

MULTIMEDIA DATA

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Objectives of the Talk

- To know the Multimedia Technology.
- To describe what is multimedia information system.
- To learn the multimedia data types.
- To discuss the multimedia data composition.
- To study on multimedia documents.



Multimedia Technology

- conveying concepts through words, pictures, and sounds
- combining audio, image, video, graphics, and text, multimedia deepens the need for efficient representation, networking, and support.
- The process of employing a variety of digital images, synchronized and perhaps embedded within one another, or within an application, to present and transmit information.
- **Image** is defined as any type of digitized information. An image may be a sound, a picture, a representation, or a section of text.



Hardware

- Laser Disc (LD)
 - first commercial optical disc storage medium, 30/60 minutes of content per side
- Compact Discs (CD)
 - 1.2 mm thick disc of polycarbonate plastic coated aluminum
 - 120mm dia (74 min audio/650 MB data) and 80mm (21 min audio/180 MB data)
- DVD (Digital Video Disc or Digital Versatile Disc)
 - for storing data, including movies with high video and sound quality
 - The disc may have one or two sides, and one or two layers of data per side; the number of sides and layers determines the disc capacity.
 - Storage capacities of DVDs range from 4.7GB (single sided) to 17.1 GB



Software

- The programs and applications that process the multimedia data on computer systems
 - operating systems that run the multimedia platforms
 - drivers that control peripherals and I/O devices
 - Applications
 - Data includes the digital images that are combined to produce multimedia applications and presentations.



Multimedia Information System

- A multimedia information system aims at integrating the various tools needed for the acquisition, management, processing and dissemination of multimedia information related to environment
- Provides to the systems designers a 'generic information system' in form of a toolbox to be used to implement their own information system.
- The variety of media types is an important feature of modern information systems. In order to deal with the variety, integration is a critical concern. Therefore,

Multimedia = Variety + Integration



Multimedia Information Systems

- Multimedia Information System (MIS) is then one which allows end-users to share, communicate and process a variety of forms of information in an integrated manner.
- MIS is attempting to solve the problems of information management by integrating the various forms of media into the computer/communications infrastructure
- Benefits of achieving this level of integration:
 - the computer can help in the task of managing and processing the information;
 - information users only have to deal with one integrated environment rather than a number of separate information systems.

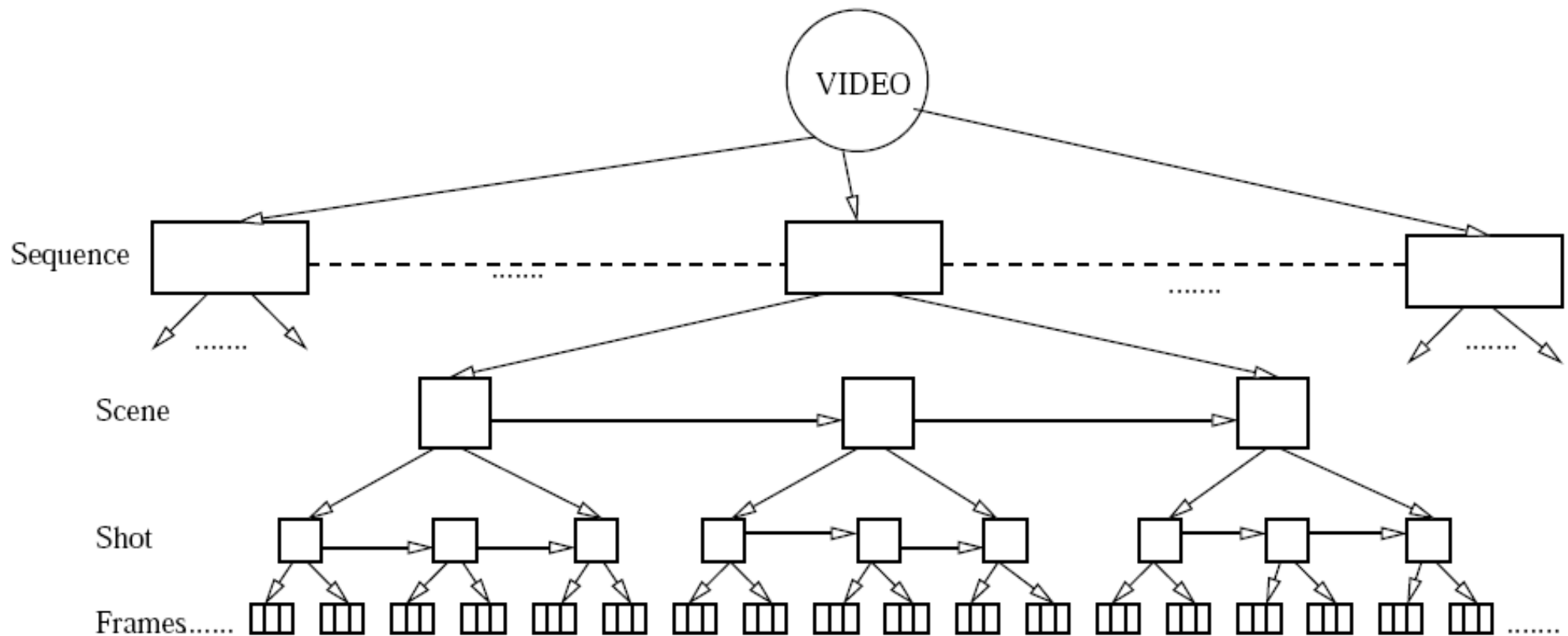


- MIS and their multimedia data types

<i>MIS</i>	<i>Media Data</i>
Office Automation Systems	Images, Text, Spreadsheets, Mail
Medical Information Systems	Video (Telephony), Images, Text
Education/Training	Audio, Video, Images, Text
Weather Information Systems	Images, Numeric Data, Text, Images
Banking Systems	Numeric Data, Text, Images
Travel Agents	Audio, Video, Images, Text
Advertising	Video, Images
Electronic Mail	Audio, Images, Text
Home Video Distribution	Audio, Video
Real Estate	Audio, Video, Images, Text
Library Information Systems	Images, Text
Tourist Information Systems	Audio, Video, Text
News-print Publication	Image, Text
Dictionaries	Image, Text
Air Traffic Control	Audio, Text, Graphics

Multimedia Data Types - Video

- Video is composed of different story units such as shots, scenes and sequences arranged according to some logical structure
- Frames recorded sequentially from a shot, one or several related shots are combined in a scene, and a series of related scenes forms a sequence.



Digital Video

- Refers to the capturing manipulation and storage of video in digital format
- The CCD (Charged-Coupled Device) cameras to capture the moving images, but they store the images in a high-quality, endlessly reproducible, easily edited, digital format.
- *pixel*: The individual picture elements, or “dots” of color, that are arranged in a two dimensional array to define a digital image or video frame
- *resolution*: The dimensions of an image, in pixels, typically expressed as the number of horizontal pixels across and the number of vertical pixels down.
- *compress(encode)*: To reduce the size of audio or video data through the use of a compression scheme. .
- *decompress(decode)*: To process a compressed bit-stream and recover the original data (if lossless compression), or an approximation of the original (if lossy compression).



Image Data

- An image is represented as a two-dimensional array of coefficients, each coefficient representing the brightness level in that point.
- The low frequency components (smooth variations) constitute the base of an image, and the high frequency components (the edges which give the detail) add upon them to refine the image, thereby giving a detailed image.
- **Digital Image Data**
- A digital image is composed of a set of pixels
- The number of pixels across a given area (described either as dots-per-inch or as the pixel dimensions of a display device) governs the resolution of an image.



Audio Data

- The term “*audio*” is synonymous with sound and is used more in TV production than in motion picture production.
- *mono*: Monophonic audio - a single channel of audio.
- *stereo*: Two-channel audio, with left and right channels.
- *narration*: A voice that explains what is happening on a video.
- *sample rate*: The rate at which samples of a continuous signal, such as music or a sound, are captured into a digital representation of the original signal.
- *Hz*: Hertz A measurement used for audio sampling rate, as in the number of audio samples per second.
- *Mic*: Microphone audio input.
- *Line level*: An analog audio connection intended for connecting interconnecting audio equipment, and without the amplification required to connect to speakers.



Audio Data

- **Digital Audio**
- Digital audio is the encoding of an audio signal as a series of symbols (or numbers) that can be processed by a computer.
- Digitization of audio data is most commonly achieved by sampling an analog signal at fixed intervals and by storing the amplitude of each sample in binary form
- A digital audio record therefore consists of a number of samples.



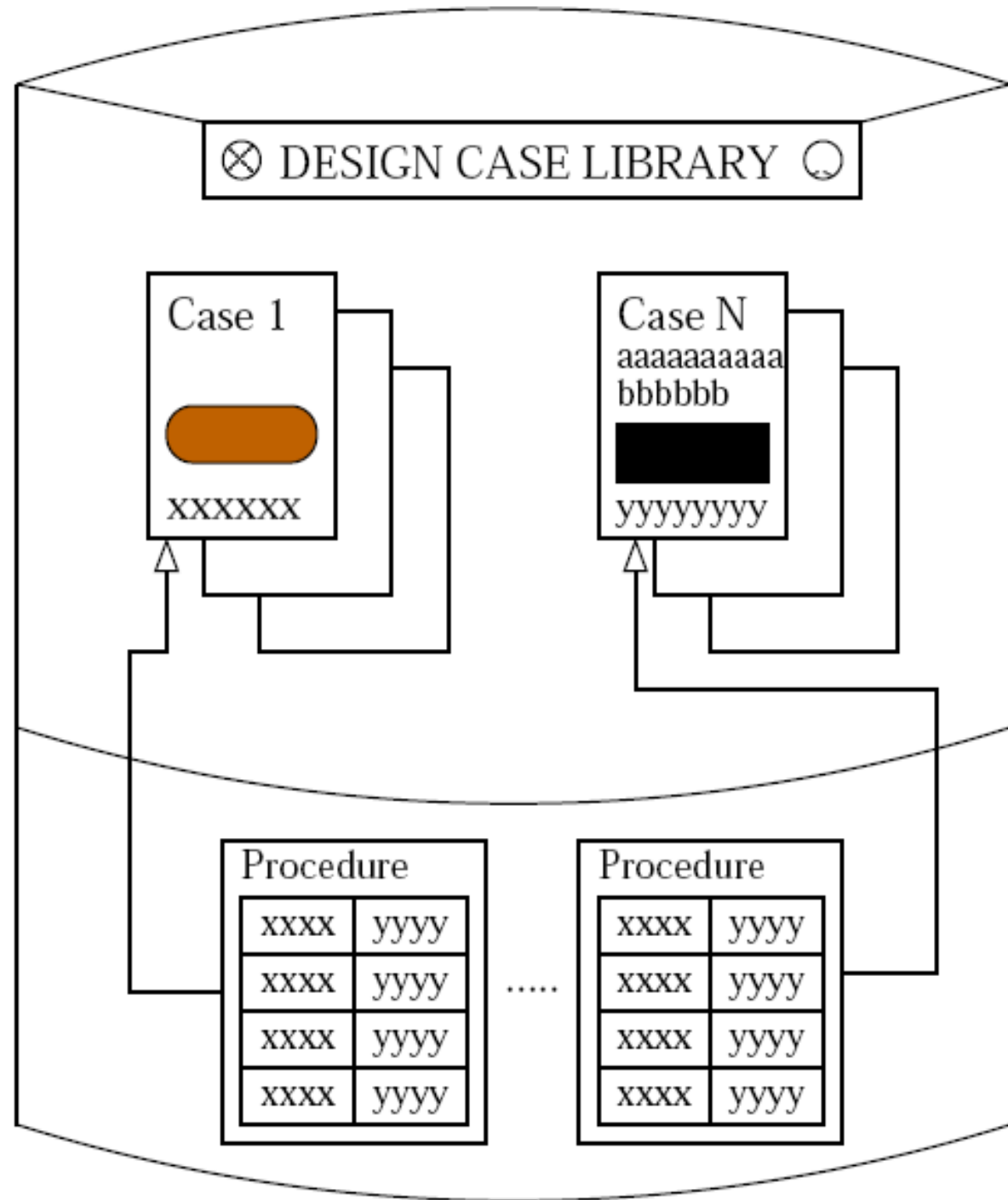
Hypertext

- Hypertext is a way of presenting information in which text, sounds, images, and actions are linked together in a way that allows you to move between them in whatever order you choose
- Hypertext usually refers to any text available on the World Wide Web(WWW) that contains links to other documents.
- Hypertext provides links among pieces of information (text, graphics or sound) that permit the user to “explore ideas and pursue ***through out in a tree*** and ***nonlinear*** fashion”.
- hypertext systems have been described as containing easier, richer, more highly featured linking of information than afforded by other types of familiar application programs available in decision support systems or reporting systems
- Hypertext has been conceptualized as existing on three levels: ***the informal, experimental, and the collaborative.***



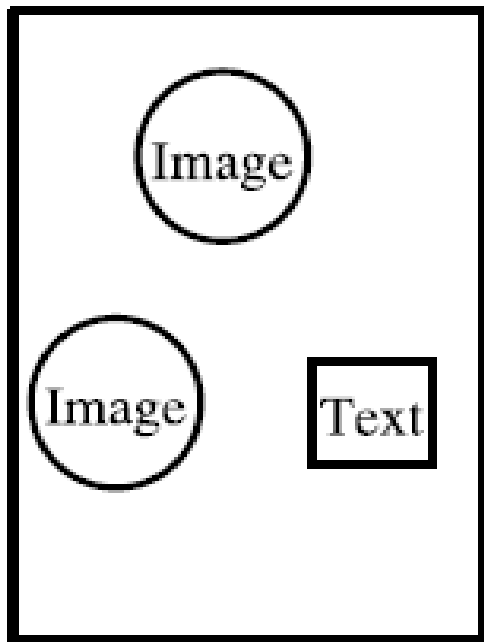
Hypertext

Hypertext
Data
Format

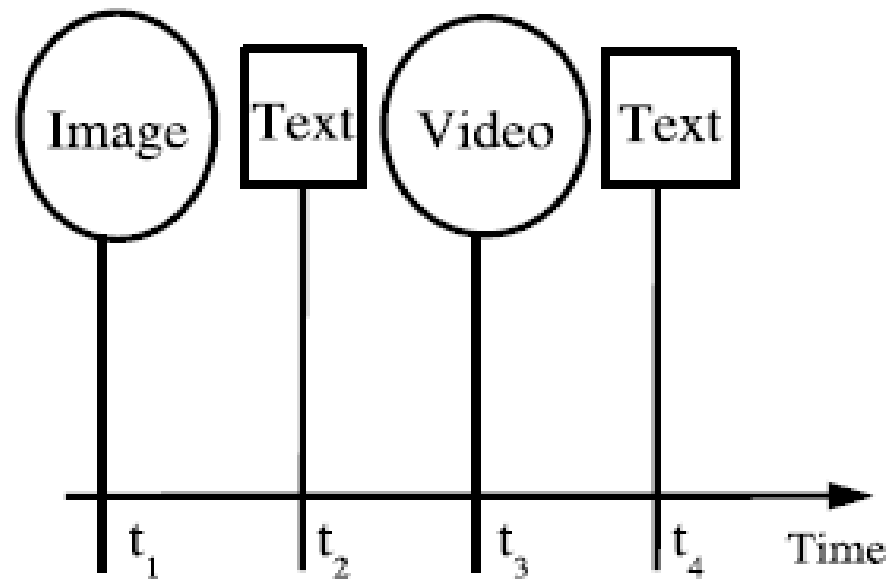


Multimedia Data Composition

- **Spatial Composition**
- Spatial composition involves assembling data based on overlaying or linking multiple data units into a single entity, as for example, the composition of textual and image information.
- **Temporal Composition**
- For temporal composition there exists a time ordering assigned to the elements of the multimedia data units.



a) Spatial composition



b) Temporal composition

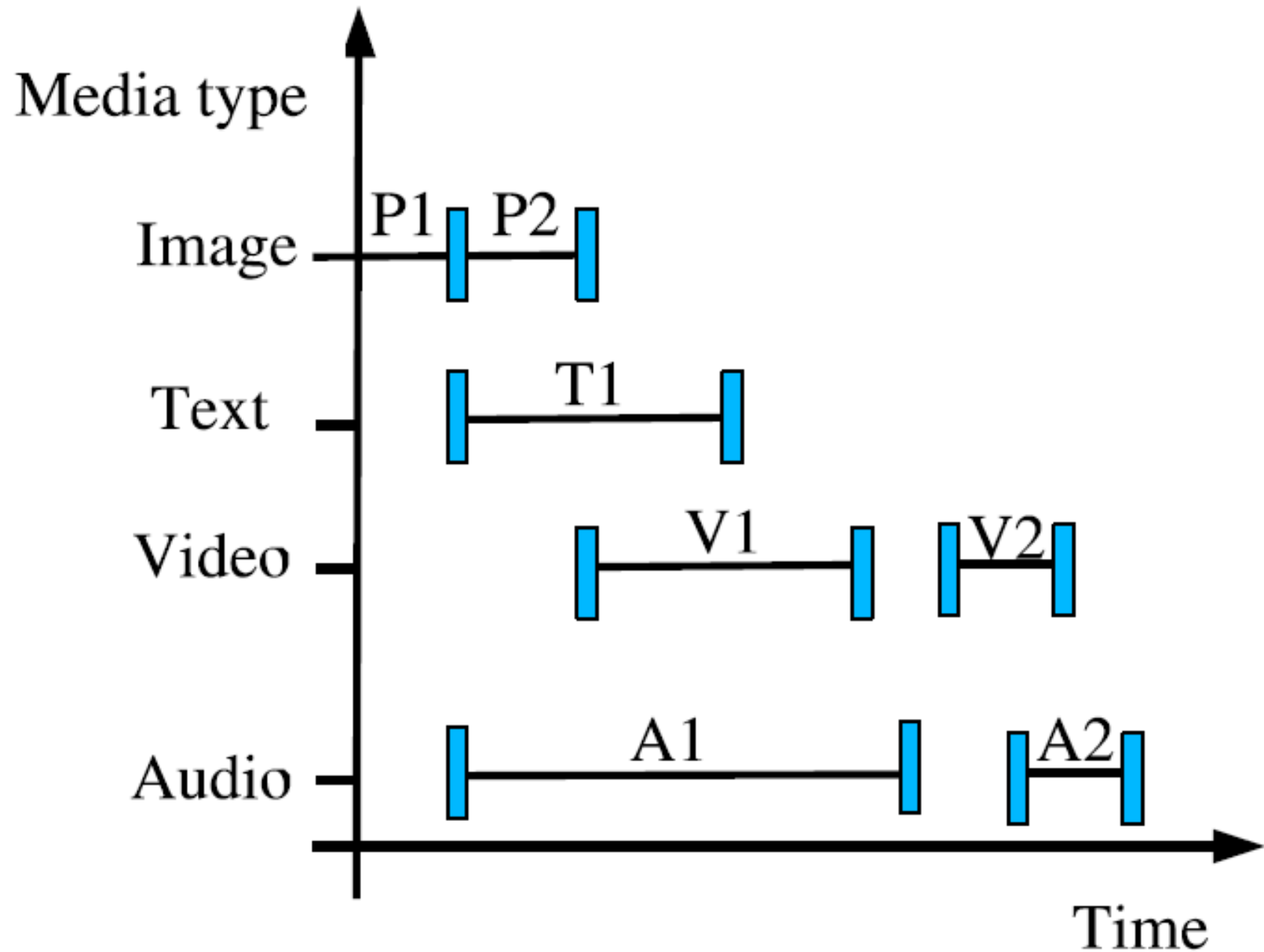
Temporal Composition

- Time can be specified in two ways: *as a point or as an interval*.
- A temporal interval is a nonzero duration of time, whereas a time instant is a zero-length time duration.
- Multimedia data units always have durations in their *playout*. As a result, the notion of temporal interval as the primitive.
- Figure gives an example of temporal relationships existing among data units in a telearchetra. This example, includes several distributed media data units involved in a scenario.
- The scenario starts with a picture P1. When P1 finishes picture P2, text T1, and audio A1 data units start simultaneously.
- After P2 finishes, video clip V1 begins. The playout of V1 overlaps with that text T1 and V1 occurs during A1 playout.
- When A1 finishes, another video clip, V2, starts, followed by audio data unit A2.

Continuous and Synthetic Temporal Compositions



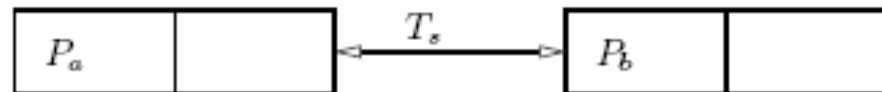
Temporal Composition



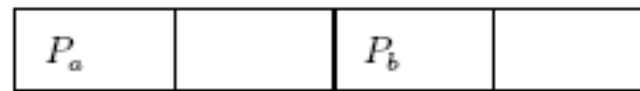
An example of temporal relations in Multimedia Scenario

Type of Temporal Relations among multimedia data units

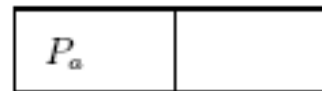
P_a before P_b



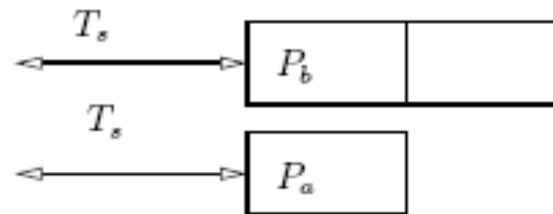
P_a meets P_b



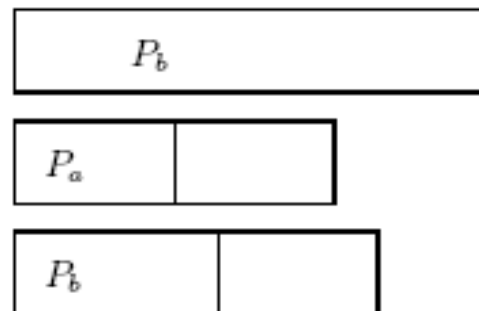
P_a overlaps P_b



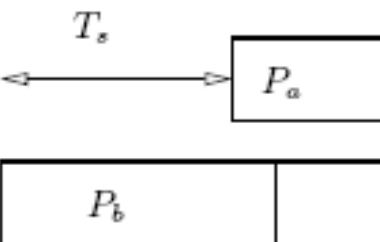
P_a during P_b



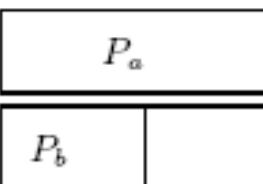
P_a starts P_b



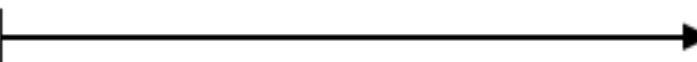
P_a finishes P_b



P_a equals P_b

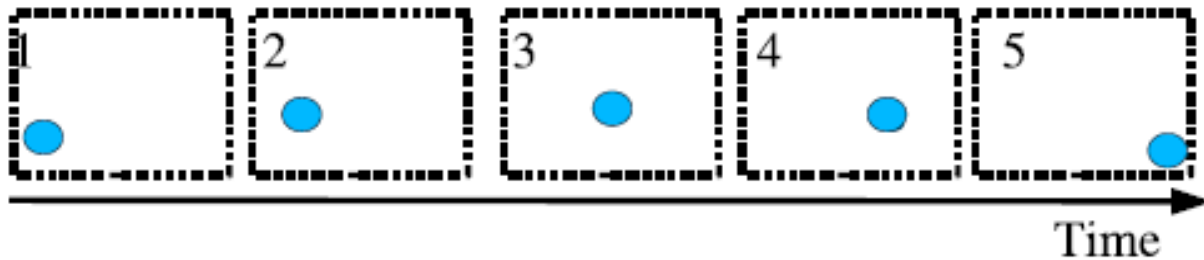


Time

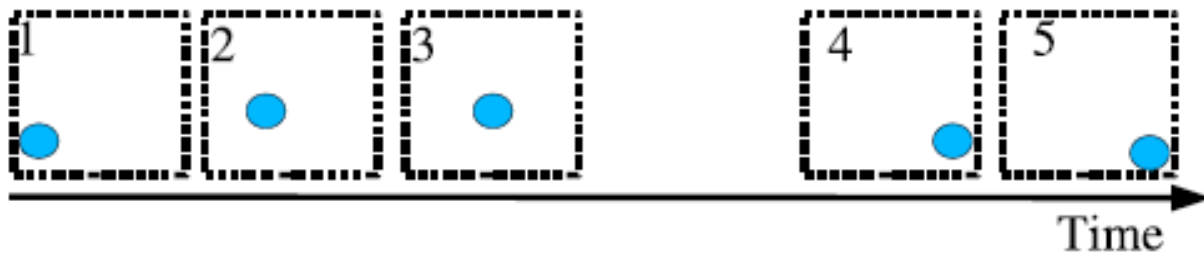


Real-Time Multimedia Data

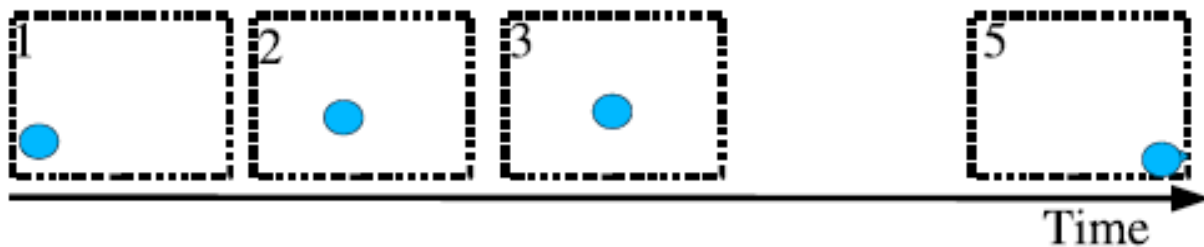
- Real-time data are defined as data available in real time



a) 5 frames in sequence of video stream



b) Inter-frame temporal spacing changed



c) Loss of data (frame 4)

An example
of real time
multimedia
data

Multimedia Document

- Integrated, homogeneous way to describe, organize, and structure multimedia information units, and to represent their temporal relationships in a single entity
- A multimedia document is a structured collection of attributes, text, image, video, and audio data
- Multimedia document storage and retrieval should be possible through the structure, attributes, and media content of the document

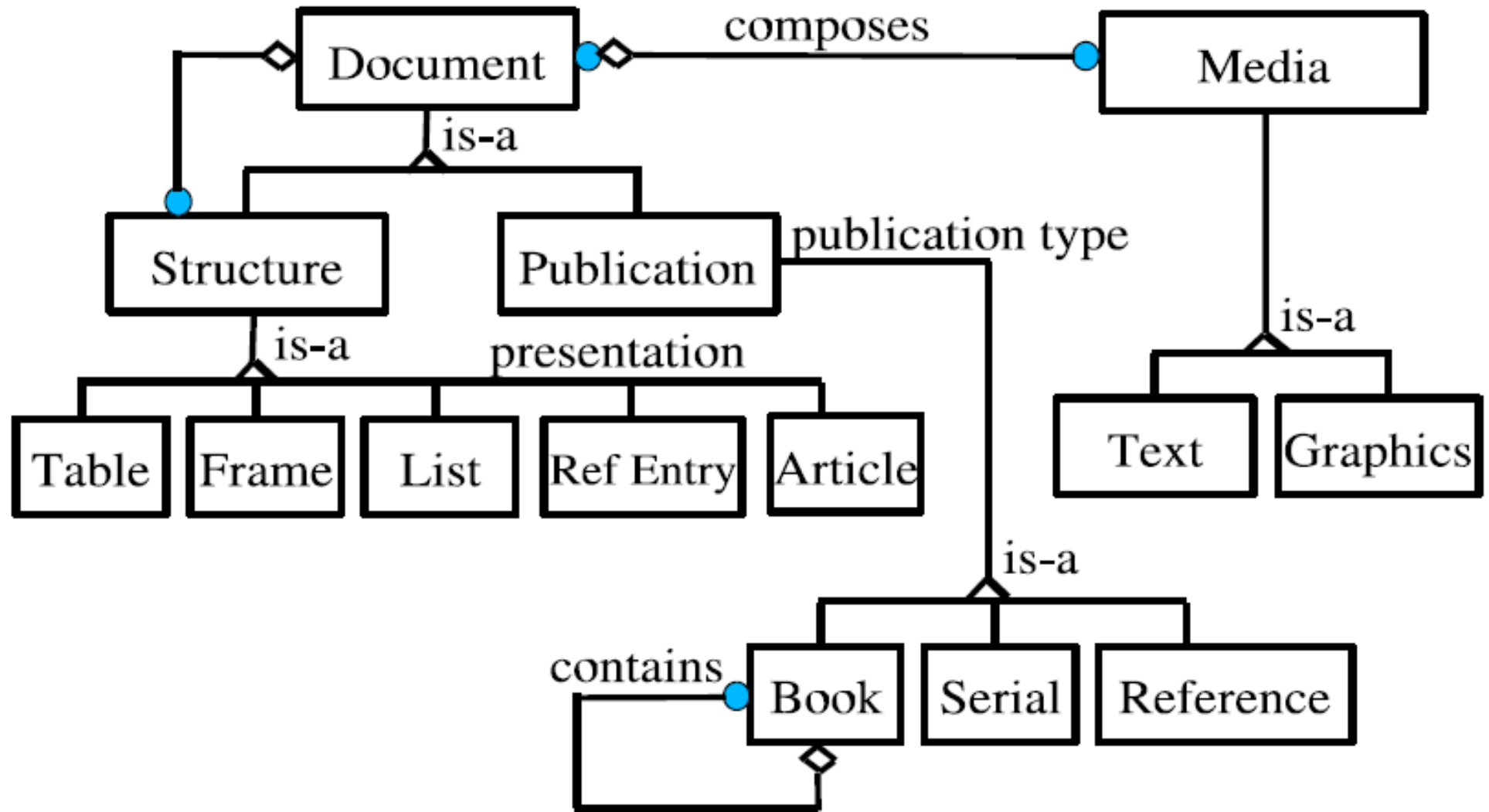


Structuring Multimedia Document

- Text documents communicates information, typically on a plane surface (a terminal or a paper).l
- A multimedia document representation can be divided into two areas, one focusing on passive documents, the other on active documents. In passive multimedia documents, the author integrates continuous media simply by representing them in a static visual form, later activated by the user.
- A multimedia document is viewed in three dimensions: ***structure***, ***media*** and ***presentation***.
- In the structure view the document is broken up into building blocks, such as volumes, parts, chapters, sections, and paragraphs.



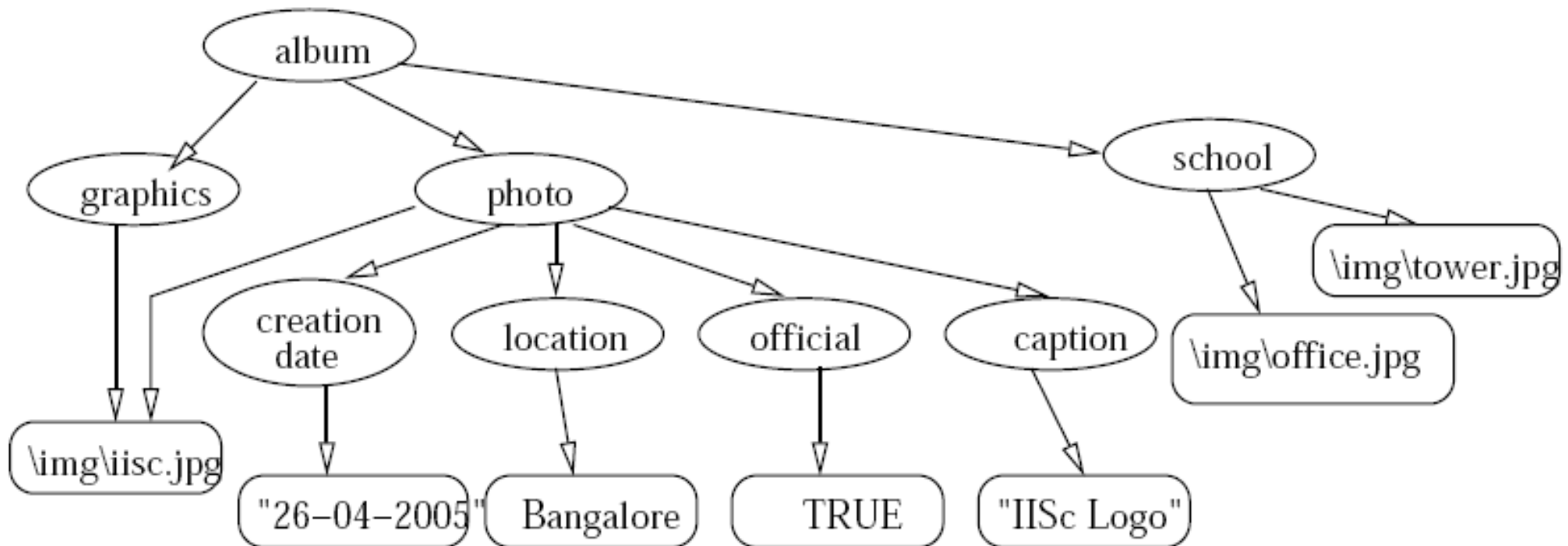
Structuring Multimedia Document



Multimedia Document Model

An Object Oriented Multimedia Document

- An **Object** is composed of an identity, a value, and a set of methods
- Objects refer to each other by their **identifiers**, and this allows object sharing.
- Data contained in the object is the **value** of the object, and the definition of the structure of this value is called the **type**.
- The behavior of the data or value is described by a set of **methods**.
- Methods are program modules. Any interaction with the data occurs



Multimedia Object Types

- Objects can be classified in terms of their presentation and application lifetimes.
- **Persistent object:** A persistent object is one that can exist for the duration of the application in a persistent store such as a database.
- **Non persistent:** A “*non-persistent*” object is created dynamically and discarded when obsolete.
- For presentation a “**transient**” object is defined as a object that is presented for a short duration without manipulation.
- The display of a series of audio or video frames represent transient presentation of objects, whether created dynamically or retrieved from a database.
- Objects are “**static**” during presentation if they exist for an extended period for their possible manipulation. A still image is an example of a static object.

