really a creative individual isn’t complete, and I don’t think they can do anything that really lasts, unless they can go through that and actually put in the hard work. The elaboration; testing the idea, working on the idea, those late nights in the studio, working at your desk, those hours in the laboratory if you are scientist, those days testing and micro-testing products. This is the elaboration stage.

**Characteristics of a Multimedia System**

A Multimedia system has four basic characteristics:

•Multimedia systems must be **computercontrolled**.

•Multimedia systems are **integrated**.

•The information they handle must be represented **digitally**.

•The interface to the final presentation of media is usually **interactive**

1. ComputerControlled

•Producing the content of the information–e.g.by using the authoring tools, image editor, sound and video editor

•Storing the information–providing large and shared capacity for multimedia information.

•Transmitting the information–through the network.

•Presenting the information to the enduser–make direct use of computer peripheral such as display device (monitor) or sound generator (speaker).

1. Integrated

•All multimedia components (audio, video, text, graphics) used in the system must be somehow integrated.

•Every device,such as microphone and camera is connected to and controlled by a single computer.

•A single type of digital storage is used for all media type.

•Video sequences are shown on computer screen instead of TV monitor

1. Interactivity

•Level1:Interactivity strictly on information delivery. Users select the time at which the presentation starts, the order, the speed and the form of the presentation itself.

•Level2: Users can modify or enrich the content of the information, and this modification is recorded.

•Level3: Actual processing of users input and the computer generate genuine result based on the users input

1. Digitally Represented

•Digitization: process involved in transforming an analog signal to digital signal.

**Classification of Media:**

1. The perception media

2. The representation Media

3. The Presentation Media

4. The storage media

5. The transmission media

6. The information Exchange media

1. **Perception media:** Perception media help human to sense their environment. The central

question is how human perceive information in a computer environment. The answer is through seeing and hearing.

**Seeing:** For the perception of information through seeing the usual such as text, image

and video are used.

**Hearing:** For the perception of information through hearing media such as music noise

and speech are used.

1. **Representation media:** Representation media are defined by internal computer representation of information. The central question is how the computer information is coded? The answer is that various format are used to represent media information in computer.

i. Text character is coded in ASCII code

ii. Graphics are coded according to CEPT or CAPTAIN video text standard.

iii. Image can be coded as JPEG format

iv. Audio video sequence can be coded in different TV standard format (PAL, NTSC,SECAM

and stored in the computer in MPEG format)

1. **Presentation Media:** Presentation media refer to the tools and devices for the input and output of the information. The central question is, through which the information is delivered by the computer and is introduced to the computer.

Output media: paper, screen and speaker are the output media.

Input Media: Keyboard, mouse, camera, microphone are the input media.

1. **Storage media**: Storage Media refer to the data carrier which enables storage of information. The central question is, how will information be stored? The answer is hard disk, CD-ROM, etc.
2. **Transmission media:** Transmission Media are the different information carrier that enables continuous data transmission. The central question is, over which information will be transmitted? The answer is co-axial cable, fiber optics as well as free air.
3. **Information exchange media:** Information exchange media includes all information carrier for transmission, i.e. all storage and transmission media. The central question is, which information carrier will be used for information exchange between different places? The answer is combine uses of storage and transmission media. E.g. Electronic mailing system.

**Real-time system:**

Real time process is the process which delivers the result of processing in a given time. Main

characteristics of real time system are the correctness of computation and fixed response time. Deadline represent the latest acceptable time for the presentation of the processing result. Real time system has both hard and soft deadline.

Soft deadline is the type of deadline which in some cases is missed and may be tolerated as

long as.

Hard deadline should never be violated. Hard deadline violation is the system failure.

**Characteristics of Real time system:**

1. Predictably fast response to time critical event and accurate timing information.

2. High degree of schedulability :

Schedulability refers to the degree of resource utilization at which or below which

deadline of each time critical task can be taken into account. Under system overload,

processing of the critical task most be done.

3. Management of manufacturing process and control of the military system are the

application area of real time system.

**Real-time and Multimedia System:**

1. A piece of music must be played back at a constant speed.

2. To fulfill the timing requirement of the continuous media, the operating system must use real time scheduling techniques.

3. The real-time requirements of traditional real-time scheduling techniques and control system in application areas such as factory automation, air craft piloting have high demand of security and fault tolerance.

4. The requirement desire from this demand somehow differentiates real time scheduling efforts applied to continuous media.

5. Multimedia system uses the different scenario than traditional real time operating system in real time requirements.

**MULTIMEDIA PRODUCTION**

Multimedia production is a complicated process, usually involving many people. Typically,

one or more of the following people may be involved in making a multimedia product:

producer, multimedia designer/creative designer, subject matter expert, programmer, instructional designer, scriptwriter, computer graphic artist, audio/video specialist, and webmaster. A brief description of each of these roles follows:

• PRODUCER—The role of the producer is to define, coordinate, and facilitate the production

of the project. Other tasks performed by the producer include negotiating with the client; securing financial resources, equipment, and facilities, and coordinating the development team. The person should be aware of the capabilities and limitations of the technology, which helps in discussions with the client.

• MULTIMEDIA DESIGNER—A multimedia designer visualizes the system and determines its

structure. The designer defines the look, feel, format, and style of the entire multimedia system.

• SUBJECT MATTER EXPERT—The subject matter expert provides the program content for the multimedia architect.

• PROGRAMMER/AUTHOR—The programmer integrates all the multimedia elements like graphics, text, audio, music, photos, and animation, and codes the functionality of the product.

• INSTRUCTIONAL DESIGNER—The team may include a specialist who can take the information provided by the content specialists and decide how to present it using suitable strategies and practices. The instructional designer makes sure that the information is presented in such a manner that the audience easily understands it.

• SCRIPTWRITER—A script is a description of events that happen in a production. The scriptwriter makes the flowchart of the entire system and decides the level of interactivity of the

system.

• COMPUTER GRAPHIC ARTIST—The computer graphic artist creates the graphic elements of the program such as backgrounds, photos, 3-D objects, logos, animation, and so on.

• AUDIO AND VIDEO SPECIALISTS—Audio and video specialists are needed when intensive

use of narration and digitized video are integrated into a multimedia presentation. The audio specialist is responsible for recording and editing narration and for selecting, recording, or editing sound effects. The video specialist is responsible for video capturing, editing, and digitizing.

• WEBMASTER—This individual has the responsibility of creating and maintaining a Web

page. The person should be capable of converting a multimedia application into a Web page or creating a Web page with multimedia elements.

**STAGES IN MULTIMEDIA PRODUCTION**

Multimedia production is a complex process that can be categorized broadly into the following

different stages:

• RESEARCH AND ANALYSIS—At this stage, we should find out as much as possible about the audience: their education, technology skill level, needs, and so on. We also gather information on the content to be presented and the system on which the multimedia product will be used.

SCRIPTING/FLOWCHARTING—Scripting (or flowcharting) involves deciding the overall structure of the multimedia project. This is done by placing the various segments of the project in

order, using arrows to reflect flow and interactive decision making. A flowchart has information about the major headings/options given to the user, what comes in the main menu of the program, and the subsequent branching when the user takes an action. For example, if we were designing our home pages with information about our education, our interests, and our favorite sites as subpages, we would draw a flowchart, starting with our main screen and indicate the other screens and how they are linked up together.

STORYBOARDING—The storyboard is a detailed design plan that the designer creates, indicating what each screen looks like, which media elements are used in the screen, and all the

specifications of the media elements. For example, a storyboard of a screen will contain information about the buttons being used on the screen, what they look like (a rough sketch), and what happens when the user clicks on a button. The storyboarding stage is where the detailed visualization of the multimedia system takes place.

CONSTRUCTION/COLLECTION OF MEDIA ELEMENTS—Usually after the storyboard, a prototype is made and tested, and the design is reviewed. After this stage, the graphic designer is

given detailed specifications of the project and begins creating graphics and other media elements.

PROGRAMMING—When the development team has created and collected the various interface

and content elements, they are assembled into a final product using a programming language like Visual Basic. One trend has been the development of easy-to-use authoring programs such as the Macromedia Director, HyperCard, and Authorware.

TESTING—The final production stage is the testing phase. It determines that everything

works on the system it is supposed to work on and also whether typical users will find the

design intuitive enough.

**EXERCISES**

1. Carefully watch an advertisement (several times) for a popular product on television. Can you figure out the intended audience? Can you figure out the main message the advertisement is trying to project to its audience? By looking at the advertisement several times, try to go back and recreate brief notes on what must have been the findings at the Research and Analysis stage. What was contained in the script and storyboard? Recreate these documents by looking at the advert.
2. Review two educational CD-ROMs and enumerate their features

DIGITAL SOUND

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

**Power of Sound**

When something vibrates in the air is moving back and forth it creates wave of pressure. These waves spread like ripples from pebble tossed into a still pool and when it reaches the eardrums, the change of pressure or vibration is experienced as sound. Acoustics is the branch of physics that studies sound. Sound pressure levels are measured in decibels (db); a decibel measurement is actually the ratio between a chosen

**Multimedia Sound Systems**

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

**Digital Audio**

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

**Preparing Digital Audio Files**

Preparing digital audio files is fairly straight forward. If you have analog source materials – music or sound effects that you have recorded on analog media such as cassette tapes. The first step is to digitize the analog material and recording it onto a computer readable digital media. It is necessary to focus on two crucial aspects of preparing digital audio files:Balancing the need for sound quality against your available RAM and Hard disk resources.

**Editing Digital Recordings**

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

1. Multiple Tasks: Able to edit and combine multiple tracks and then merge the tracks and

export them in a final mix to a single audio file.

2. Trimming: Removing dead air or blank space from the front of a recording and an unnecessary extra time off the end is your first sound editing task.

3. Splicing and Assembly: Using the same tools mentioned for trimming, you will probably

want to remove the extraneous noises that inevitably creep into recording.

4. Volume Adjustments: If you are trying to assemble ten different recordings into a single

track there is a little chance that all the segments have the same volume.

5. Format Conversion: In some cases your digital audio editing software might read a format

different from that read by your presentation or authoring program.

6. Re sampling or down sampling: If you have recorded and edited your sounds at 16 bit

sampling rates but are using lower rates you must resample or down sample the file.

7. Equalization: Some programs offer digital equalization capabilities that allow you to modify

a recording frequency content so that it sounds brighter or darker.

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

Making MIDI Audio

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

**Audio File Formats**

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

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

specific file.

1. \*.AIF, \*.SDII in Macintosh Systems

2. \*.SND for Macintosh Systems

3. \*.WAV for Windows Systems

4. MIDI files – used by north Macintosh and Windows

5. \*.WMA –windows media player

6. \*.MP3 – MP3 audio

7. \*.RA – Real Player

8. \*.VOC – VOC Sound

9. AIFF sound format for Macintosh sound files

10. \*.OGG – Ogg Vorbis

**Software used for Audio**

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

 Soundrecorder fromMicrosoft

 Apple’s QuickTime Player pro

 Sonic Foundry’s SoundForge for Windows

 Soundedit16

**Exercise**

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

**IMAGE**

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

**Digital Image**

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

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

**Digital Image Format**

There are different kinds of image formats in the literature. We shall consider the image format that comes out of an image frame grabber, i.e., the captured image format, and the format when images are stored, i.e., the stored image format. Captured Image Format The image format is specified by two main parameters: spatial resolution, which is specified as pixels (eg. 640x480)and color encoding, which is specified by bits per pixel. Both parameter values depend on hardware and software for input/output of images.

**Stored Image Format**

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

**Bitmaps**

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

**Clip Art**

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

software.

**Multiple Monitors**

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

**Making Still Images**

Still images may be small or large, or even full screen. Whatever their form, still images are generated by the computer in two ways: as bitmap (or paint graphics) and as vector drawn (or just plain drawn) graphics. Bitmaps are used for photo-realistic images and for complex drawing requiring fine detail. Vector-drawn objects are used for lines, boxes, circles,polygons, and other graphic shapes that can be mathematically expressed in angles, coordinates, and distances. A drawn object can be filled with color and patterns, and you can select it as a single object. Typically, image files are compressed to save memory and disk space; many image formats already use compression within the file itself – for example, GIF, JPEG, and PNG. Still images may be the most important element of your multimedia project. If you are designing multimedia by yourself, put yourself in the role of graphic artist and layout designer.

**Bitmap Software**

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

**Capturing and Editing Images**

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

**Scanning Images**

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

**Vector Drawing**

Most multimedia authoring systems provide for use of vector-drawn objects such as lines, rectangles, ovals, polygons, and text. Computer-aided design (CAD) programs have traditionally used vector-drawn object systems for creating the highly complex and geometric rendering needed by architects and engineers. Graphic artists designing for print media use vector-drawn objects because the same mathematics that put a rectangle on your screen can also place that rectangle on paper without jaggies. This requires the higher resolution of the printer, using a page description language such as PostScript. Programs for 3-D animation also use vector-drawn graphics. For example, the various changes of position, rotation, and shading of light required to spin the extruded.

**How Vector Drawing Works**

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

**Color**

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

**Understanding Natural Light and Color**

The letters of the mnemonic ROY G. BIV, learned by many of us to remember the colors of the rainbow, are the ascending frequencies of the visible light spectrum: red, orange, yellow, green, blue, indigo, and violet. Ultraviolet light, on the other hand, is beyond the higher end of the visible spectrum and can be damaging to humans. The color white is a noisy mixture of all the color frequencies in the visible spectrum. The cornea of the eye acts as a lens to focus light rays onto the retina. The light rays stimulate many thousands of specialized nerves called rods and cones that cover the surface of the retina. The eye can differentiate among millions of colors, or hues, consisting of combination of red, green, and blue.

**Additive Color**

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

**Subtractive Color**

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

**Image File Formats**

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

few image file formats.

**Format Extension**

Microsoft Windows DIB .bmp .dib .rle

Microsoft Palette .pal

Autocad format 2D .dxf

JPEG .jpg

Windows Meta file .wmf

Portable network graphic .png

Compuserve gif .gif

Apple Macintosh .pict .pic .pct

**ANIMATION**

Introduction

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

**Principles of Animation**

Animation is the rapid display of a sequence of images of 2-D artwork or model positions in order to create an illusion of movement. It is an optical illusion of motion due to the phenomenon of persistence of vision, and can be created and demonstrated in a number of ways. The most common method of presenting animation is as a motion picture or video program, although several other forms of presenting animation also exist Animation is possible because of a biological phenomenon known as persistence of vision and a psychological phenomenon called phi. An object seen by the human eye remains chemically mapped on the eye’s retina for a brief time after viewing. Combined with the human mind’s need to conceptually complete a perceived action, this makes it possible for a series of images that are changed very slightly and very rapidly, one after the other, to seemingly blend together into a visual illusion of movement. The following shows a few cells or frames of a rotating logo. When the images are progressively and rapidly changed, the arrow of the compass is perceived to be spinning. Television video builds entire frames or pictures every second; the speed with which each frame is replaced by the next one makes the images appear to blend smoothly into movement. To make an object travel across the screen while it changes its shape, just change the shape and also move or translate it a few pixels for each frame.

**Animation Techniques**

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

**Cel Animation**

The term cel derives from the clear celluloid sheets that were used for drawing each frame, which have been replaced today by acetate or plastic. Cels of famous animated cartoons have become sought-after, suitable-for-framing collector’s items. Cel animation artwork begins with key frames (the first and last frame of an action). For example, when an animated figure of a man walks across the screen, the balances the weight of his entire body on one foot and then the other in a series of falls and recoveries, with the opposite foot and leg catching up to support the body.

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

Computer Animation

Computer animation programs typically employ the same logic and procedural concepts as cel animation, using layer, keyframe, and tweening techniques, and even borrowing from the vocabulary of classic animators. On the computer, paint is most often filled or drawn with tools using features such as gradients and antialiasing. The word links, in computer animation terminology, usually means special methods for computing RGB pixel values, providing edge detection, and layering so that images can blend or otherwise mix their colors to produce special transparencies, inversions, and effects. Computer Animation is same as that ofthe logic and procedural concepts as cel animation and use the vocabulary of classic cel animation – terms such aslayer, Keyframe, and tweening. The primary difference between the animation software program is in how much must be drawn by the animator and how much is automatically generated by the software In 2D animation the animator creates an object and describes a path for the object to follow. The software takes over, actually creating the animation on the fly as the program is being viewed by your user. In 3D animation the animator puts his effort in creating the models of individual and designing the characteristic of their shapes and surfaces. Paint is most often filled or drawn with tools using features such as gradients and anti- aliasing.

**Kinematics**

It is the study of the movement and motion of structures that have joints, such as a walking man. Inverse Kinematics is in high-end 3D programs, it is the process by which you link objects such as hands to arms and define their relationships and limits. Once those relationships are set you can drag these parts around and let the computer calculate the result.

**Morphing**

Morphing is popular effect in which one image transforms into another. Morphing application and other modeling tools that offer this effect can perform transition not only between still images but often between moving images as well The morphed images were built at a rate of 8 frames per second, with each transition taking a total of 4 seconds.

**Animation File Formats**

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

Director \*.dir, \*.dcr

AnimationPro \*.fli, \*.flc

3D Studio Max \*.max

SuperCard and Director \*.pics

CompuServe \*.gif

Flash \*.fla, \*.swf

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

3D Studio Max

Flash

AnimationPro

**Video**

**Analog versus Digital**

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

**Broadcast Video Standards**

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

PAL

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

SECAM

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

**Shooting and Editing Video**

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

**Video Tips**

A useful tool easily implemented in most digital video editing applications is “blue screen,” “Ultimate,” or“chromo key” editing. Blue screen is a popular technique for making multimedia titles because expensive sets are not required. Incredible backgrounds can be generated using 3-D modeling and graphic software, and one or more actors, vehicles, or other objects can be neatly layered onto that background. Applications such as Video Shop, Premiere, Final Cut Pro, and I Movie provide this capability. Recording Formats S-VHS video. In S-VHS video, color and luminance information are kept on two separate tracks. The result is a definite improvement in picture quality. This standard is also used in Hi-8. still, if your ultimate goal is to have your project accepted by broadcast stations, this would not be the best choice.

**Component (YUV)**

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

Digital Video

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

**Video Compression**

To digitize and store a 10-second clip of full-motion video in your computer requires transfer of an enormous amount of data in a very short amount of time. Reproducing just one frame of digital video component video at 24 bits requires almost 1MB of computer data; 30 seconds of video will fill a gigabyte hard disk. Full-size, full-motion video requires that the computer deliver data at about 30MB per second. This overwhelming technological bottleneck is overcome using digital video compression schemes or codecs (coders/decoders). A codec is the algorithm used to compress a video for delivery and then decode it in real-time for fast playback. Real-time video compression algorithms such as MPEG, P\*64, DVI/Indeo, JPEG, Cinepak, Sorenson, ClearVideo, RealVideo, and VDOwave are available to compress digital video information. Compression schemes use Discrete Cosine Transform (DCT), an encoding algorithm that quantifies the human eye’s ability to detect color and image distortion. All of these codecs employ lossy compression algorithms. In addition to compressing video data, streaming technologies are being implemented toprovide reasonable quality low-bandwidth video on the Web. Microsoft, RealNetworks, VXtreme, VDOnet, Xing, Precept, Cubic, Motorola, Viva, Vosaic, and Oracle are actively pursuing the commercialization of streaming technology on the Web. QuickTime, Apple’s software-based architecture for seamlessly integrating sound, animation, text, and video (data that changes over time), is often thought of as a compression standard, but it is really much more than that.

MPEG

The MPEG standard has been developed by the Moving Picture Experts Group, aworking group convened by the International Standards Organization (ISO) and the International Electro-Technical Commission (IEC) to create standards for digital representation of moving pictures and associated audio and other data. MPEG1andMPEG2 are the current standards. Using MPEG1, you can deliver 1.2 Mbps of video and 250 Kbps of two-channel stereo audio using CD-ROM technology. MPEG2, a completely different system from MPEG1, requires higher data rates (3 to 15 Mbps) but delivers higher image resolution, picture quality, interlaced video formats, multi resolution scalability, and multichannel audio features. DVI/Indeo DVI is a property, programmable compression/decompression technology based on the Intel i750 chip set. This Hardware consists of two VLSI (Very Large Scale Integrated) chips to separate the image processing and display functions.

Two levels of compression and decompression are provided by DVI: Production Level Video (PLV) and Real Time Video (RTV). PLV and RTV both use variable compression rates. DVI’s algorithms can compress video images at ratios between 80:1 and 160:1.DVI will play back video in full-frame size and in full color at 30 frames per second.

**Input devices**

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

**Format File Description**

**The Anatomy of a Web page**

A web page is an electronic document written in a computer language called HTML, short for Hypertext Markup Language. Each web page has a unique address, called a URL or Uniform Resource Locator that identifies on which web server the document resides.

A website has one or more related web pages, depending on how it's designed. Web pages on a site are linked together through a system of hyperlinks, enabling you to jump between them by clicking on a link.

Pages come in two varieties:

**Home pages:**

A home page is like a title page, table of contents, index, and introduction combined. The home page is the first, or "top," page in a site. It usually contains some prefatory material and a complete list of links to each of the site's major content pages, or to each major content section in larger sites.

**Content pages:**

Where home pages describe what information the site contains, content pages contain the information itself. Each content page should have a link "up" to the site's home page. If you follow a link from one page to the content page on another site, look for the link (usually at the bottom or top) to the destination site's home page to see what else is available there.

Most Web pages, whether home or content pages, have a similar basic structure. Here is the layout of a typical Web page:

From Horton and Lynch, Yale C/AIM Style Manual, 1st Ed. 2nd edition available at:  
http://info.med.yale.edu/caim/manual/contents.html

|  |  |
| --- | --- |
| **The Header** | usually contains a text title or graphic banner. The header may also contain links that lead directly to other pages in the site, or a set of "next" and "previous" buttons linked to the next and previous pages in a sequence. |
| **The Body** | contains the actual content, including text and links. Links --those active "hot-words" in the text-- can lead to another page, a different site, or to a different section of the same page. |
| **The Footer** | contains critical information about the page: it usually shows the date when it was created and last updated, the name of the author, the e-mail address of the author, and the name of the institution, organization, or company that sponsors the site. |

Knowing the date when a page was written and published on the Web is an important step in evaluating its content. If you encounter a page which does not have this information, your Web browser can at least tell you when it was published. On Netscape Navigator 4.0, for instance, select "Page Info" under the "View" menu to find out when the open page was put on its server.