LNCT GROUP OF COLLEGES

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Unit IV

Introduction to multimedia components applications, Multimedia System Architecture, Evolving technologies for Multimedia, Defining objects for Multimedia systems, Multimedia Data interface standards, Multimedia Databases, Multimedia Hardware, SCSI, IDE, MCI, Multimedia Tools, presentation tools, Authoring tools.

MULTIMEDIA- The literal meaning of multimedia.

- **Multi** − it means more than one

- **Medium** − it is singular and it means intermediary or mean

- **Media** − it is plural and it means conveying the information

Likewise, Multimedia is the field of Computer Science that integrates different forms of information and represents in the form of audio, video, and animation along with the traditional media, i.e., text, graphics/drawings, images, etc.

MULTIMEDIA COMPONENTS-

Following are the major components of a multimedia computer system −

Text-

It contains alphanumeric and some other special characters. Keyboard is usually used for input of text; however, there are some internal (inbuilt) features to include such text.

Graphics-

It is technology to generate, represent, process, manipulate, and display pictures. It is one of the most important components of multimedia application. The development of graphics is supported by a different software.

Animation-

Computer animation is a modern technology, which helps in creating, developing, sequencing, and displaying a set of images (technically known as '*frames*'). Animation gives visual effects or motion very similar to that of a video file (see image given below).
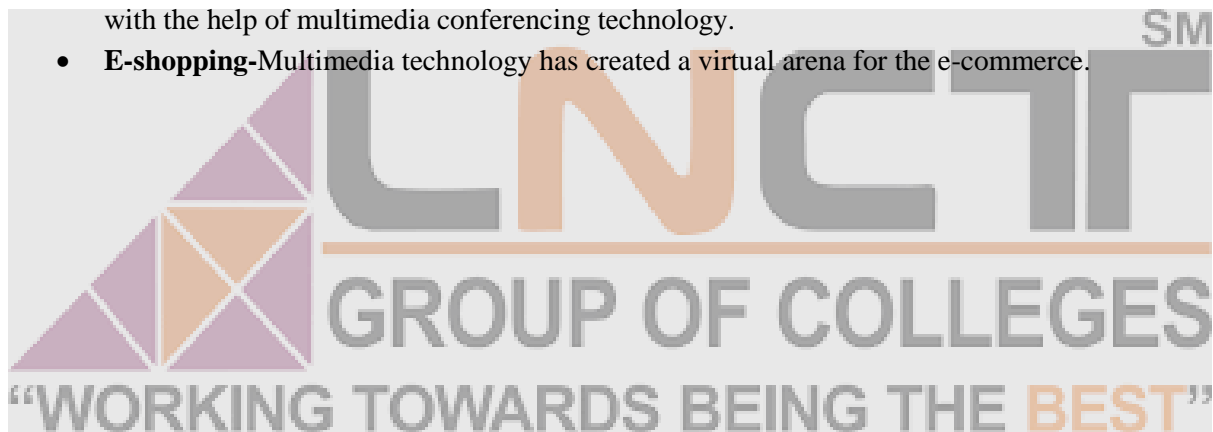
Audio-

This technology records, synthesizes, and plays audio (sound). There are many learning courses and different instructions that can be delivered through this medium appropriately.
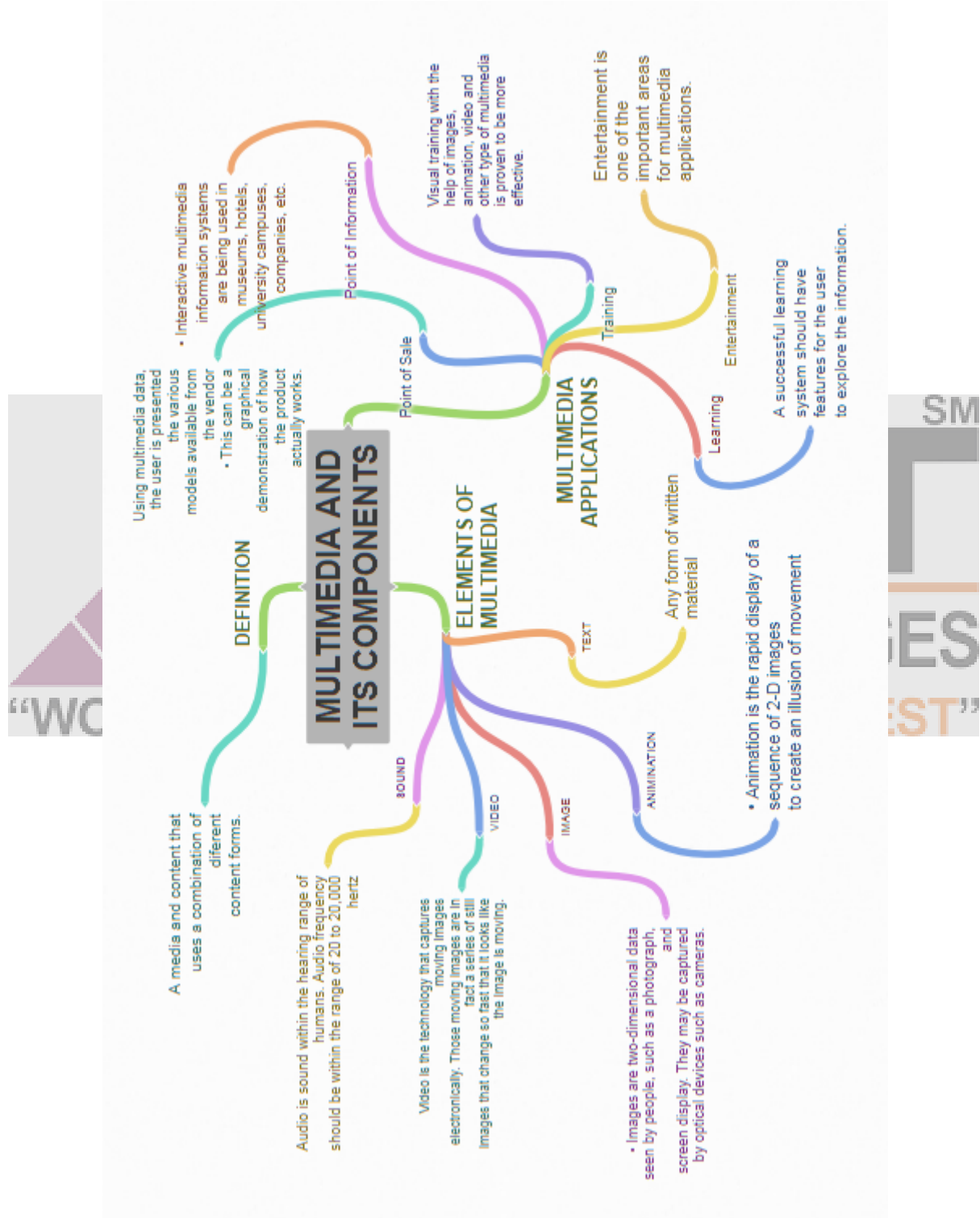
Video-

This technology records, synthesizes, and displays images (known as frames) in such sequence (at a fixed speed) that makes the creation appear as moving; this is how we see a completely developed video. In order to watch a video without any interruption, video device must display 25 to 30 frames/second.

MULTIMEDIA APPLICATION

Let us now see the different fields where multimedia is applied. The fields are described in brief below −

- **Presentation-**With the help of multimedia, presentation can be made effective.
- **E-books-**Today, books are digitized and easily available on the Internet.
- **Digital Library-**The need to be physically present at a library is no more necessary. Libraries can be accessed from the Internet also. Digitization has helped libraries to come to this level of development.
- **E-learning-**Today, most of the institutions (public as well as private both) are using such technology to education people.
- **Movie making-**Most of the special effects that we see in any movie is only because of multimedia technology.
- **Video games-**Video games are one of the most interesting creations of multimedia technology. Video games fascinate not only the children but adults too.
- **Animated films-**Along with video games, animated film is another great source of entertainment for children.
- **Multimedia conferencing-**People can arrange personal as well as business meetings online with the help of multimedia conferencing technology.
- **E-shopping-**Multimedia technology has created a virtual arena for the e-commerce.

MULTIMEDIA AND ITS COMPONENTS

DEFINITION
- Using multimedia data, the user is presented the various models available from the vendor
- This can be a graphical demonstration of how the product actually works.
- A media and content that uses a combination of different content forms.

ELEMENTS OF MULTIMEDIA

SOUND — Audio is sound within the hearing range of humans. Audio frequency should be within the range of 20 to 20,000 hertz

VIDEO — Video is the technology that captures moving images electronically. Those moving images are in fact a series of still images that change so fast that it looks like the image is moving.

IMAGE — Images are two-dimensional data seen by people, such as a photograph, and screen display. They may be captured by optical devices such as cameras.

ANIMATION — Animation is the rapid display of a sequence of 2-D images to create an illusion of movement

TEXT — Any form of written material

MULTIMEDIA APPLICATIONS

Point of Information — Interactive multimedia information systems are being used in museums, hotels, university campuses, companies, etc.

Point of Sale

Training — Visual training with the help of images, animation, video and other type of multimedia is proven to be more effective.

Entertainment — Entertainment is one of the important areas for multimedia applications.

Learning — A successful learning system should have features for the user to explore the information.

MULTIMEDIA SYSTEMS ARCHITECTURE

Multimedia encompasses a large variety of technologies and integration of multiple architectures interacting in real time. All of these multimedia capabilities must integrate with the standard user interfaces such as Microsoft Windows.

The following figure describes the architecture of a multimedia workstation environment. In this diagram.
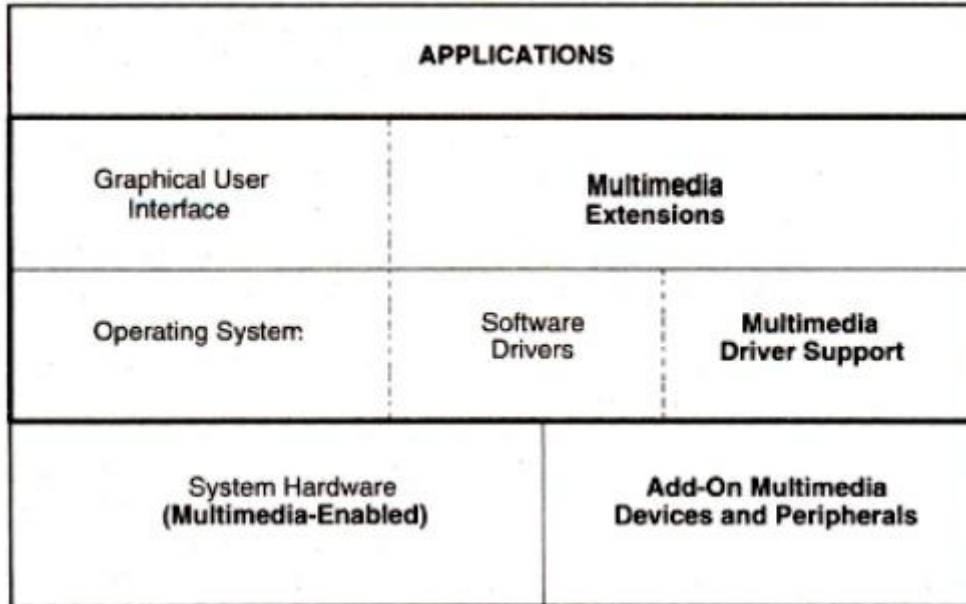
The right side shows the new architectural entities required for supporting multimedia applications.

For each special devices such as scanners, video cameras, VCRs and sound equipment-, a software device driver is need to provide the interface from an application to the device. The GUI require control extensions to support applications such as full motion video.
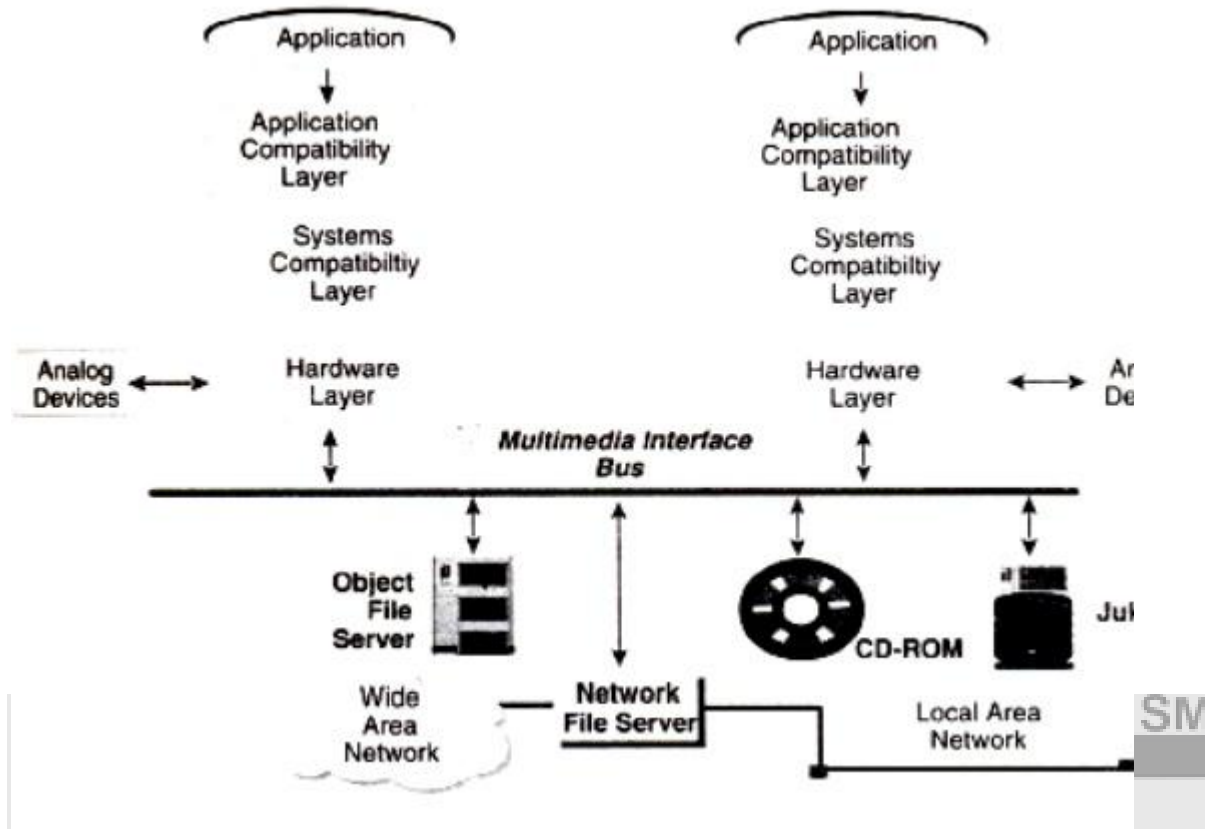
Fig: Network Architecture for Multimedia Systems

Network Architecture for Multimedia Systems:

Multimedia systems need special networks. Because large volumes of images and video messages are being transmitted.

➢ Asynchronous Transfer Mode technology (A TM) simplifies transfers across LANs and W ANs.

Task based Multi level networking

Higher classes of service require more expensive components in the workstations as well as in the servers supporting the workstation applications.

Rather than impose this cost on all work stations, an alternate approach is to adjust the class of service to the specific requirement for the user. This approach is to adjust the class of services according to the type of data being handled at a time also.

Duplication: It is the process of duplicating an object that the user can manipulate. There is no requirement for the duplicated object to remain synchronized with the source (or master) object.

Replication: Replication is defined as the process of maintaining two or more copies of the same object in a network that periodically re-synchronize to provide the user faster and more reliable access to the data Replication is a complex process.

Networking Standards: The two well-known networking standards are Ethernet and token ring. ATM and FDDI are the two technologies which we are going to discuss in detail.

ATM: ATM is an acronym for Asynchronous Transfer Mode. It's topology was originally designed for broadband applications in public networks.

ATM is a method of multiplexing and relaying (cell-switching) 53 byte cells. (48 bytes of user information and 5 bits of header information).

*Cell Switching***:** It is a form of fast packet switching based on the use of cells. **Cells:** Short, fixed length packets are called cells.

ATM provides high capacity, low-latency switching fabric for data. It is independent of protocol and distances. ATM effectively manages a mix of data types, including text data, voice, images and full motion video. ATM was proposed as a means of transmitting multimedia applications over asynchronous networks.

FDDI: FDDI is an acronym of Fiber Distributed Data Interface. This FDDI network is an excellent candidate to act as the hub in a network configuration, or as a backbone that interconnects different types of LANs.

FDDI presents a potential for standardization for high speed networks.

The ANSI standard for FDDI allows large-distance networking. It can be used as high-performance backbone networks to complement and extend current LANs.

EVOLVING TECHNOLOGIES FOR MULTIMEDIA SYSTEMS

Multimedia applications use a number of technologies generated for both commercial business application as well as the video game industry.

Hypermedia documents

Hypermedia documents are documents which have text, embedded or linked multimedia objects such as image, audio, hologram, or full-motion video.

Hypertext

-Hypertext systems allow authors to link information together, create information paths through a large volume of related text in documents.

-It also allows annotating existing text, and appending notes.

-It allows fast and easy searching and reading of selected excerpts.

HYPERMEDIA

It is an extension of hypertext.

In that, we can include texts, any kind of information that can be stored in electronic storage, such as audio, animated video, graphics or full-motion video.

Hypermedia documents used for electronic mail and work flow applications provide a rich functionality for exchanging a variety of information types. The hypermedia document is a definition of a document and a set of pointers to help locate the various elements of the document on the network.

HYPER SPEECH

Multimedia stimulated the development of general-purpose speech interfaces. Speech synthesis and speech recognition are fundamental requirement for hyperspeech systems. Speech recognition is nothing but converting the analog speech into a computer action and into ASCII text. Speech-recognition systems cannot segment a stream of sounds without breaks into meaningful units. The user must speak in a stilted fashion. He should make sure to interpose silence between each word.

HDTV AND UDTV

HDTV is an acronym of High-Definition Television.

The broadcasting standards such as NTSC, PAL, SECAM, NHK have an idea of bringing the world together on a single high-definition Television broadcasting standard.

The japanese broadcasting services developed a 1125-line, along MUSE system. A competing standard in the U.S. changed direction from analog to digital technology:A 1125-line digital HDTV has been developed and is being commercialized. NHK of Japan is trying to leapfrog the digital technology to develop ultra definition television (digital UDTV) featuring approximately 3000 lines

3D TECHNOLOGIES AND HOLOGRAPHY

Three-dimensional technologies are concerned with two areas: pointing devices and displays. 3-D pointing devices are essential to manipulate object in a 3-D display system. 3-D displays are achieved using holography techniques.

The techniques developed for holography have been adapted for direct computer use.

Fuzzy Logic

Fuzzy logic is logic which is used for low-level process controllers.

Use of fuzzy logic in multimedia chips is the key to the emerging graphical interfaces of the future. It is expected to become an integral part of multimedia hardware. Fuzzy logic has mathematical principles. Hence, the application of multimedia can benefit those principles.

Digital Signal Processing

Digital Signal Processing is used in applications such as digital servos in hard disk drives, and fax/modems. DSP technology is used in Digital wireless communications, such as personal communication networks (pens), wireless local area networks and digital cordless phones.

DSP Architectures and Applications

A typical DSP operating system architecture would contain the following subsystems:

Memory Management: DSP architectures provide dynamic allocation of arrays from multiple segments, including RAM, SRAM and DRAM.

Hardware-Interrupt handling: A DSP operating system must be designed to minimize hardware-interrupt latency to ensure fast response to real time events for applications, such as servo systems.

Multitasking: DSPs need real-time kernels that provide pre-emptive multitasking and user-defined and dynamic task prioritization

DEFINING OBJECTS FOR MULTIMEDIA SYSTEMS

The basic data types of object using in multimedia include text, image, audio, holograms and full-motion video.

TEXT-

-It is the simplest of data types and requires the least amount of storage. Text is the base element of a relational database.

-It is also the basic building of a document.

-The major attributes of text include paragraph styling, character styling, font families and sizes, and relative location in a document

HYPERTEXT

-It is an application of indexing text to provide a rapid search of specific text strings in one or more documents. It is an integral component of hypermedia documents. A hypermedia document is the basic complex object of which text is a sub object.

-Sub-objects include images, sound and full motion video.

-A hypermedia document always has text and has one or more other types of sub-objects

IMAGES

-Image object is an object that is represented in graphics or encoded form. Image object is a subobject of the hypermedia document object. In this object, there is no direct relationship between successive representations in time.

-The image object includes all data types that are not coded text. It do not have a temporal property associated with them.

-The data types such as document images, facsimile systems, fractals, bitmaps, meta files, and still pictures or still video frames are grouped together.

Figure describes a hierarchy of the object classes
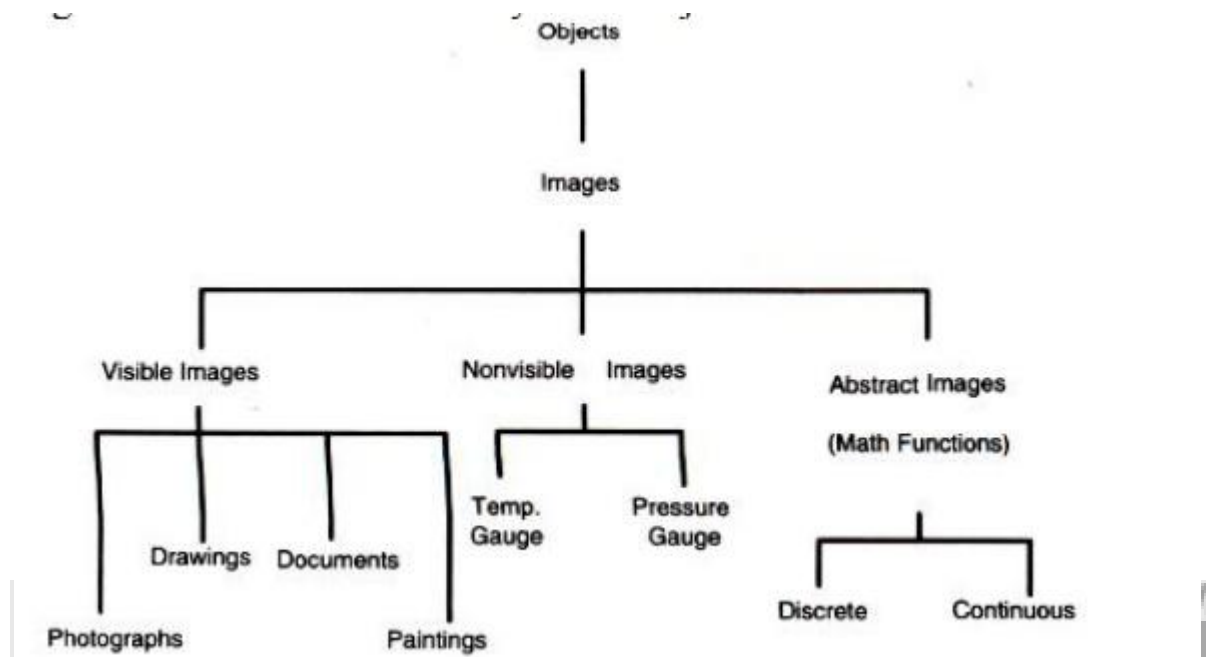
Non-Visible: These types of images are not stored as images. But they are displayed as images. Example: Pressure gauges, and temperature gauges.

Abstract: Abstract images are computer-generated images based on some arithmetic calculations. They are really not images that ever existed as real-world objects. Example of these images is fractals.

AUDIO AND VOICE

Stored-Audio and Video objects contain compressed audio information. This can consist of music, speech, telephone conversation and voice commands. An Audio object needs to store information about the sound clip.

Information here means length of the sound clip, its compression algorithm, playback characteristics, and any annotations associated with the original clip.

FULL MOTION AND LIVE VIDEO

Full motion video refers to pre-stored video clips. Live video refers to live and it must be processed while it is being captured by the camera. . From a storage perspective, we should have the information about the coding algorithm used for compression. It needs decoding also.

From a processing perspective, video should be presented to user with smooth and there should not be any unexpected breaks.

Hence, video object and its associated audio object must be transferred over the network to the decompression unit. It should be then played at the fixed rate specified for it.

For successful playback of compressed video, there are number of technologies. They are database storage, network media and protocols, decompression engines and display engines.

MULTIMEDIA DATA INTERFACE STANDARDS

File Formats for Multimedia Systems:

(i) Device-independent Bitmap (DIB): This file format contains bit map, color, and color palette information.

(ii) RIFF device Independent Bitmap (RDIB): Resource Interchange File Format **(RIFF)** is the standard file format defined for Microsoft Windows and OS/2. It allows a more complex set of bit maps than can be handled by DIB.

(iii) Musical Instrument Digital interface (MIDI): This is the interface standard for file transfer between a computer and a musical instrument such as a digital piano. It is also, used for full-motion video and voice-mail messaging systems. It has the advantage of ready availability of MIDI device controller boards for personal computers.

RIFF Musical Instrument Digital Interface

A MIDI format within a RIFF envelope provides a more complex interface.

Palette File Format (PAL)-An interface that allows defining a palette of 1 to 256 colors in a representation as RGB values.

Rich Text Format (RTF) - This file format allows embedding graphics and other file formats within a document. This format is used by products such as Lotus Notus. This format is also the basis for the use of OLE.

Waveform Audio File Format (WAVE) A digital file representation of digital audio.

Windows Metafile Format (WMF) This is a vector graphic format used by Microsoft Windows as an interchange format.

Multimedia Movie Format (MMM) This is a format used for digital video animation.

Apple's Movie Format This format was defined as the standard for file exchange by Quick Time enabled systems.

Digital Video Command Set (DVCS) This is the set of digital video commands simulating VCR controls.

Digital Video Media Control Interface Microsoft's high level control interface for VCR controls, including play, rewind, record and so on.

Vendor - Independent Messaging (VIM) Developed by a consortium of Vendors providing a standardized format for cross-product messages.

Apple's Audio Interchange File Format Apple's standard files format for compressed audio and voice data.

SDTS GIS Standard The Spatial Data Transfer Standard (SDTS) is designed to provide a common storage format for geographic and cartographic data.

VIDEO PROCESSING STANDARDS

INTELS DVI - DVI is an achronym of Digital Video Interface.

DVI standard is to provide a processor independent specification for a video interface. That video interface should accomodate most compression algorithms for fast multimedia displays. An example of custom-designed chip which supports DVI is Intel's i750 B. This chip is designed for enhancing low-end, software based PC video.

Advantages of the DVI Chip

1. It can operate software video processing real time.
2. It can share the processing with the host CPU.
3. It can handle additional vector-quantization-type algorithms in conjunction with host processing. DVI silicon chip relies on a programmable video processor. It gives potential to DVI chips to run a range of compression algorithms.

APPLE QUICK TIME

Quick Time standard is developed by Apple Computer. It is designed to Support multimedia applications. It is integrated with the operating system. Quick time refers to both the extensions to the Mac Operating system and to the compression/decompression functionality Of the environment. Quick Time is designed to be the graphics standard for time based graphic data types.

Quick Time's definition has been extended to include (i) System Software, (ii) File Formats, (Hi) Compression! decompression algorithms, (iv) Human Interface Standards.

Quick Time adjusts automatically to the hardware being used by the user. MPEG is another competing standard which is comparatively higher-end, hardware-assisted standard. It can produce better resolutions at faster rates.

MICROSOFT AVI

A VI is an acronym for Audio Video Interleave Standard. It is similar to Apple's Quick Time. It offers low-cost, low-resolution video processing for the average desktop user. It is a layered product. A VI is scalable. It allows users to set parameter such as window size, frame rate, quality and compression algorithm through a number of dialog boxes. AVI-compatible hardware allows enhancing performance through hardware-accelerated compression algorithms such as DVI and MPEG. A VI supports several compression algorithms

MULTIMEDIA DATABASES

Images, sounds and movies can be stored, retrieved and played by many databases. In future, multimedia databases will become a main source of interaction between users and multimedia elements. **Multimedia storage and retrieval** Multimedia storage is characterized by a number of considerations. They are:

i. massive storage volumes
ii. large object sizes

    iii.   multiple related objects

    iv.   temporal requirements for retrieval

Massive Data Volumes

A single multimedia document may be a combination of different media Hence indexing of documents, films and tapes is more complex. Locating massive data volumes requires searching through massive storage files.

Locating and indexing systems can be understood only by a few key staff personnel. Hence it requires a major organizational eff0l1 to ensure that they are returned in proper sequence to their original storage location.

Storage technologies

There are two major mass storage technologies used currently for storage of multimedia documents.

[1]. Optical disk storage systems.
[2]. High-speed magnetic storage.

Advantages of Optical disk storage systems:

(i)   Managing a few optical disk platters in a juke box is much simpler than managing a large magnetic disk farm.

(ii)   Optical disk storage is excellent storage system for off line archival of old and infrequently referenced documents for significant periods of time.

Multimedia object storage

Multimedia object storage in an optical medium serves its original purpose, only if it can be located fast and automatically. A key issue here is random keyed Access t6 various components of hypermedia database record. Optical media provides very dense storage. Speed of retrieval is another consideration.

Retrieval speed is a direct result of the storage latency, size of the data relative to display resolution, transmission media and speed, and decompression efficiency. Indexing is important for fast retrieval of information. Indexing can be at multiple levels.

Multimedia document retrieval

The simplest form of identifying a multimedia document is by storage platter identification and its relative position on the platter (file number). These objects can then be grouped using a database in folders (replicating the concept of paper storage in file folders) or within complex objects representing hypermedia documents.

The capability to access objects using identifiers stored in a database requires capability in the database to perform the required multimedia object directory functions. Another important application for sound and full motion video is the ability to clip parts of it and combine them with another set.

Indexing of sound and full-motion video is the subject of intense debate and a number of approaches have been used.

Database Management Systems for Multimedia Systems

Since most multimedia applications are based primarily on communications technologies, such as electronic mail, the database system must be fully distributed. A number of database storage choices are available.

The choices available are:

  ➢ Extending the existing relational database management systems, (RDBMSs) to support the various objects for multimedia as binary objects.
  ➢ Extending RDBMSs beyond basis binary objects to the concepts of inheritance and classes. RDBMSs supporting these features provide extensions for object-programming front ends and/or C++ support.
  ➢ Converting to a fully fledged object oriented database that supports the standard SQL language.
  ➢ Converting the database and the application to an object oriented database and using an object-oriented language, or an object-enabled SQL for development.

Multimedia applications combine numerical and textual data, graphics from GUI front-ends, CAD/CAM systems and GIS applications, still video, audio and full-motion video with recorded audio and annotated voice components. Relational databases, the dominant database paradigm, have lacked the ability to support multimedia databases. Key limitations of relational database systems for implementing multimedia applications stem from two areas: the relational data model and the relatIonal computational model.

RDBMSs have been designed to manage only tabular alphanumeric forms of data (along with some additional data types stored in binary form such as dates).

RDBMS EXTENSIONS FOR MULTIMEDIA

Binary Large Object (BLOB) is a data type which has been adapted by most of the leading relational databases. BLOBs are used for objects such as images or other binary data types.

The relational database is extended to access these BLOBs to present the user 'with a complete' data set. Extended relational databases provide a gradual migration path to a more object-oriented environment. Relational database tables include location information for the BLOBs which may be stored outside the database on separate image or video servers. Relational databases have the strength of rigorous set management for maintaining the integrity of the database

Object-Oriented Databases for Multimedia

In object databases, data remains in RMS or flat files. Object databases can provide the fastest route to multimedia support. Object programming embodies the principles of reusable code and modularity. This will ease future maintenance of these databases.

Object database capabilities such as message passing, extensibility, and the support of hierarchical structures, are important for multimedia systems.

We can develop the application fastest class definitions. ODBMSs are extensible. They allow incremental changes to the database applications.

Extensibility: Extensibility .means that the set of operations, structures and constraints that are available to operations are not fixed, and developers can define new operations, which can then be added as needed to their application.

Object-oriented software technology has three important concepts. They are:

Encapsulation: It is the ability to deal with software entities as units that interact in pre-defined and controllable manner, and where the control routines are integral with entity.

Association: It is the ability to define a software entity in terms of its differences from another entity.

Classification: It is the ability to represent with a single software entity a number of data items that all have the same behavior and the same state attributes.

Object orientation helps to organize the software in a more, modular and re-usable manner. **Encapsulation** allows for the development of open systems where one part of the application does not need to know the functioning of other part. It also provides autonomy; **Autonomy** means we can interface to a variety of external programs can be built in one class of objects and the storage of the data in another class of objects.

Database Organization for Multimedia Applications

Data organization for multimedia systems has some key issues. They are:

1. Data independence
2. Common distributed database architecture
3. Distributed database servers.
4. Multimedia object management.

Data Independence

Flexible access by a number of databases requires that the data be independent from the application so that future applications can access the data without constraints related to a previous application.

Key features of data independent designs are:

1. Storage design in independent of specific applications.
2. Explicit data definitions are independent of application program.
3. Users need not know data formats or physical storage structures.
4. Integrity assurance in independent of application programs.
5. Recovery in independent of application programs.

Distributed Data servers

Distributed database servers are a dedicated resource on a network accessible to a number of applications. The database server is built for growth and enhancement, and the network provides the opportunity for the growth of applications and distributed access to the data.

Multimedia Object Management

The object management system must be capable of indexing, grouping and storing multimedia objects in distributed hierarchical optional storage systems, and accessing these objects on or keyed basis.

The design of the object management system should be capable indexing objects in such a manner that there is no need to maintain multiple storage copies.

Multimedia transactions are very complex transactions. We define a multimedia transaction as the sequence of events that starts when a user makes a request to display, edit, or print a hyper media document. The transaction is complete when the user releases the hypermedia document and stores back the edited versions or discards the copy in memory (including virtual memory) or local storage.

MULTIMEDIA AUTHORING TOOLS

Definition

Multimedia authoring is a process of assembling different types of media contents like text, audio, image, animations and video as a single stream of information with the help of various software tools available in the market. Multimedia authoring tools give an integrated environment for joining together the different elements of a multimedia production. It gives the framework for organizing and editing the components of a multimedia project. It enables the developer to create interactive presentation by combining text, audio, video, graphics and animation.

Features of Authoring Tools

- **Editing Features**- Most authoring environment and packages exhibit capabilities to create edit and transform different kinds of media that they support. For example, Macromedia Flash comes bundled with its own sound editor. This eliminates the need for buying dedicated software to edit sound data. So authoring systems include editing tools to create, edit and convert multimedia components such as animation and video clips.

- **Organizing Features**- The process of organization, design and production of multimedia involve navigation diagrams or storyboarding and flowcharting. Some of the authoring tools provide a system of visual flowcharting or overview facility to showcase your project's structure at a macro level. Navigation diagrams help to organize a project. Many web-authoring programs like Dreamweaver include tools that create helpful diagrams and links among the pages of a website.

- **Visual programming with icons or objects**- It is simplest and easiest authoring process. For example, if you want to play a sound then just clicks on its icon.

- **Programming with a scripting language**- Authoring software offers the ability to write scripts for software to build features that are not supported by the software itself. With script you can perform computational tasks - sense user input and respond, character creation, animation, launching other application and to control external multimedia devices.

- **Document Development tools**- Some authoring tools offers direct importing of pre-formatted text, to index facilities, to use complex text search mechanism and to use hypertext link-ing tools.

- **Interactivity Features**- Interactivity empowers the end users to control the content and flow of information of the project. Authoring tools may provide one or more levels of interactivity.

- **Simple branching**- Offers the ability to go to another section of the multimedia production.

- **Conditional branching**- Supports a go to base on the result of IF-THEN decision or events.

- **Playback Features**- When you are developing multimedia project, you will continousally assembling elements and testing to see how the assembly looks and performs. Therefore authoring system should have playback facility.

- **Supporting CD-ROM or Laser Disc Sources**- This software allows over all control of CD-drives and Laser disc to integrate audio, video and computer files. CD-ROM drives, video and laserdisc sources are directly controlled by authoring programs.

- **Supporting Video for Windows**- Videos are the right media for your project which are stored on the hard disk. Authoring software has the ability to support more multimedia elements like video for windows.

- **Hypertext**- Hypertext capabilities can be used to link graphics, some animation and other text. The help system of window is an example of hypertext. Such systems are very useful when a large amount of textual information is to be represented or referenced.

- **Cross-Platform Capability**- Some authoring programs are available on several platforms and provide tools for transforming and converting files and programs from one to the other.

- **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 content. Some advanced authoring programs provide special packaging and run-time distribution for use with devices such as CD-ROM.

- **Internet Playability**- Due to Web has become a significant delivery medium for multimedia, authoring systems typically provide a means to convert their output so that it can be delivered within the context of HTML or DHTML.

Authoring Tools Classification

1. **Card or Page based authoring tools**

In these authoring systems, elements are organized as pages of a book or a stack of cards. In the book or stack there are thousands of pages or cards available. These tools are best used when the bulk of your content consists of elements that can be viewed individually, for example the pages of a book or file cards in card file. You can jump from page to page because all pages can be interrelated. In the authoring system you can organize pages or cards in the sequences manner. Every page of the book may contain many media elements like sounds, videos and animations.

One page may have a hyperlink to another page that comes at a much later stage and by clicking on the same you might have effectively skipped several pages in between. Some examples of card or page tools are:

- Hypercard (Mac)
- Tool book (Windows)
- PowerPoint (Windows)
- Supercard (Mac)

Advantages: Following are the advantages of card based authoring tools.
- Easy to understand.
- One screen is equal to 1card or 1page.

- Easy to use as these tools provide template.
- Short development time.
-

Disadvantages: Following are the disadvantages of card based authoring tools.
- Some run only on one platform.
- Tools not as powerful as equivalent stand alone.

2. Icon based or Event driven authoring tools

Icon-based tools give a visual programming approach to organizing and presenting multimedia. First you build a structure or flowchart of events, tasks and decisions by dragging appropriate icons from a library. Each icon does a specific task, for example- plays a sound, open an image etc. The flowchart graphically displays the project's logic. When the structure is built you can add your content text, graphics, animation, video movies and sounds. A nontechnical multimedia author can also build sophisticated applications without scripting using icon based authoring tools. Some examples of icon based tools are:

- Authorware Professional (Mac/Windows)
- Icon Author (Windows)

Advantages: Following are the advantages of icon/event based authoring tools.
- Clear Structure.
- Easy editing and updating
-

Disadvantages: Following are the disadvantages of icon/event based authoring tools.
- Difficult to learn.
- Expensive.

3. Time based authoring tools

Time based authoring tools allow the designer to arrange various elements and events of the multimedia project along a well defined time line. By time line, we simply mean the passage of time. As the time advances from starting point of the project, the events begin to occur, one after another. The events may include media files playback as well as transition from one portion of the project to another. The speed at which these transitions occur can also be accurately controlled. These tools are best to use for those projects, wherein the information flow can be directed from beginning to end much like the movies. Some example of Time based tools are:

- Macromedia's Director
- Macromedia Flash

Advantages: Following are the advantages of time based authoring tools.
- Good for creating animation.
- Branching, user control, interactivity facilities.

Disadvantages: Following are the disadvantages of time based authoring tools.
- Expensive
- Large file size
- Steep learning curve to understand various features.

4. Object-Oriented authoring tools:

Object oriented authoring tools support environment based on object. Each object has the following two characteristics:

1. **State or Attributes** - The state or attributes refers to the built in characteristics of an object. For example, a color T.V has the following attributes:

   o Color receiver
   o Volume control
   o Picture control
   o 128 channels
   o Remote control unit

2. **Behavior or Operations** - The behavior or operations of an object refers to its action. For example, a T.V can behave in any of the following manner at a given point of time:
   o Switched on
   o Switched off
   o Displays picture and sound from
      ▪ A TV cable connection
      ▪ A TV transmitter
      ▪ A DVD
      ▪ A VCR

In these systems, multimedia elements events are often treated as objects that live in a hierarchical order of parent and child relationships. These objects use messages passed among them to do things according to the properties assigned to them. For example, a video object will likely have a duration property i.e how long the video plays and a source property that is the location of the video file. This video object will likely accept commands from the system such as play and stop. Some examples of the object oriented tools are:
   o mTropolis (Mac/Windows)
   o Apple Media Tool (Mac/Windows)
   o Media Forge (Windows)