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Multimedia Elements Representation- A Survey

[1]K.Anitha, [2]C.Satheesh Kumar and [3]A.R.Vithya,
[1,2,3]Scholar, Information Technology Department,
Sri Krishna Arts and Science College, Coimbatore, TamilNadu, India

Abstract: Multimedia is content that uses a combination of different content forms such as text, audio, images, animation, video and interactive content. Multimedia devices are electronic media devices used to store and experience multimedia content. Multimedia is distinguished from mixed media in fine art; by including audio. Multimedia can be recorded and played, displayed, dynamic, interacted with or accessed by information content processing devices, such as computerized and electornic devices. Through this paper we have represented how the media are get transferred through the electronic devices.

Keywords: *Media, Text, Analog Signal, Digital Signal, Video, Audio, Images.*

I. INTRODUCTION

All types of multimedia informations are stored and processed within a computer in a digital form.in the case of textual information consisting of strings of characters entered with a keyboard by a unique combination of a fixed number of bits known as the codeword. Similarly, computer-generated graphical images are made up of a mix of lines,circles, squares and so on, each represented in a digital form.

A. Digitization principles

A signal whose amplitude varies continuously with time is known as an analog signal. Techniques involved in analog-to-digital conversion include sampling and quantization. The range of frequencies of the sinusoidal components that make up a signal is called the signal bandwidth. Any signal transmitted over a channel must have a signal bandwidth less than the channel bandwidth [5].

Nyquist sampling theorem: The amplitude of a signal must be sampled at a minimum rate that is equal to or greater than twice the bandwidth of the signal.

B. Analog Signals

An analog signal is a continuous wave denoted by a sine wave and may vary in signal strength (amplitude) or frequency (time). The sine wave's amplitude value can be seen as the higher and lower points of the wave, while the frequency (time) value is measured in the sine wave's physical length from left to right. An example for analog is the sound from human voice, because sound waves are continuous, as is our own vision, because we see various shapes and colors in a continuous manner due to light waves [5].

C. Encoder Design

Encoder consists of two main circuits: a band limiting filter and an analog-to-digital converter (ADC), the latter comprising of sample-and-hold and a quantizer. There is also a typical waveform set for a signal encoder. The output of the band limiting filter is fed to the sample-and-hold circuit which, as its name implies, is used to sample the amplitude of the filtered signal at regular time intervals and to hold the sample amplitude constant between samples. This, in turn, is fed to the quantizer circuit which converts each sample amplitude into a binary value known ascodeword [5].

D. Decoder Design

Analog signals are stored, processed and transmitted in a digital form, normally, prior to their output, they must be converted back again into their analog form. This conversion can be made using the decoder which converts the digital to analog form.[6]

II. DATA REPRESENTATION

Text, audio, image, video are the data which are get used in multimedia. Their brief representation is given as:

A. Audio Representation

There are two types of audio signal: speech and music-quality audio.

Table 1: Summary of Characteristics

	Speech	Music
Typical bandwidth	50Hz-10kHz	15Hz-20kHz
Sampling rate	20kHz	40kHz
Bits per sample	12	16
No. of channels	Usually mono	Usually stereo

Audio can be produced either naturally by means of a microphone or electronically using some form of synthesizer. Output of all digitized audio signals the stream of digitized values must be converted back into its analog form as loudspeakers operate using an analog signal.[2]

1. PCM Speech

Initially, the PSTN operated with analog signals throughout, the source speech signal being transmitted and switched unchanged in its original analog form. However, the older analog transmission circuits were replaced by digital circuits. The bandwidth of a speech circuit in this network was limited to 200Hz through to 3.4 kHz. and also, the Nyquist rate is 6.8 kHz, the poor quality of the bandlimiting filters used meant that a sampling rate of 8 kHz was required to avoid aliasing. More modern systems have moved to using 8 bits per sample in each case, giving a much improved performance over early 7 bit systems. The digitization procedure is known as pulse code modulation or PCM.[2]

2. CD-quality Audio

The disk used in CD players and CD-ROMs re digital storage devices for stereophonic music and more general multimedia information streams. There is a standard associated with these devices which is known as the CD-digital audio (CD-DA) standard. As indicated, music has an audible bandwidth of from 15 Hz through to 20 kHz and hence the minimum sampling rate is 40 ksps. The recording of stereophonic music requires two separate channels and hence the total bit rate required is double that for mono. Hence,

Bit rate per channel = sampling rate * bits per sample

$= 44.1 \times 10^3 \times 16 = 705.6$ kbps

Total bit rate $= 2 \times 705.6 = 1.411$Mbps

B. Image Representation

1. Image features

A digital image is an array of pixels, where each pixel has a color. The basicrepresentation for the color of the pixel is the triple R(ed), G(reen), B(lue). Thereare however many other color spaces which are more appropriate in certain tasks.We consider HSV and Lab.

2. Image Representation: Spectrum

It defines the purity of a color distinguishing for example signal-red frompink. Finally, the V(olume) is a measure for the brightness or intensity of the color.This make the difference between a dark and a light color if they have the same Hand S values.

Lab is another color space that is used often. The L is similar to the V in HSV.The a and b are similar to H and V. The important difference is that in the Labspace the distance between colors in the color space is approximately equal to theperceived difference in the colors.[1]

3. Image Segmentation

For images we can also consider the different ways of segmenting an image. A partition decomposes the image into fixed regions. Commonly this is either a fixed set of rectangles, or one fixed rectangle in the middle of the image, and a further partition of the remaining space in a fixed number of equal parts. Weak segmentation boils down to grouping pixels in the image based on a homogeneity criterion on color or texture, or by connecting edges. For strong segmentation, finding specific conceptual objects in the image, we again have to rely on models for each specific object, or a large set of hand-annotated examples [1].

C. Video Representation

1. Video Features

As a video is a set of temporally ordered images its representation clearly shares many of the representations considered above for images. However, the addition of a time component also adds many new aspects. In particular we can consider the observed movement of each pixel from one frame to another called the optic flow, or we can consider the motion of individual objects segmented from the video data [1].

2. Video Segmentation

A partition of an image can be any combination of a temporal and spatial partition. For weak segmentation we have, in addition to color and texture based grouping of pixels, motion based grouping which groups pixels if the have the same optic flow i.e. move in the same direction with the same speed. Strong segmentation requires again object models. The result of either weak or strong segmentation is called a spatio-temporal object. For video there is one special case of weak segmentation which is temporal segmentation. Thus, the points in time are detected where there is a significant change in the content of the frame. This will be considered in a more elaborate form later [4].

3. Spatio-Temporal relations

Spatio-temporal relations are clearly a combination of spatial and temporal relations. One should note, however, that in a video spatial relations between two objects can vary over time. Two objects A and B can be in the relation A left-of B at some point in time, while the movement of A and B can yield the relation B left-of A at a later point in time.[4]

D. Text Representation

Essentially, there are three types of text that are used to produce pages of documents:

Unformatted text: This is alsoknown as plaintext and enables pages to be created which comprise strings of fixed-sized characters from a limited character set[3].

Formatted text: This is also known as richtext and enables pages and complete documents to be created which comprise of strings of characters of different styles, size, and shape with tables, graphics, and images inserted at appropriate points.

Hypertext: This enables an integrated set of documents to be created which have defined linkages between them[3].

III. MULTIMEDIA INDEXING TOOL

For browsing, searching, and manipulating video documents, an index describing the video content is required. It forms the crux for applications like digital libraries storing multimedia data, or filtering systems(95) which automatically identify relevant video documents based on a user profile. To cater for these diverse applications, the indexes should be rich and as complete as possible [7].

Multimedia indexing is a very active field of research, despite most works using only a single medium. This is mainly due to the fact that while they may be correlated, media are not strongly synchronized. Segment models appear to be a good candidate to manage such a desynchronization.

IV. INFORMATION VISUALIZATION

When a lot of information is stored in the database it is important for a user to be able to visualize the information. Scheidermann1 makes this more precise and defines the purpose of information visualization as:

• Provide a compact graphical presentation AND user interface for manipulating large numbers of items (102 - 106), possibly extracted from far larger datasets.

• Enables users to make discoveries, decisions, or explanations about patterns (trend, cluster, gap, outlier...), groups of items, or individual items.

To do so a number of basic tasks are defined:

- **Overview:** Gain an overview of the entire collection
- **Zoom:** Zoom in on items of interest
- **Filter :** Filter out uninteresting items
- **Details-on-demand:** Select an item or group and get details when needed
- **Relate:** View relationships among items

And to support the overall process we need:

- **History:** Keep a history of actions to support undo, replay, and progressive refinement
- **Extract:** Allow extraction of sub-collections and of the query parameters

For each of these items we will also have computed features and the similarity between different multimedia items. To be able to understand and explore the datasets we need to visualize the data as well as the features and the similarity in such a way that the user gets sufficient insight to make decisions.

The data may have an inherent structure e.g. as the corresponding ontology is organized as a hierarchical tree, or the different items have been grouped into different clusters. For structure the following three basic types are defined:

- **Temporal structures:** data with a temporal ordering e.g. elements related to a timeline.
- **Tree structures:** data with a hierarchical structure.
- **Network structures:** data with a graph-like structure e.g. a network where the nodes are formed by the multimedia items and where the weighted edges are labelled with the similarity between the items.[7]

CONCLUSION

Hence multimedia is one of the most essential factor in this technology world. Through multimedia we can be able to transfer any kind of media files.Multimedia Learning Theory gives educators and instructional designers an important weapon to draw upon as they develop digital contents.

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