**Multimedia** is content that uses a combination of different content forms such as text, audio, images, animations, video and interactive content. **Multimedia** contrasts with media that use only rudimentary computer displays such as text-only or traditional forms of printed or hand-produced material.

what are the multimedia elements?

Text, image, audio, video, and animation are the five **multimedia elements**. The first **multimedia element** is text. Text is the most common **multimedia element**. Text expresses the information the developer is trying to get across to their viewers.

what are the multimedia applications?

A Multimedia Application is an Application which uses a collection of multiple media sources e.g. text, graphics, images, sound/**audio**, animation and/or video. Hypermedia can be considered as one of the multimedia applications.

## Evaluation of Multimedia systems

**Evaluation** is testing whether a **multimedia** programme fulfills the objectives set, and suggesting improvements it requires to make the programme useful for its target audience. **Evaluation** is not a uniform process and **evaluation** cannot be identical for all programmes.

## Storage of multimedia

**Multimedia Storage** υ **Multimedia** can be **stored** in mediums such as Optical Disks, Hard Drives, Magnetic **Storage** Some media is time independent or static or discrete media: normal data, text, single images, graphics are examples.υMedia and such. ... Video, animation and audio are examples of continuous media.

# Synchronization in Multimedia Systems

Multimedia: Computing, Communications & Applications.

**Introduction**

Synchronization in multimedia systems refers to temporal relationships between media objects in the multimedia systems. In future multimedia systems (based, e.g., on MPEG-4) synchronization may also refer to spatial and content relationships, as well as temporal.

Synchronization between media objects comprises relationships between time-dependent media objects as well as time-independent media objects. Synchronization may need to occur at different levels in a multimedia system, consequently synchronization support is typically found in the operating system, communication system, databases, multimedia documents, and the application. A general scheme might involve a layered approach to achieving synchronization. For example, a Computer-Supported Collaborative Workgroup (CSCW) session might involved a multi-party video conferencing session with audio, and a shared whiteboard. Parties may make reference to objects on the shared whiteboard, using a pointer, to support what they are saying (e.g., saying "This area here..." while indicating the area with a pointer). Here, video and audio are continuous media objects which are highly periodic, whereas the shared whiteboard is a discrete media stream, as changes to it are highly irregular (the content, including the position of the pointer, depends on which participant has control of the object and when they make changes to it). The media streams must be highly synchronized, so that speech remains lip synchronized, and the whiteboard updates are synchronized with audio references to them.

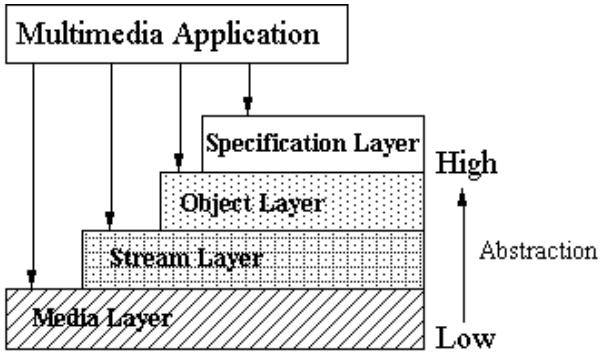
The operating system and lower levels of the communication system are responsible for ensuring that jitter on individual streams does not occur during presentation of the video, audio, and whiteboard streams (intramedia synchronization). At a higher level, the runtime support for the synchronization of multiple multimedia media streams must ensure that the various media streams remain synchronized with respect to each other (intermedia synchronization). Finally, the application(s) are responsible for ensuring synchronicity between application-level events (usually initiated by the users). For example, if the application at the source does not capture timing dependencies between a user waving the pointer over part of the object in the whiteboard and the supporting audio stream, then it will be impossible for the application at the sink to know that the whiteboard and audio events need to be synchronized.

The temporal relations between media objects must be specified during capture of the media objects, if the goal of the presentation is to present media in the same way that they were originially captured. Synchronization information of events in an animation sequence or a slide show is usually specified by the designer, using, for example, a time-axis.

**A Reference Model for Multimedia Synchronization**

A reference model is needed to understand the requirements of multimedia synchronization, identify and structure runtime mechanisms that can support these requirements, identify interfaces between runtime mechanisms, and compare solutions for multimedia synchronization systems.

Figure 11.1 shows a reference model for multimedia synchronization systems. Each layer implements synchronization mechanisms which are provided by an appropriate interface. These interfaces can be used to specify or enforce the temporal relationships. Each interface can be used by the application directly, or by the next higher layer to implement an interface. Higher layers offer higher programming and QoS abstractions.




**Media Layer**

An application operates on a single continuous media stream, which is treated as a sequence of LDUs. Networking components must be taken into account. Provides access to files and devices.

**Stream Layer**

The stream layer operates on continuous media streams as well as groups of media streams. In a group, all streams are presented in parallel by using mechanisms for interstream synchronization. QoS parameters will

specify intrastream and interstream synchronization requirements.
Continuous media is seen as a data flow with implicit time constraints; individual LDUs are not visible. An application using the stream layer is responsible for starting, stopping and grouping the streams, and for the definition of the required QoS in terms of timing parameters supported by the stream layer. It is also responsible for the synchronization with time-independent media objects. Tasks include resource reservation and LDU process scheduling.

**Object Layer**

The object layer operates on all media streams and hides the differences between continuous and discrete media. An application that interacts with this layer will be presented with a view of a complete, synchronized presentation. This layer takes a complete synchronization specification as its input and is responsible for the correct schedule of the overall presentation.

**Specification Layer**

This layer contains applications and tools that are allowed to create synchronization specifications (e.g., authoring tools, multimedia document editors).
The specification layer is also responsible for mapping user-required QoS parameters to the qualities offered at the object layer interface.
Synchronization specifications can be:

- Interval-based: specifications of the temporal relations between the time intervals of the presentation of media objects
- Axes-based: allows presentation events to be synchronized according to shared axes, e.g., a global timer
- Control flow-based: at specified points in presentations, they are synchronized
- Event-based: Events in the presentation trigger presentation actions

**Synchronization in a Distributed Environment**

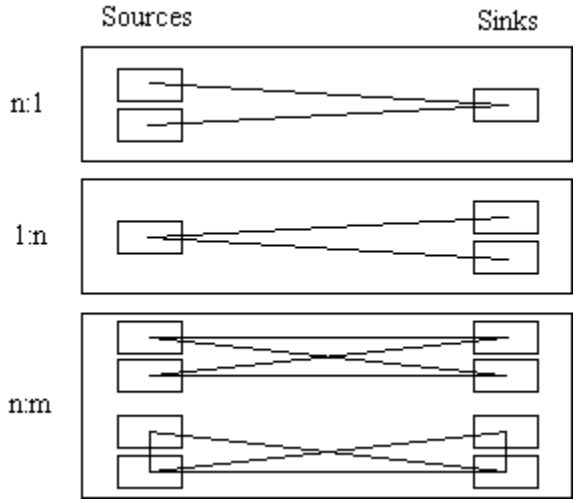
Synchronization in a distributed environment is complex, because there may be more than one source of multimedia data, and more than one sink consuming it. The synchronization information for the various media stream may also reside at different sources.

**Transport of the synchronization specification**

The sink needs to have the synchronization information available to correctly display an object. There are three main approaches to delivering the synchronization information to the sink:

- Delivery of the synchronization information before the start of the presentation
- Use of an additional synchronization channel
- Multiplexed data streams

If the multimedia presentation is live and multiple parties are involved, then none of the approaches above is suitable for delivering synchronization information to the sink(s) in a timely fashion. Figure 11.2 shows typical communication patterns.




Of particular interest here, is that if multiple sinks are involved, then they will receive identical data. It would be inefficient if the data were replicated at the source for separate transmission to each of the sinks. It would also be inefficient if the same operation was carried out at different sinks. *Multicasting* or broadcasting of streams is

the responsibility of the stream layer, whereas efficient planning of operation execution in the different communication patterns is a responsibility of the object layer.

**Multi-Step Synchronization**

In a distributed environment, synchronization is typically a multi-step process, during which the synchronization must be maintained so as to enable the sink to perform the final synchronization. The synchronization steps are:

- during object acquisition, e.g., during frame digitization
- during retrieval, e.g., synchronized access to frames of a stored video
- during delivery of the LDUs to the network
- during the transport of the LDUs, e.g., using isochronous protocols
- at the sink, e.g., synchronized delivery to the output devices
- within the output device

With many different points at which synchronization must occur decisions must be made about how to implement it. A first decision is the selection of the type of transport for the synchronization specification. In runtime, decisions must be taken concerning the location of synchronization operations, keeping clocks in synchrony (if used to provide common timing information), and the handling of multicast and broadcast messages. Coherent planning of the steps in the synchronization process, together with the necessary operations of the objects, e.g., decompression, must also be done. In addition, presentation manipulation operations demand additional replanning at runtime.

**Synchronization Specification**

A synchronization specification should comprise:

- Intra-object synchronization specifications for the media objects of the presentation
- QoS descriptions for intra-object specifications
- Inter-object synchronization specifications for media objects of the presentation
- QoS descriptions for inter-object synchronization

In addition, the form, or alternate forms, of a multimedia object may be described. For example, a text could be presented as text on the screen or as a generated audio sequence. In the case of live synchronizations, the temporal relations are implicitly defined during capture. QoS requirements are specified before the start of the capture. In the case of synthetic synchronization, the specification must be created explicitly.

**Synchronization in multimedia** systems refers to temporal relationships between media objects in the **multimedia** systems. ... The media streams must be highly **synchronized**, so that speech remains lip **synchronized**, and the whiteboard updates are **synchronized** with audio references to them.

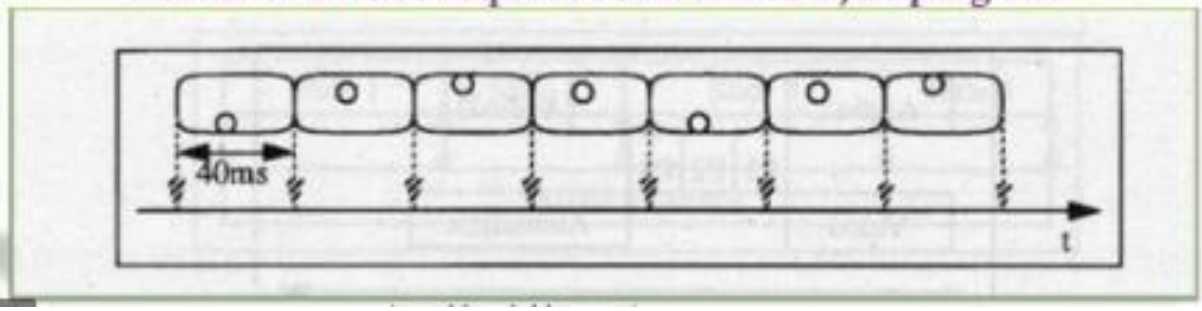
# MULTIMEDIA SYNCHRONIZATION IN DISTRIBUTED ENVIRONMENT

## 1. Intra-Object Synchronization :-

Time Relation Between Various Presentation Units of One Time-Dependent Media Object

Ex : Time relation between the single frames of a video sequence. For a video with a rate of 25 frames per second each of the frames has to be displayed for 40 ms .

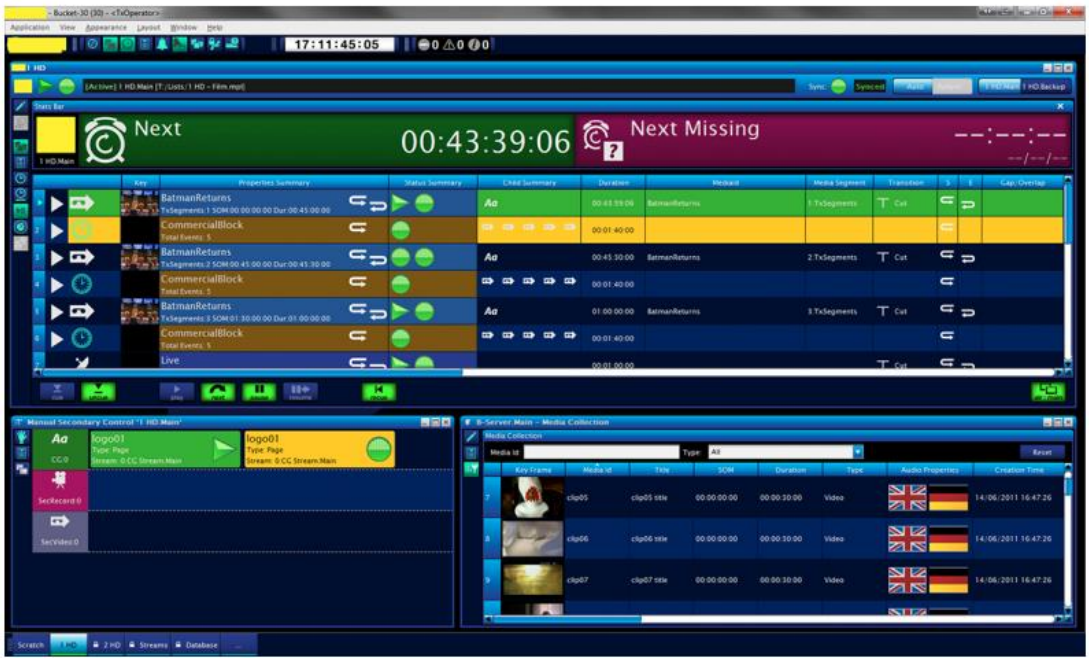
Frames of a video sequence that shows a jumping ball




A new category has appeared in the marketing lexicon of playout automation and media management companies, namely ‘media orchestration’. It describes a process that will play an increasingly significant role as media organisations make the inevitable transition from baseband (SDI) to IP network technology.

# What Is Media Orchestration?

November 21st 2014 - 02:20 PM
By Adrian Pennington




“Broadly, media orchestration describes both the control of playout and media management but also addresses the management, configuration, and monitoring aspects that relate to content delivery,” explains Andy Warman, director of product management, media servers and storage at Harmonic - one of the company's using the term.

“Automation deals with accepting schedules, maintaining device control, and ensuring first that media is available and playable at the right time, and then, after playout, that it can be reconciled and monetized,” says Warman. “However, the ability to add new channels and features, reconfigure what is already in place, track the emergence of issues, move forward with diagnosis, and quickly fix any problems is also key to health of each channel. Media orchestration considers all these aspects of playout and media delivery.”

Another company making play of the term is Imagine Communications.

“While the specifics of the transition [to IP] are still being defined, maintaining the integrity of all content being created, processed and distributed remains a non-negotiable requirement,” explains Glenn LeBrun, Imagine's VP of product marketing.

He highlights solutions like the Magellan SDN Orchestrator which “help facilitate a seamless integration of IP technology with legacy systems, protecting existing infrastructure investments while maintaining operational workflow integrity in the hybrid SDI/IP environment.” Ideally, says LeBrun, this ‘orchestration’ is invisible to the operator; “No new training or expensive ‘forklift’ system upgrade – during a phased transition to an IP infrastructure.”

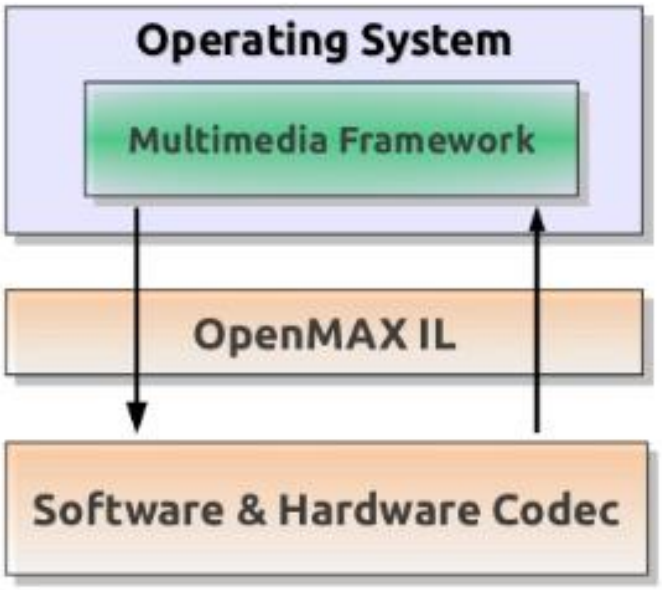
Harmonic brands its range of media orchestration products as Polaris. These tools already uses IP connectivity for all control elements. Warman says it's the default way to control Harmonic video server and encoder products.

“We provide serial and GPI control to provide legacy support on both the video I/O devices and on Polaris automation systems. Once the dependence of these legacy interfaces can be removed, and pure IP control can be used, users are ready to take the first logical step to virtualizing playout. That said, there are other issues that need to be overcome in order to migrate control to the cloud.”

The bigger issue is that the industry is in the early stages of its transition to off-the-shelf IP playout automation platforms that do not require dedicated hardware, but the vast majority of systems will continue to need some form of dedicated hardware for some time.

“Ties to dedicated hardware can stem from the need to interface to existing SDI infrastructure, requirements for serial and GPI control, and the use of house timecode sources and reference to sync automation and playout systems in the air chain,” explains Warman. “Even some cutting-edge solutions need GPU acceleration to perform on otherwise standard IT hardware. These limitations prevent broadcasters from taking a true datacenter-based and/or visualized approach to handling the playout chain. Consequently, appliance-type solutions — for which the vendor supplies the computer, configures it with add on cards, and warrants its performance — will be dominant for years to come.”
One issue in shifting control to the cloud is that of timing and, in particular, how to meet frame-accuracy requirements. Challenges in this area remain, but an end is in sight that could allow for a common time base in a virtual infrastructure. The next hurdle is that of managing control itself. Already, various de facto standard mechanisms and protocols (such as VDCP, CII, SCTE 104/35) exist to solve problems but typically they do not address the needs of the air chain itself and all of its sub-elements.
“If a number of these needs cannot be bundled together, then vendors create proprietary control mechanisms to achieve their goals,” warns Warman. “Thus, while virtualizing control is possible today, achieving a standards-based approach remains challenging.”

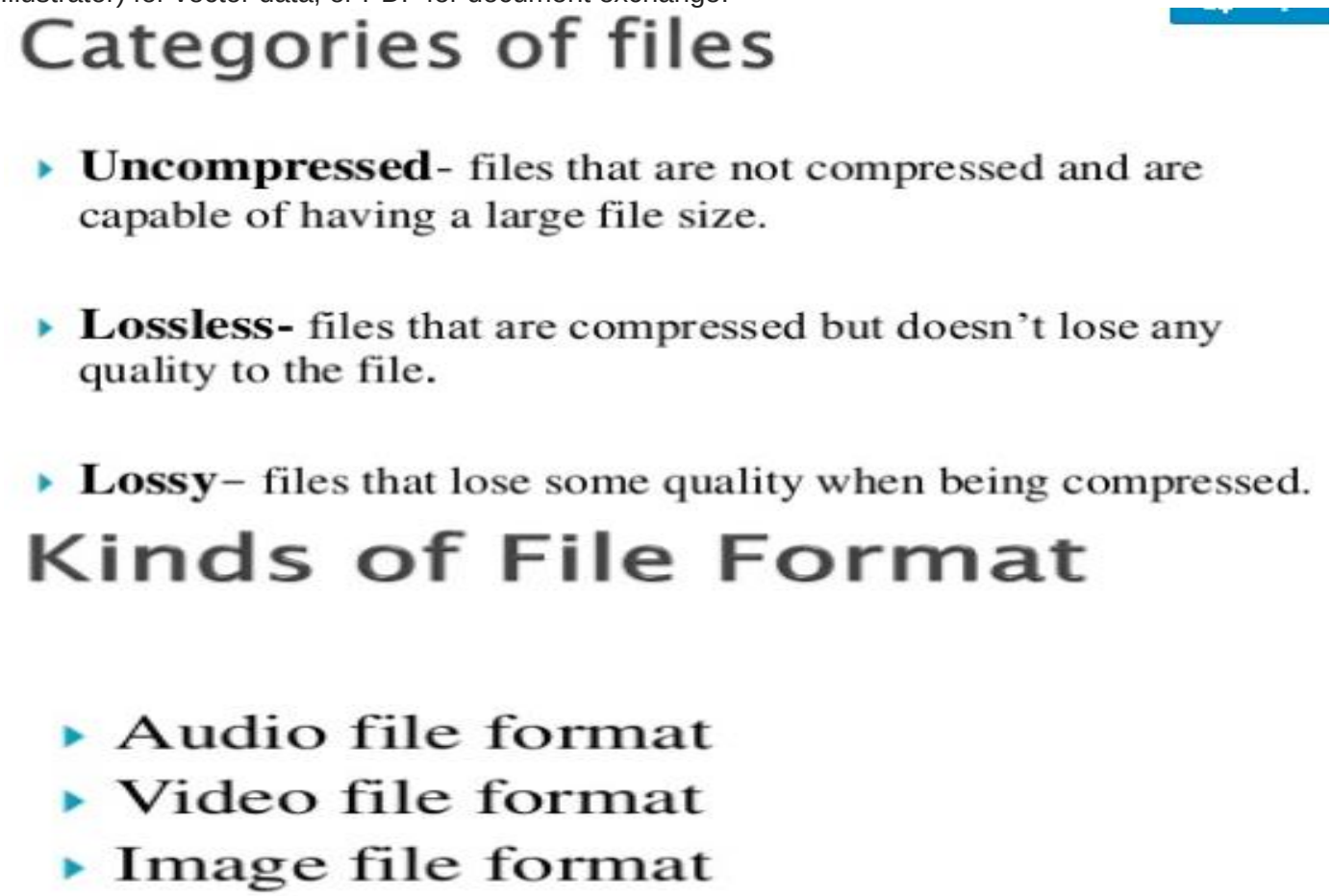
A **multimedia framework** is a software **framework** that handles media on a computer and through a network. A good **multimedia framework** offers an intuitive API and a modular architecture to easily add support for new audio, video and container formats and transmission protocols.




A **multimedia framework** is a software framework that handles media on a computer and through a network. A good multimedia framework offers an intuitive API and a modular architecture to easily add support for new audio, video and container formats and transmission protocols. It is meant to be used by applications such as media players and audio or video editors, but can also be used to build videoconferencing applications, media converters and other multimedia tools. Data is processed among modules automatically, it is unnecessary for app to pass buffers between connected modules one by one.
In contrast to function libraries, a multimedia framework provides a run time environment for the media processing. Ideally such an environment provides execution contexts for the media processing blocks separated from the application using the framework. The separation supports the independent processing of multimedia data in a timely manner. These separate contexts can be implemented as threads.

**File Format**

A **file format** is the structure of how information is stored (encoded) in a computer **file**. **File formats** are designed to store specific types of information, such as JPEG and TIFF for image or raster data, AI (Adobe Illustrator) for vector data, or PDF for document exchange.

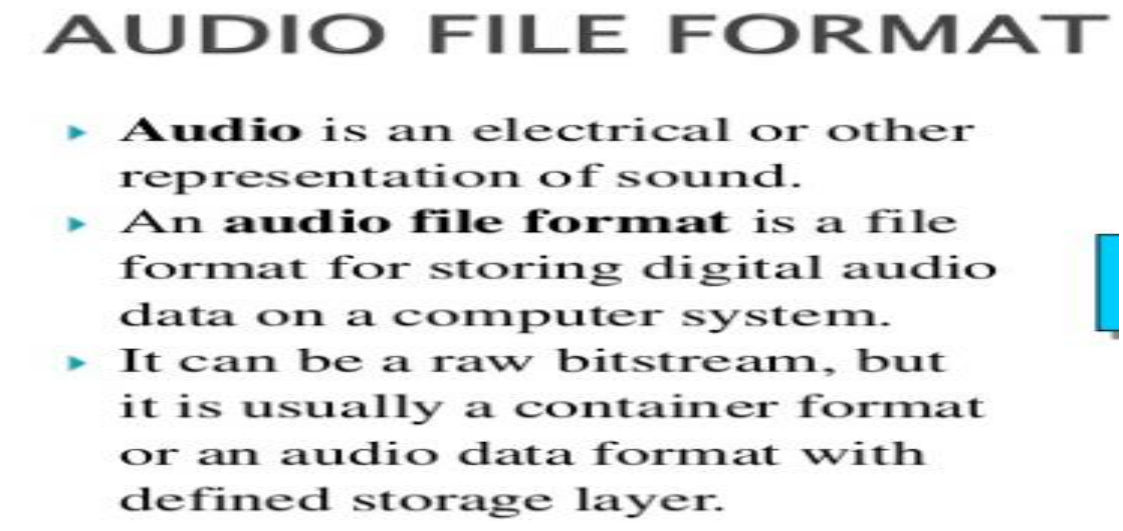






**Supported multimedia file formats and types**

- Video: .mov, .mp4, .m4a, .m4v, .mpg/.mpeg, .wmv, .avi, .flv, .3gp, .3gpp, .3g2, .3gp2.
- Audio: .mp3.
- Image: .jpg, .jpeg, .png.



**1.MP3-** MPEG Audio Layer 3 (AC3) **file**. **MP3** (MPEG-1 Audio Layer-3) is a standard technology and **format** for compressing a sound sequence into a very small **file** (about one-twelfth the size of the original **file**) while preserving the original level of sound quality when it is played. **MP3**provides near CD quality audio. It is a lossy compression.

**2.WAV**- WAV is a file extension for an audio file format created by Microsoft. The WAV file has become a standard PC audio file format for everything from system and game sounds to CD-quality audio.

Also referred to as pulse code modulation (PCM) or waveform audio, a WAV file is uncompressed audio. A Wave file also stores information about the file's number of tracks, sample rate, bit depth, and whether it's mono or stereo.

### 3. WMA - Windows Media Audio (.wma)

Short for Windows Media Audio, WMA is a Microsoft file format for encoding digital audio files similar to MP3 though can compress files at a higher rate than MP3. WMA files, which use the ".wma" file extension, can be of any size compressed to match many different connection speeds, or bandwidths.

4. **Ogg (.ogg) -** Ogg is an audio compression format, comparable to other formats used to store and play digital music, but differs in that it is free, open and unpatented. It uses Vorbis, a specific audio compression scheme that's designed to be contained in Ogg.

# VIDEO FILE FORMAT

Video files are collections of images, audio and other data. The attributes of the video signal include the pixel dimensions, frame rate, audio channels, and more. In addition, there are many different ways to encode and save video data. This page outlines the key characteristics of the video signal, and the file formats used to capture, work with, and deliver that data.

**1. AVI (Audio Video Interleave) -**

Developed by Microsoft and introduced to the public in November 1992 as part of its Video for Windows technology, the AVI format is one of the oldest video formats. It is so universally accepted that many people consider it the de facto standard for storing video and audio information on the computer. Due to it's simple architecture, AVI files are able to run on a number of different systems like Windows, Macintosh, Linux; is also supported by popular web browsers. AVI files stores data that can be encoded in a number of different codec's, although most commonly with M-JPEG or DivX codecs. This means that all AVI files, while they may look similar on the outside, differ substantially from one another on the inside.

**2. WMV (Windows Media Video)**

Developed by Microsoft, WMV was originally designed for web streaming applications, as a competitor to RealVideo, but it can now cater to more specialized content. WMV files are the tiniest video files over the Web, as their file size decreases significantly after compression, which results in poor video quality. However, one advantage of this small file size is that it is probably the only video file format that allows users to upload and share their videos through the e-mail system. Being a Microsoft software, the Windows Media Player is the main application that is used to play WMV files on all Microsoft's Windows operating systems, but there are also WMV players available for free for the Macintosh operating system.

**3. MOV (Apple QuickTime Movie)**

Developed by Apple. Inc, the QuickTime file format is a popular type of video sharing and viewing format amongst Macintosh users, and is often used on the Web, and for saving movie and video files. In recent years, Apple came up with a newer version called QuickTime X, currently available on Mac OS X Snow Leopard, Lion and Mountain Lion. MOV files are most commonly opened via the Apple QuickTime Player for the Macintosh Operating System. However, MOV files are not just limited to being played on Apple computers, as there is a free version of the QuickTime Player available for the Windows Operating System among many other players. Considered one of the best looking file formats, MOV files are of high quality and are usually big in file size.

## 4. MP4 (Moving Pictures Expert Group 4)

MP4 is an abbreviated term for MPEG-4 Part 14, a standard developed by the Motion Pictures Expert Group who was responsible for setting industry standards regarding digital audio and video, and is commonly used for sharing video files on the Web. First introduced in 1998, the MPEG-4 video format uses separate compression for audio and video tracks; video is compressed with MPEG-4 or H.264 video encoding; and audio is compressed using AAC compression. The MP4 file format is also another great file sharing format for the Web, MP4 file sizes are relatively small but the quality remains high even after compression. MP4 standard is also becoming more popular than FLV for online video sharing, as it compatible with both online and mobile browsers and also supported by the new HTML5.

Clip slide

# IMAGE FILE FORMAT

1. **JPG- JPG** is the most used image file format. Digital cameras and web pages normally use JPG files - because JPG heroically compresses the data to be very much smaller in the file. However JPG uses lossy compression to accomplish this feat, which is a strong downside. A smaller file, yes, there is nothing like JPG for small, but this is at the cost of image quality. This degree is selectable (with an option setting named JPG Quality), to be lower quality smaller files, or to be higher quality larger files. In general today, JPG is rather unique in this regard, using lossy compression allowing very small files of lower quality, whereas almost any other file type uses lossless compression

2. **TIF - TIF** is which is considered the highest quality format for commercial work. The TIF format is not necessarily any "higher quality" per se (the same RGB image pixels, they are what they are), and most formats other than JPG are lossless too. TIF simply has no JPG artifacts, no additional losses or JPG artifacts to degrade and detract from the original. And TIF is the most versatile, except that web pages don't show TIF files. For other purposes however, TIF does most of anything you might want, from 1-bit to 48-bit color, RGB, CMYK, LAB, or Indexed color. Most any of the "special" file types (for example, camera RAW files, fax files, or multipage documents) are based on TIF format, but with unique proprietary data tags - making these incompatible unless expected by their special software.

3. **GIF – GIF** was designed by CompuServe in the early days of computer 8-bit video, before JPG, for video display at dial up modem speeds. GIF discards all Exif data, and while GIF is fine for video screen purposes, GIF does Not retain printing resolution values. GIF always uses lossless LZW compression, but it is always an indexed color file (1 to 8-bits per pixel). GIF can have a palette of 24-bit colors, but only 256 of them maximum (which colors depend on your image colors).

4. **PNG - PNG** can replace GIF today (web browsers show both), and PNG also offers many options of TIF too (indexed or RGB, 1 to 48-bits, etc). PNG was invented more recently than the others, designed to bypass possible LZW compression patent issues with GIF, and since it was more modern, it offers other options too (RGB color modes, 16 bits, etc). One additional feature of PNG is transparency for 24 bit RGB images. Normally PNG files are a little smaller than LZW compression in TIF or GIF (all of these use lossless compression, of different types), but PNG is slower to read or write. That patent situation has gone away now, but PNG remains excellent lossless compression. Less used than TIF or JPG, but PNG is another good choice for lossless quality work.

## Multimedia authoring and User Interface Multimedia Authoring Systems

Multimedia authoring systems are designed with two primary target users: They are (i) Professionals who prepare documents, audio or sound tracks, and full motion video clips for wide distribution. (il) Average business users preparing documents, audio recordings, or full motion video clips for stored messages' or presentations.

### Multimedia authoring and User Interface Multimedia Authoring Systems

Multimedia authoring systems are designed with two primary target users: They are

(i) Professionals who prepare documents, audio or sound tracks, and full motion video clips for wide distribution.

(il) Average business users preparing documents, audio recordings, or full motion video clips for stored messages' or presentations.

The authoring system covers user interface. The authoring system spans issues such as data access, storage structures for individual components embedded in a document, the user's ability to browse through stored objects, and so on.

Most authoring systems are managed by a control application.

## Design Issues for Multimedia Authoring

Enterprise wide standards should be set up to ensure that the user requirements are fulfilled with good quality and made the objects transferable from one system to another.

So standards must be set for a number of design issues

1. Display resolution
2. Data formula for capturing data
3. Compression algorithms
4. Network interfaces
5. Storage formats.

**Display resolution**

A number of design issues must be considered for handling different display outputs. They are:

(a) Level of standardization on display resolutions.

(b) Display protocol standardization.

(c) Corporate norms for service degradations

(d) Corporate norms for network traffic degradations as they relate to resolution issuesSetting norms will be easy if the number of different work station types, window managers, and monitor resolutions are limited in number.But if they are more in number, setting norms will

be difficult.Another consideration is selecting protocols to use. Because a number of protocols have emerged, including AVI, Indeo, Quick Time and so on.So, there should be some level of convergence that allows these three display protocols to exchange data and allow viewing files in other formats.

## File Format and Data Compression Issues

There are variety of data formats available for image, audio, and full motion video objects.

Since the varieties are so large, controlling them becomes difficult. So we should not standardize on a single format. Instead, we should select a set for which reliable conversion application tools are available.

Another key design Issue is to standardize on one or two compression formula for each type of data object. For example for facsimile machines, CCITT Group 3 and 4 should be included in the selected standard. Similarly, for full motion video, the selected standard should include MPEG and its derivatives such as MPEG 2.

While doing storage, it is useful to have some information (attribute information) about the object itself available outside the object to allow a user to decide if they need to access the object data. one of such attribute information are:

(i) Compression type (ii) Size of the object

(iii) Object orientation (iv)Data and time of creation

(v) Source file name (vi)Version number (if any)

(vii) Required software application to display or playback the object.

**Service degradation policies**: Setting up Corporate norms for network traffic degradation is difficult as they relate to resolution Issues:

To address these design issues, several policies are possible. They are:

1. Decline further requests with a message to try later.
2. Provide the playback server but at a lower resolution.

3. Provide the playback service at full resolution but, in the case of sound and full motion video, drop intermediate frames.

### Design Approach to Authoring

Designing an authoring system spans a number of design issues. They include:

Hypermedia application design specifics, User Interface aspects, Embedding/Linking streams of objects to a main document or presentation, Storage of and access to multimedia objects. Playing back combined streams in a synchronized manner.

A good user interface design is more important to the success of hypermedia applications.

## Types of Multimedia Authoring Systems

There are varying degrees of complexity among the authoring systems. For example, dedicated authoring systems that handle only one kind of an object for a single user is simple, where as programmable systems are most complex.

### Dedicated Authority Systems

Dedicated authoring systems are designed for a single user and generally for single streams.

Designing this type of authoring system is simple, but if it should be capable of combining even two object streams, it becomes complex. The authoring is performed on objects captured by the local video camera and image scanner or an objects stored in some form of multimedia object library. In the case of dedicated authoring system, users need not to be experts in multimedia or a professional artist. But the dedicated systems should be designed in such a way that. It has to provide user interfaces that are extremely intuitive and follow real-world metaphors.

A structured design approach will be useful in isolating the visual and procedural design components.

### TimeLine –based authoring

In a timeline based authoring system, objects are placed along a timeline. The timeline can be drawn on the screen in a window in a graphic manner, or it created using a script in a mann.er similar to a project plan. But, the user must specify a resource object and position it in the timeline.

On playback, the object starts playing at that point in the time Scale. Fig:TimeLinebased authoring

In most timeline based approaches, once the multimedia object has been captured in a timeline,.it is fixed in location and cannot be manipulated easily, So, a single timeline causes loss of information about the relative time lines for each individual object.

### Structured Multimedia Authoring

A structured multimedia authoring approach was presented by Hardman. It is an evolutionary approach based on structured object-level construction of complex presentations. This approach consists of two stages:

(i) The construction of the structure of a presentation.

(ii) Assignment of detailed timing constraints.

A successful structured authoring system must provide the following capabilities for navigating through the structure of presentation.

1. Ability to view the complete structure.

2.Maintain a hierarchy of objects.

3.Capability to zoom down to any specific component. 4.View specific components in part or from start to finish.

5.Provide a running status of percentage full of the designated length of the presentation. 6.Clearly show the timing relations between the various components.

7.Ability to address all multimedia types including text, image, audio, video and frame based digital images.

The author must ensure that there is a good fit within each object hierarchy level. The navigation design of authoring system should allow the author to view the overall structure while examining a specific object segment more closely.

**Programmable Authoring Systems** :Ea rly structured authoring tools were not able to allow the authors to express automatic function for handling certain routine tasks. But,

programmable authoring system bas improved in providing powerful

functions based on image processing and analysis and embedding program interpreters to use image-processing functious.

The capability of this authoring system is enhanced by Building user programmability in the authoring tool to perform the analysis and to manipulate the stream based on the analysis results and also manipulate the stream based on the analysis results. The programmability allows the following tasks through the program interpreter rather than manually. Return the time stamp of the next frame. Delete a specified movie segment. Copy or cut a specified movie segment to the clip board . Replace the current segment with clip board contents.

## Multisource Multi-user Authoring Systems

We can have an object hierarchy in a geographic plane; that is, some objects may be linked to other objects by position, while others may be independent and fixed in position".

We need object data, and information on composing it. Composing means locating it in reference to other objects in time as Well as space.

Once the object is rendered (display of multimedia object on the screen) the author can manipulate it and change its rendering information must be available at the same time for display.If there are no limits on network bandwidth and server performance, it would be possible to assemble required components on cue at the right time to be rendered.

In addition to the multi-user compositing function A multi user authoring system must provide resource allocation and scheduling of multimedia objects.

## Telephone Authoring systems

There is an application where the phone is linking into multimedia electronic mail application

1.Tele phone can be used as a reading device by providing fill text to-speech synthesis capability so that a user on the road can have electronic mail messages read out on the telephone.

2. The phone can be used for voice command input for setting up and managing voice mail messages. Digitized voice clips are captured via the phone and embedded in electronic mail messages.

3. As the capability to recognize continuous speech is deploy phones can be used to create electronic mail messages where the voice is converted to ASCII text on the fly by high-performance voice recognition engines.

Phones provide a means of using voice where the alternative of text on a screen is not available. A phone can be used to provide interactive access to electronic mail, calendar information databases, public information databass and news reports, electronic news papers and a variety of other applications. !ntegrating of all these applications in a common authoring tool requires great skill in planning.

The telephone authoring systems support different kinds of applications. Some of them are: 1.Workstation controls for phone mail.

2.Voice command controls for phone mail.

3.Embedding of phone mail in electric mail.

**Hypermedia Application Design Consideration**

The user interface must be highly intuitive to allow the user to learn the tools quickly and be able to use them effectively. In addition, the user interface should be designed to cater to the needs of both experienced and inexperienced user.

In addition to control of their desktop environments, user also need control of their system environment. This controlThe abilityshould toincludespec fysomeaprimaryofthefollowing:serverfor each object class within a domain specified by the system administrative. A domain can be viewed as a list of servers to which they have

unrestricted access.

The ability to specify whether all multimedia -objects or only references should be replicated.

The ability to specify that the multimedia object should be retrieved immediately for display versus waiting for a signal to "play" the object. This is more significant if the object must be retrieved from a remote server.

Display resolution defaults for each type of graphics or video object.

**Essential for good hypermedia design:**

1.Determining the type of hypermedia application.

2.Structuring the information.

3.Determining the navigation throughout the application.

4.Methodologies for accessing the information.

5.Designing the user interface.

**Integration of Applications**

The computer may be called upon to run a diverse set of applications, including some combination of the following:

1.Electronic mail.

2.Word processing or technical publishing.

3.Graphics and formal presentation preparation software. . 4.. Spreadsheet or some other decision support software. 5.Access to a relational on object-oriented database. 6.Customized applications directly related to job function:

* Billing * Portfolio management * Others.

Integration of these applications consists of two major themes: the appearance of the applications and the ability of the applications to exchange of data.

**Common UI and Application Integration**

Microsoft Windows has standardized the user interface for a large number of applications by providing standardization at the following levels: Overall visual look and feel of the application windows

This standardization level makes it easier for the user to interact with applications designed for the Microsoft Windows operational environment. Standardization is being provided for Object Linking and Embedding (OLE), Dynamic Data Exchange (DOE), and the Remote Procedure Call (RPC).

**Data Exchange**

The Microsoft Windows Clipboard allows exchanging data in any format. It can be used to exchange multimedia objects also. We can cut and copy a multimedia objects in one document and pasting in another. These documents can be opened under different applications.The windows clipboard allows the following formats to be stored:

.:. Text Bitrnap

.:. Image Sound

.:. Video (AVI format).

**Distributed Data Access**

If all applications required for a compound object can access the subobjects that they manipulate, then only application integration succeeds.

Fully distributed data access implies that any application at any client workstation in the enterprise-wide WAN must be able to access any data object as if it were local. The underlying data management software should provide transport mechanisms to achieve transparence for the application.

**Hypermedia Application Design**

Hypermedia applicati'ons are applications consisting of compound objects that include the multimedia objects. An authoring applicationn may use existing multimedIa objects or call upon a media editor to CD create new object.

## Structuring the Information

A good information structure should consist the following modeling primitives:

**.:.** Object types and object hierarchies.

**.:.** Object representations.

**.:.** Object connections.

**.:.** Derived connections and representations.

The goal of information Structuring is to identify the information objects and to develop an information model to define the relationships among these objects.

**Types and Object Hierarchies**

Object types are related with various attributes and representations of the objects. The nature of the information structure determines the functions that can be performed on that information set. The object hierarchy defines a contained-in relationship between objects. The manner in which this hierarchy is approached depends on whether the document is being created or played back.

Users need the ability to search for an object knowing very little about the object. Hypermedia application design should allow for such searches.

The user interface with the application depends on the design of the application, particularly the navigation options provided for the user.

**Object representations**

Multimedia objects have a variety of different object representations. A hypermedia object is a compound object, consists of s~ information elements, including data, text, image, and video

Since each of these multimedia objects may have its own sub objects, the design must consider the representation of objects.

An object representation may require controls that allow the user to alter the rendering of the object dynamically. The controls required for each object representation must be specified with the object.

**Object connection**

In the relational model, the connections are achieved through joins, and in the object oriented models, through pointers hidden inside objects. Some means of describing explicit connections is required for hypermedia design to define the relationships among objects more clearly and to help in establishing the navigation.

**Derived Connections and Representations**

Modeling of a hypermedia system should attempt to take derived objects into consideration for establishing connection guidelines.

**User Interface Design** Multi media applications contain user interface design. There are four kinds of user interface development tools. They are

1. Media editors
2. An authoring application
3. Hypermedia object creation
4. Multimedia object locator and browser

A media editor is an application responsible of the creation and editing of a specific multimedia object such as an image, voice, or Video object. Any application that allows the user to edit a multimedia object contains a media editor. Whether the object is text, ~voice, or full-motion video, the basic functions provided by the editor are the same: create, delete, cut, copy, paste, move, and merge.

**Navigation through the application**

Navigation refers to the sequence in which the application progresses and objects are created, searched and used.

Naviation can be of three modes:

(i) Direct: It is completely predefined. In this case, the user needs to know what to expect with successive navigation actions.

**Free-form mode**: In this mode~ the user determines the next sequence of actions.

**Browse mode**: In this mode, the user does not know the precise question and wnats to get general information about a particular topic. It is a very common mode in application based on large volumes of non-symbolic data. This mode allows a user to explore the databases to support the hypothesis.

## Designing user Interfaces

User Interface should be designed by structured following design guidelines as follows:

1. Planning the overall structure of the application
2. Planning the content of the application
3. Planning the interactive behavior
4. Planning the look and feel of the application

A good user interface must be efficient and intuitive by most users.

The interactive behaviour of the application determines how the User interacts with the application. A number of issues are determined at this level.

They are Data entry dialog boxes

Application designed sequence of operation depicted by graying or enabling specific menu items Context-Sensitive operation of buttons. Active icons that perform ad hoc tasks (adhoc means created for particular purpose only)

A look and feel of the application depends on a combination of the metaphor being used to simulate real-life interfaces, Windows guidelines, ease of use, and aesthetic appeal.

**Special Metaphors for Multimedia Applications**

In this section let us look at a few key multimedia user interface metaphors.

**The organizer metaphor**

One must begin to associate the concept of embedding multimedia object in the appointment diary or notepad to get obvious view of the multimedia aspe.cts of the organizer.

Other use of multimedia object in an organizer is to associate maps or voice mail directions with addresses in address books.

The lotus organizer was the first to use a screen representation of the office diary type organizer '**Telephone Metaphor**: The role of the telephone was changed b the advent of voice mail system. Voice mail servers convert the analog voice and store it in digital form. With the standards for voice ~ail file formats and digital storage of sound for computer. Now, computer system is used to manage the phone system. The two essential components of a phone system are speakers and microphones. They are included in most personal computers.

Figure 5.5 shows how a telephone can be created on a screen to make it a good user interface

The telephone keypad on the screen allows using the interface just as a telephone keypad is used. Push buttons in dialog boxes and function selections in memos duplicate the function provided by the keypad. Push buttons, radio buttons, list boxes, and data entry fields and menu selections allow a range of functionality than can be achieved by the telephone.

**Aural User Interface**: A Aural user interface allows computer systems to accept speech as direct input and provide an oral response to the user actions. Speech enabling is an important feature in this UI. To design AUI system first, we have to create an aural desk top which substitutes voice and ear for the keyboard and display and be able to mix and match them Aural cues should be able to represent icons, voice, menus and the windows of graphical user interface.

AUl design involves human perception, cagnitive science and psycho-acoutic theory. AUI systems learn systems to perform routine functions without user's feedback. An AUI must be temporal and use time based metaphors.

AUI has to address the following issues

1. Recent user memory
2. Attention span
3. Rhythms
4. Quick return to missed oral cues

The VCR metaphor: The User interface metaphor for VCR is to draw a TV on screen and provide live buttons on it for selecting channels, increasing sound volume and changing channel.

User interface for functions suchas video capture, channel play, and stored video playback is to emulate the camera, television and VCR on screen Fi5.6 shows all functions of typical video camera when it is in a video capture mode.

**Audio/Video Indexing Functions**

Index marking allowed users to mark the location on tape in the case of both audio and video to which they may wish to fast forward are rewind.

Other form of index marking is time based. In his form the tape counter shows playtime in hours, minutes, and secondsfrom the time the counter was reset.

Three paradigms for indexing audio and video tapes are

Counter identify tape locations, and the user maintains index listingSpecial events are used as index markersUsers can specify locations for index markings and the system maintains the index.Indexing is useful only if the video is stored. Unless live video is stored, indexing information is lost since the video cannot be repeated.In most systems where video is stored, the sound and video streams are decompressed and managed separately, so synchronization for playback is important. The indexing information n\must be stored on apermanent basis.

**Information Access:**

Access structure defines the way objects can be accessed and how navigation takes place through the information objects.

The common forms of navigations for information access are:

**Direct**: Direct information accessis completely predefined. User must have knowledge about the object that need to be accessed. That information includes object representations in a compound object. **Indexed:** Index access abstracts the real object from the access to the object. If the object ID of the object is an index entry that resolves to a filename on a specific server and disk partition, then the information access mechanism is an indexed mechanism. \

**Random Selection:** In this fonn, the user can pick one of several possible items. The items need not arranged in any logical sequence; and they need not to be displayed sequentially. The user need not have much knowledge about the infonnation. They must browse through the infornlation.

**Path selection or Guided tour:** In guided tour, the application guides the user through a predefined path acrosS a number of objects and operations. The user may pause to examine the objects at any stage, but the overall access is controlled by the application. Guided tours can also be used for operations such as controlling the timing for discrete media, such as slide show. It can be used for control a sound track or a video clip.

**Browsing:** It is useful when the user does not have much knowledge about the object to access it directly.

**Object Display Playback Issues**: User expects some common features apart from basic functions for authoring systems. And to provide users with same special control on the display/ playback of these objects, designer have to address some of these issues for image, audio and video objects.

**Image Display Issues Scaling**: Image scaling is performed on the fly after decompressio The image is scaled to fit in an application defined window at t:' full pixel rate for the window.The image may be scaled by using factors. For eg: for the window 3600 x 4400 pixels can be scaled by a factor of 6 x 10 ie.60 x 440 (60 times).

**Zooming**: Zooming allows the user to see more detail for a specific area of the image. Users can zoom by defining a zoom factor (eg: 2: 1,5: 1 or 10: 1). These are setup as preselected zoom values.

**Rubber banding:** This is another form of zooming. In this case, the user uses a mouse to define two comers of the rectangle. The selected area can be copied to the clipboard, cut, moved or zoomed. **Panning**: If the image window is unable to display the full image at the ·selected resolution for display. The image can be panned left to right or right to left as wellas top to bottom or bottom to top. Panning is useful for finding detail that is not visible in the full image.

**Audio Quality**: Audio files are stored in one of a number of formats, including WAVE and A VI. Playing back audio requires that the audio file server be capable of playing back data at the

rate of 480 kbytes/min uncompressed or 48 kbytes/min for compressed 8 bit sound or 96 kbytes/min for 16 bit sound.

The calculation is based on an 8 MHz sampling rate and ADCPM compression with an estimated compression ratio. 32 bit audio will need to be supported to get concert hall quality in stored audio. Audio files can be very long. A 20 minute audio clip is over 1 MB long. When played back from the server, it must be transferred completely in one burst or in a controlled manner.

**Special features for video playback**: Before seeing the features of video playback let us learn what is isochronous playback. The playback at a constant rate to ensure proper cadence (the rise and fall in pitch of a person's voice) is known as isochronous playback. But isochronous playback is more complex With video than It is for sound. .

If video consists of multiple clips of video and multiple soundtracks being retrieved from different servers and combined for playback by accurately synchronizing them, the problem becomes more complex.To achieve isochronous playback, most video storage systems

use frame interleaving concepts. Video Frame Interleaving: Frame interleaving defines the structure o;the video file in terms of the layout of sound and video components.

**Programmed Degradation**: When the client workstation is unable to keep up with the incoming data, programmed degradation occurs. Most video servers are designed to transfer data from storage to the client at constant rates. The video server reads the file from storage, separate the sound and video components, and feeds them as a seperate streams over the network to the client workstations. Unless specified by the user, the video server defaults to favoring sound and degrades video playback by dropping frames. So, sound can be heard on a constant basis. But the video loses its smooth motion and starts looking shaky. Because intermediate frames are not seen.

The user can force the ratio of sound to video degradation by changing the interleaving factor for playback; ie the video server holds back sound until the required video frames are transferred. This problem becomes more complex when multiple streams of video and audio are being played back from multiple source servers. .

**Scene change Frame Detection:** The scene we see changes every few seconds or minutes and it replaced by a new image.Even within the same scene, there may be a constant motion of some objects in a scene.

**Reason for scene change detection:** Automating scence change detection is very useful for browsing through very large video clips to find the exact frame sequence of interest. Spontaneous scene change detection provides an automatic indexing mechanism that can be very useful in browsing. A user can scan a complete video clip very rapidly if the key frame for each new scene is displayed in an iconic (poster frame) form in a slide sorter type display. The user can then click on a specific icon to see a particular scene. This saves the user a significant

amount of time and effort and reduces resource load by decompressing and displaying only the specific scene of interest rather than the entire video.

Scene change detection is of real advantage if it can be performed without decompressing the video object. Let us take a closer-look at potential techniques that can be employed for this purpose. Techniques:

**(i) Histogram Generation**: Within a scene, the histogram changes as the subject of the scene mover. For example, if a person is running and the camera pans the scene, a large part of the scene is duplicated with a little shift. But if the scene changes from a field to a room, the histogram changes quite substantially. That is, when a scene cuts over to a new scene, the histogram changes rapidly. Normal histograms require decompressing the video for the successive scenes to allow the optical flow of pixels to be plotted on a histogram. The foot that the video has tobe decompressed does help in that the user can jump from one scene to the nect. However, to show a slide sorter view requires the entire video to be decompressed. So this solution does not really of the job.

Since MPEG and JPEG encoded video uses DCT coefficients, DCT quantization analysis on uncompressed video or Audio provides the best alternatives for scene change detection without decompressing video

The efficiency can be managed by determining the frame interval for checks and by deciding on the regions within the frame that are being checked. A new cut in a scene or a scene change can be detected by concentrating on a very small portion of the frame

The scene change detection technology as is the case with video compression devices as well as devices that can process compressed video, the implementations of scene change detection can be significantly enhanced.

## Video scaling, Panning and Zooming:

**Scaling:**

Scaling is a feature since users are used in changing window sizes. When the size of the video window is changed, scaling take place.

**Panning:** Panning allows the user to move to other parts of the window. Panning is useful incombination with zooming. Only if the video is being displayed at full resolution and the video window is not capable of displaying the entire window then panning is useful. Therfore panning is useful only for video captured using very high resolution cameras.

**Zooming:**

Zooming implies that the stored number of pixels is greater than the number that can be displayed in the video window . In that case, a video scaled to show the complete image in the video window can be paused and an area selected to be shown in a higher resolution within the same video window. The video can be played again from that point either in the zoomed mode or in scaled to fit window mode.

**Three Dimensional Object Display and VR(Virtual Reality)**

Number of 3D effects are used in home entertainment a advanced systems used for specialized applications to achieve find Ine results.

Let us review the approaches in use to determine the impact 0 multimedia display system design due to these advanced systems.

**Planar Imaging Technique**: The planar imaging technique, used in computer-aided tomography (CAT Scan) systems, displays a twodimensional [20] cut of X-ray images through multidimensional data specialized display techniques try to project a 3D image constructed from the 2D data. An important design issue is the volume of data being displayed (based on the image resolution and sampling rate) and the rate at which 3D renderings need to be constructed to ensure a proper time sequence for the changes in the data.

Computed tomography has a high range of pixel density and can be used for a variety of applications. Magnetic resonance imaging, on the other hand, is not as fast, nor does it provide as high a pixel density as CT. Ultrasound is the third technique used for 3D imaging in the medical and other fields. .