Multimedia Communication (SW-416)

INTRODUCTION

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Multimedia Communication (SW-416)
Course Learning Outcomes:

- Upon successful completion of this course, the student will be able to:

CLOs	Description	Taxonomy level	PLO
1	Explain multimedia systems which incorporate digital audio, graphics and video, pictures, integration of media, multimedia authoring, and delivery of multimedia.	C3	1
2	Discover techniques for data compression and transmission, audio and video compression, 3D modeling, and animation in multimedia.	C4	2

Course Outline:

Introduction to Multimedia

- Multimedia (MM) applications and requirements, Overview of MM systems, Characteristics, Challenges and Components of MM system, Overview of MM software tools, MM Authoring tools, their types and features, Organizing MM team.

Text

- Typeface and Font, HyperText, and Font Editing and Design Tools.

Images

- Bitmap and Vector graphics, Image file formats, Digitizing Real world Images, Image Processing software, Color models, and Using Light sources and perspective.

Course Outline:

Video

- Analogue Video and its standards (PAL, SECAM, NTSC), Digital Video and its standards (AVI, MPEG, QUICKTIME, MOV).

Animation

- Animation techniques, file formats and animation process, 3D drawing, modeling and surface rendering and its methods.

Audio and Video Compression

- Audio and video compression (e.g., JPEG, MPEG, H.26X, etc.), scalable coding, perceptual audio encoders. Performance comparison of coding algorithms, Algorithms for image and video processing.

Recommended Books:

- Jeff Burger, “**The Desktop Multimedia Bible**”, Addison Wesley Publishing Company, Latest Edition.
- Vaughan, “**Multimedia Making It work**”, Osborne Mc Graw Hill, Latest Edition.
- Fred Halsall, "**Multimedia Communications: Applications, Networks, Protocols, and Standards**", Latest Edition.

Multimedia Multi - Media

- **Multi:** more than one
- **Media:** means for conveying information

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

Introduction to Multimedia

- Generally, multimedia is the presentation (usually by computer) of information through many forms of media.
- Media, such as pictures, sound effects, music, animation, video are organized and directed by a program to produce a specific experience for the user.

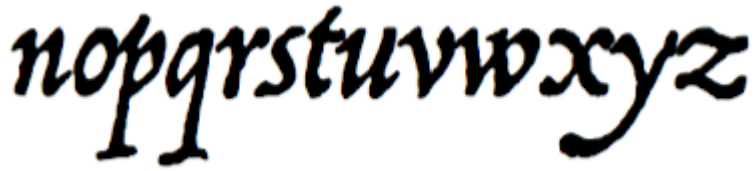
Multimedia is the field concerned with the computer-controlled integration of text, graphics, drawings, still and moving images (video), animation, audio, and any other media where every type of information can be

represented, stored, transmitted, and processed digitally.

Multimedia Categorization

- ***Linear***: Active content progresses without any navigational control for the viewer.
- A cinema presentation or a live video feed can be considered linear multimedia because the viewer has no ability to speed up or slow down the presentation or skip to different segments. E.g. Live cricket or football matches.
- ***Nonlinear:*** Interactive multimedia combine the same technologies as linear ones, but with a twist. The viewer is hands-on controlling what is viewed.
- Multimedia ceases to be classified as linear when any interactive elements are introduced.
  - The ability to skip to different chapters in a DVD, rewind or fast-forward in a video, move a character in a game, or navigate to different sections of a website.
- Non-linear interactive multimedia uses interactivity to control progress as with self-paced computer based training.

Basic Elements of Multimedia
Text (including hypertext)



With multimedia technology, the reliance on textual information is complemented by sounds and pictures that enhance understanding and retention.

In addition, hypertext enhances the meaning of the written word. Hypertext is where a word, or phrase in a section of text, can be referenced to another related topic when the user clicks on the word with his or her mouse; the computer then displays the linked reference.

Basic Elements of Multimedia
Graphics (Pictures / Images)

A digital representation of non-text information, such as a drawing, chart, or photograph.

Images are an important component of any multimedia product. They are commonly used to represent visual controls, graphical buttons, statistical findings, photographs and so on.

Evolution of the Concept

- **Pre-Industrial Age:**

Clay Tablets

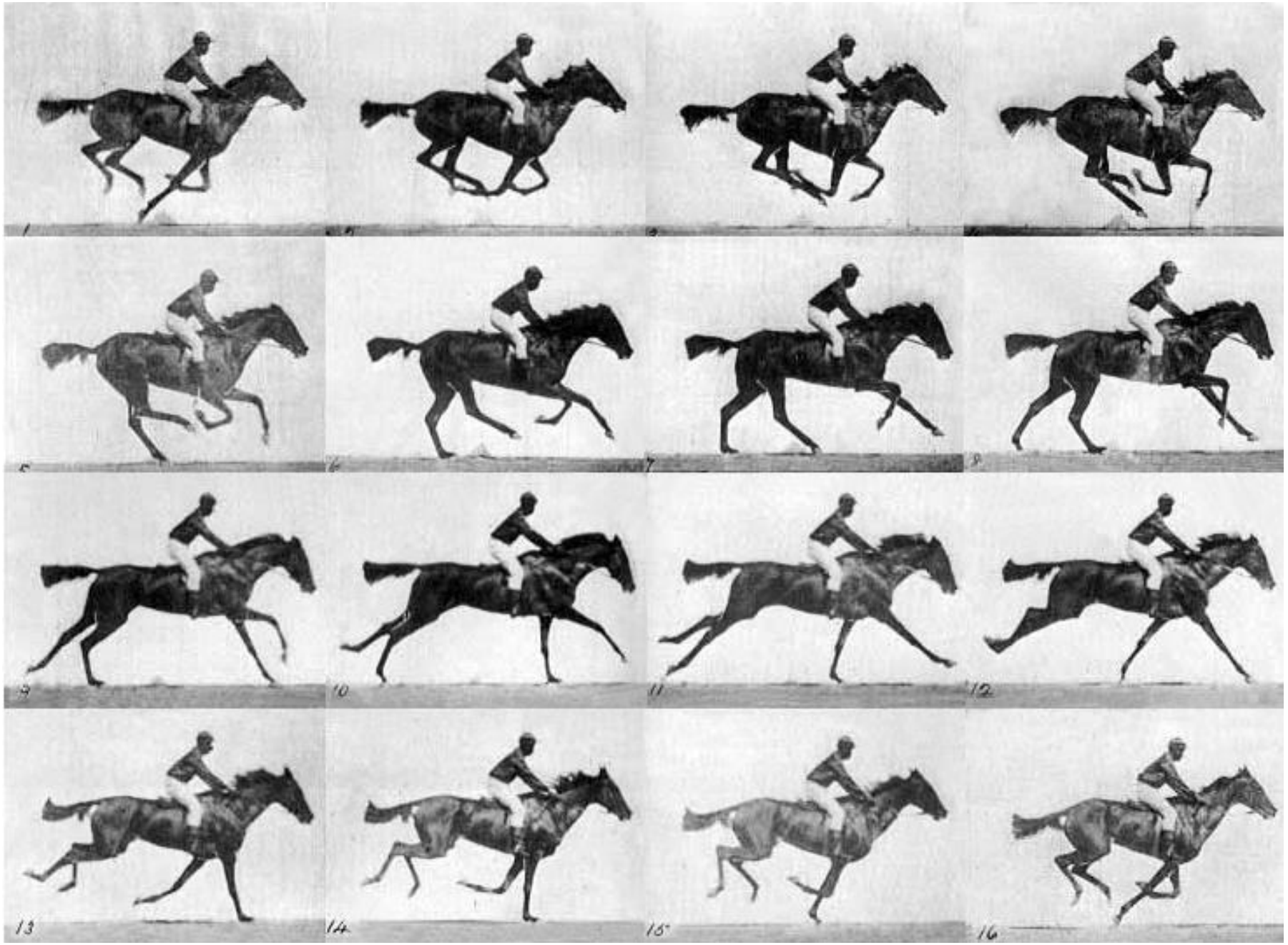
Woodblock Printing

- **Industrial Age**
- **Newspaper:** start of communication with media
  - perhaps the first mass communication medium: uses text, graphics, and images.

Basic Elements of Multimedia
Animation

Animation is created by moving and changing a sequence of pictures or objects on cue.

It is achieved by changing an image slightly, one frame at a time, in a timed sequence to give the illusion of movement.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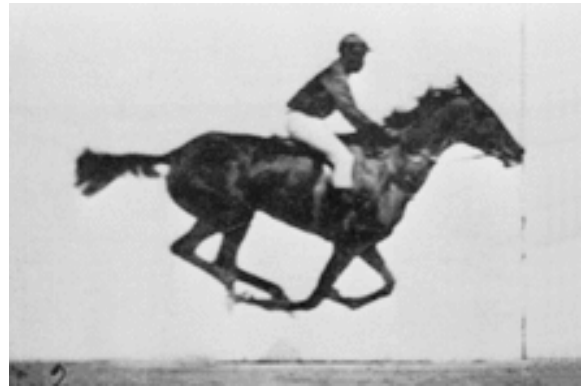
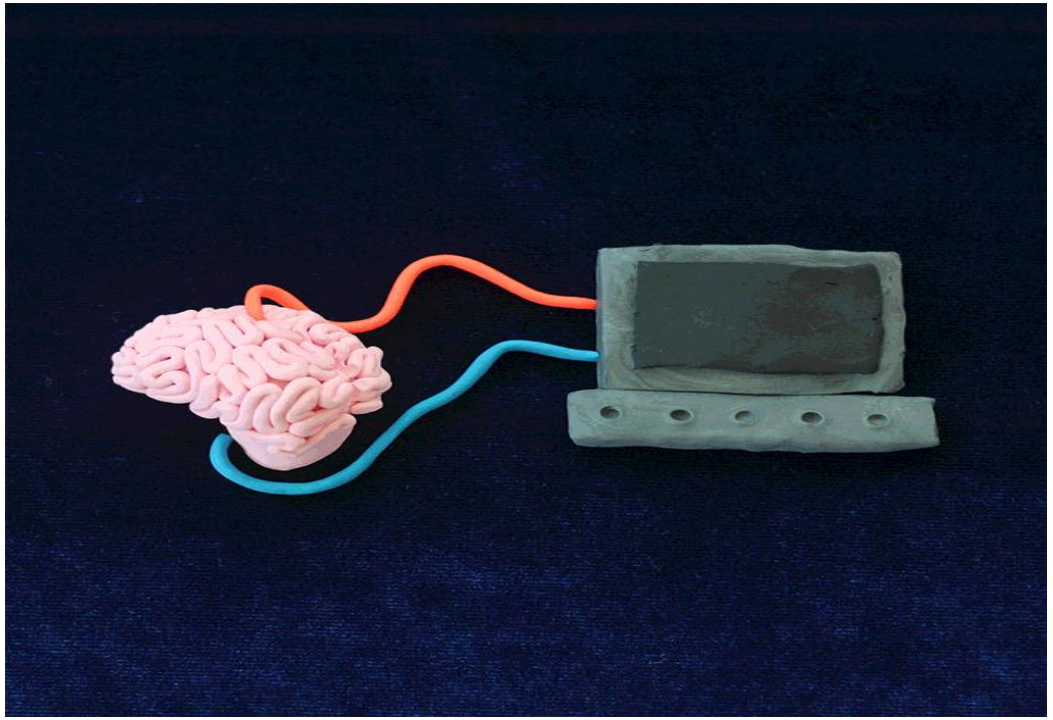


Basic Elements of Multimedia Animation

Flip-Book Animation



Clay Animation

Basic Elements of Multimedia
Sound and Music files

Sound files are a digital recording of an actual sound whether that sound be an event, such as a door closing, or music, such as a symphony playing.

Recorded Audio - Audio Interchange File Format (AIFF) is an audio file format standard used for storing sound data for personal computers and other electronic audio devices most commonly used on Apple Mac systems. WAVE or WAV (Waveform Audio File Format), also named Audio for Windows, is a MS and IBM audio file format standard for storing an audio bit stream on PCs. Main format used for raw and typically uncompressed audio.

In contrast, a digital music file (also known as a MIDI file, from Musical Instrument Digital Interface) is not an actual recording of a live sound. A MIDI file is a composed sequence of data that is interpreted by the computer's sound synthesizer and translated into actual sound. This file format lets users exchange music and data without regard to computer operating system platform. Today, there are many Web sites devoted to the sale and exchange of music data in the Standard MIDI File format.

Basic Elements of Multimedia
Video files

Digital video files (commonly called AVI or QuickTime files) store moving picture information in a format that can be played back on the computer screen.

Photographic images are played back at speeds of 15 to 30 frames a second and provide the appearance of full motion.

Evolution of the Concept

Radio - Guglielmo Marconi (Italy)

TV - The innovative media in 20th century
Changed the pubic communication all over the world

Film without sound:

- Thomas A. Edison invented the moving camera in 1887
- The art of motion pictures grew into full maturity in the "silent era" (1894 in film – 1929 in film).
- The height of the silent era (from the early 1910s in film to the late 1920s)

The Jazz Singer

- Jazz Singer (Music film), the first film with sound - 1927

Evolution of the Concept

1945: Memex (hypermedia system) from Vannevar Bush

1989: Tim Berners-Lee proposed the World Wide Web (WWW)

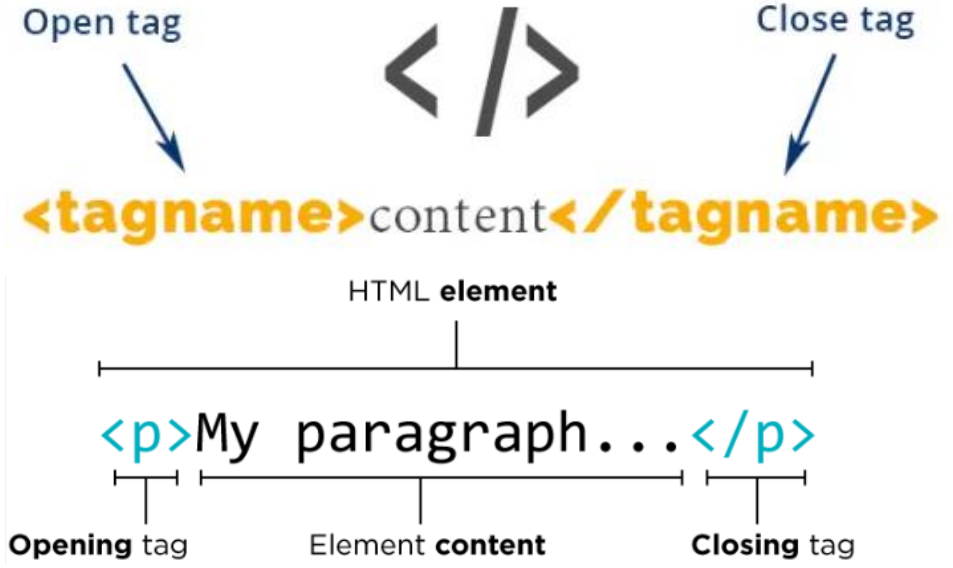
1990: Hypertext Markup language (HTML) was invented

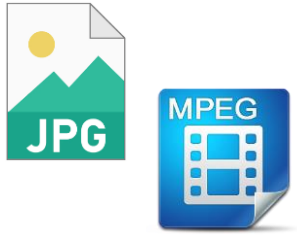
1991: MPEG-1 was approved

1992: JPEG was approved

1992: WWW became publicly available

1994: Netscape (first browser) program was created





Basic Elements of Multimedia Virtual Reality

An artificial environment created with computer hardware and software and presented to the user in such a way that it appears and feels like a real environment.

A computer-based technology for simulating visual, auditory, and other sensory aspects of complex environments.

Virtual Reality Modeling Language (VRML) technology provides the user with the capability to browse and fly through three-dimensional space models on the Internet. Virtual reality systems require extremely expensive hardware and software and are confined mostly to research laboratories

Basic Elements of Multimedia
Haptics

Haptics is the science of applying touch sensation and control to interaction with computer applications.

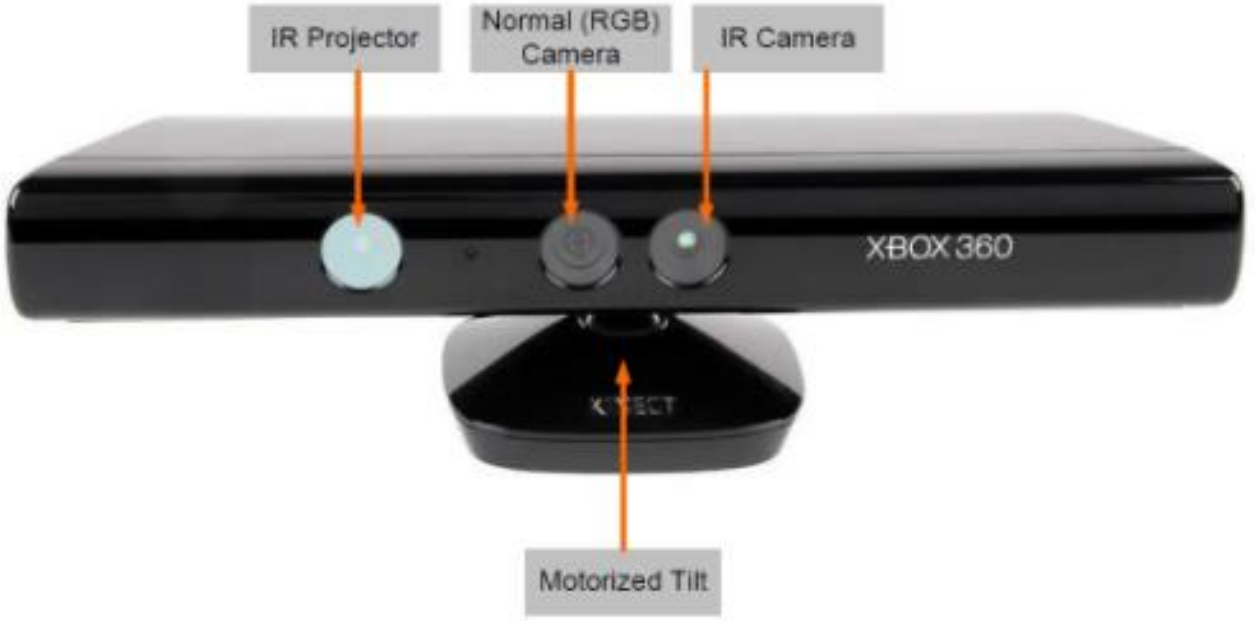
Haptics technology can be used to train people for tasks requiring hand-eye coordination, such as surgery and space ship maneuvers.

Users can receive feedback from computer applications in the form of felt sensations in the hand or other parts of the body.

An input/ouput device can be used to sense the body's movements such as joy stick or data glove.


7D


VR BOX


IR Projector
Normal (RGB) Camera
IR Camera
XBOX 360
Motorized Tilt

Usage of Multimedia

- Examples of use of multimedia:
  - Advertisements
  - Art and Entertainment
  - Video teleconferencing
  - Education (Distributed lectures for higher education)
  - Medicine (Tele-medicine)
  - Business (Co-operative work environment)
  - Scientific Research
  - Searching in large video and image databases (e.g. YouTube)

Advantages of Using Multimedia

- User-Friendly
  - It doesn’t take much energy out of the user, in the sense that you can sit and watch the presentation, you can read the text and hear the audio.
- Multi Sensorial
  - It uses a lot of the user’s senses while making use of multimedia, for example hearing, seeing and talking
- Integrated and Interactive
  - All the different mediums are integrated through the digitization process.
  - Interactivity is heightened by the possibility of easy feedback.
- Flexible
  - Being digital, this media can easily be changed to fit different situations and audiences.
    - It can be used for a wide variety of audiences, ranging from one person to a whole group.

Disadvantages of Using Multimedia

- Information overload
  - Because it is so easy to use, it can contain too much information at once.
- Can be Expensive
  - Multimedia makes use of a wide range of resources, which can cost you a large amount of money.
- Takes time to Compile
  - Even though it is flexible, it takes time to put the original draft together.
- Too much makes it Unpractical
  - Large files like video and audio has an effect of the time it takes for your presentation to load. Adding too much can mean that you have to use a larger computer to store the files.

Multimedia System

- A system capable of processing multimedia data and applications.

A Multimedia System is characterized by the *generation, storage, processing, manipulation* and *rendition* of Multimedia information.

Characteristics of a Multimedia System

- In terms of computing, four fundamental multimedia attributes:
- **Digitized:**
  - All media including audio/video are represented in digital format.
- **Distributed:**
  - The information conveyed is remote, either pre-produced and stored or produced in real-time and distributed over networks.
- **Integrated:**
  - The media are treated in a uniform way, presented in an orchestrated way, but are possible to manipulate independently.
- **Interactive:** The interface to the final presentation of media is usually ***interactive***
  - It is possible to affect the information received, and send your own information, in a non-trivial way beyond start, stop, fast forward.

Challenges for Multimedia Systems

- There are two form of problems:

1. *Sequencing within the media* ***- playing frames in correct order/time frame in video***
2. *Synchronization -* ***inter-media scheduling (e.g. Video and Audio).***
    - Lip synchronization is clearly important for humans to watch playback of video and audio and even animation and audio.

The key issues multimedia systems need to deal with are:

- How to represent and store temporal information?
- How to strictly maintain the temporal relationships on play back/retrieval?
- What processes are involved in the above?

Components of Multimedia Systems

- **Capturing device:**
  - Video Camera, Video Recorder, Audio Microphone, Keyboards, Mouse, Graphic tablets, 3D input devices, Tactile sensors, VR devices, touch pen.
- **Storage device:**
  - Hard disks, CD-ROMs, Jaz/Zip drives, DVD, etc
- **Communication Networks**
  - Ethernet, Token Ring, FDDI, ATM, Intranets, Internets.
- **Computer Systems**
  - Multimedia Desktop machines, Workstations, MPEG/VIDEO/DSP Hardware
- **Display Devices**
  - CD-quality speakers, HDTV,SVGA, Hi-Res monitors, Color printers etc.

Multimedia Production Team

- A Multimedia team consists of people with various capabilities.
- Individual members of multimedia team can perform various tasks.
- To create a good multimedia project/presentation, diverse range of skills are required with detailed knowledge of computers, text, graphics arts, sound and video.
- Depending upon the scope and content of project, the team may employ mix of people, e.g. animators, composers, musicians, special effect engineers, researchers and others.
- Successful multimedia projects begin with selecting team players.

Multimedia Production Team

- Project Manager / Producer
- Multimedia Designer
- Subject Matter Expert
- Script Writer
- Audio And Video Specialist
- Programmer / Author
- Computer Graphic Artist
- WebMaster

Multimedia Production Team
Project Manager / Producer:

- At the center of the action. This will likely include working with and managing a team of people who specialize in certain areas of media production.
- Responsible for overall development, implementation and day to day operations.
- Plays an important role in each of the three phases in the production process: preproduction, production and postproduction.
- Manages budges, time sheets, invoices, schedules.
- Must understand the strengths and limitations of hardware/software to make timely decisions.
- Must have understanding of interactivity and experience with interactive media.
- Must have several year experience with interface design and have good design sensibilities.
- Superior attention to detail and ability to coordinate large amounts of information.

Multimedia Production Team
Multimedia Designer:

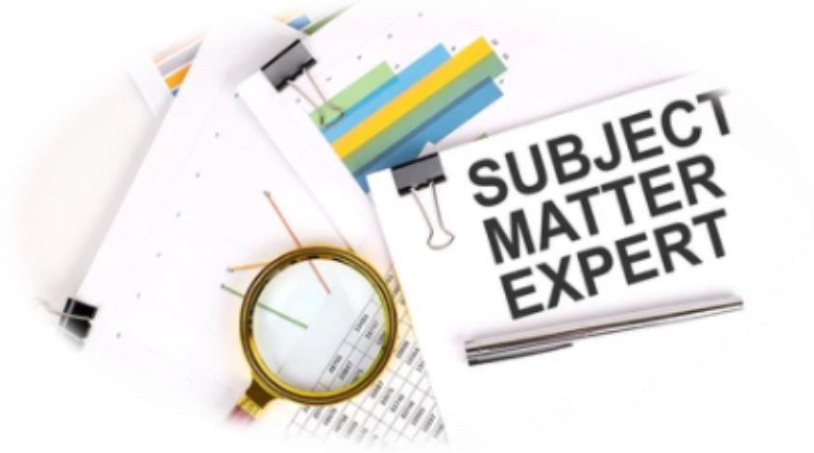
- The look and feel of a multimedia project should always be pleasing and aesthetic as well as engaging and inviting.
- Screens should present an appealing look of color, shape and elegance.
- The project should contain visual consistency.
- Navigation should be clear, icons should be meaningful and straight forward.
- The design should be sensitive to the needs of the general population using the project.
- **Management of all this and more comprises the responsibilities of the multimedia designer.**

Multimedia Production Team
Multimedia Designer:

- Multimedia Designers work in a creative group that provides the clients with the multimedia content they need.
- The main responsibility of a Multimedia Designer is to design; that is, to produce sketches, scale models, plans, and drawings of the multimedia content to be developed. These plans and sketches will be checked by the creative director or by the producers for any inconsistencies or for production feasibility.
- *Multimedia Designers are the ones in charge on the overall feel of the multimedia content.* They can design the props, the set, and decide on the costumes that will best compliment the design.
- Responsible to make pleasant look and feel of multimedia project. They need to maintain the visual consistency and support the overall message of the program.

Multimedia Production Team
Subject Matter Expert:

- This term is used to describe professionals with expertise in the field of application but usually without technical project knowledge.



Multimedia Production Team
Script Writer:

- Multimedia writers do everything writers of Linear Media do. They create characters, action, point of views and they create interactivity.
- They write proposals, they script voice-overs and action sequences and narrations. They write text screens to deliver messages. Writers of text screens are often referred to as content writers.
- Create character, action, point of view and interactivity.
- Develop characters designed for an interactive environment
- Collect information, synthesize it and communicate it in concise manner
- Are different from writing a film or video script because multimedia stories can go in many different ways
- Must be familiar with interactive design and user interface issues
- Ability to work under tight deadlines in a team environment is essential

Multimedia Production Team
Audio Specialist:

- The quality of audio elements can make or break a multimedia project.
- Audio Specialists are the wizards who make a multimedia project come alive, by designing and producing music, voice over narrations and sound effects.
- They are also responsible for recording, digitizing and editing sound.
- Adding sound effects and background music transitions.

Multimedia Production Team
Video Specialist:

- The video specialist digitizes video along with adding and editing video effects and transitions. Shooting quality video, integrating scenes and action sequences and efficient delivery on CD, DVD or on web is also the responsibility of the video specialist.

- Must be skilled in managing all phases of production, from concept to final edit
- Must have strong background in video direction and editing
- Good understanding of interactive programming is required and how it will affect the video

Multimedia Production Team Computer Graphics Artist:

- Graphic design is a collaborative process between a client and a designer in conjunction with producers of form to convey a specific message to a targeted audience.

- The graphic artist develops the Graphic Elements of the program such as backgrounds, buttons, photo collages, 3D objects, logos and animation.

Multimedia Production Team
Multimedia Programmer:

- A multimedia programmer or a software engineer integrates all the multimedia elements into of a project into a seamless whole using an authoring system or a programming language.

- Their function ranges from coding simple displays of multimedia elements to managing complex timings, transitions and record keeping
- Integrates all the MM elements of a project using programming language
- Promotes the ability to quickly learn and understand systems
- Must have working familiarity with digital media, digital video
- Must function well in team oriented environments

Multimedia Production Team
Webmaster:

- Creates and maintain the web site. Integrates the multimedia elements into a web page and handles enquiries and feedback.
- A webmaster can **keep tabs on everything related to a website**. They monitor its performance with search engines, functionality, speed and design.
- Webmasters even keep track of content, campaigns and marketing efforts.