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A Brief Study on Multimedia Database and its Issues

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Abstract: Multimedia is the most popular and widely used culture around the globe. It can be known as storage and retrieval of data. This paper gives the general introduction of multimedia database and types of queries used to retrieve the data from database. Some of the components and architecture of multimedia database is being discussed. In today's world not only personal data but professional data is digitized. Data and results of experiments are stored in digitized form which make backup copies and provide access to other professionals easier. As the number of stored files increases the problem of how to manage them emerges. This paper introduces basic concepts of multimedia database.

Keywords: Data, Multimedia Database, QBIC (Query based by image context).

I. INTRODUCTION

In this era of computers, multimedia has emerged into our day to day life. Multimedia data typically means digital images, audio, video, animation and graphics together with data. Today due to the wide spread of computers and technological advancements resulted in high resolution devices (scanners, printers etc) which can capture and display multimedia data. In today's world not only personal data but professional data is digitized. Data and results of experiments are stored in digitized form which make backup copies and provide access to other professionals easier. As the number of stored files increases the problem of how to manage them emerges [2], [4], [5], [7]. The basic concentration is on how to retrieve the stored data images effectively in less time as compared to other ways of retrieval. The ultimate objective is how to access multimedia data effectively. With respect to access multimedia data can be classified into active objects i.e. those objects which participate in retrieval process and passive objects i.e. those objects which do not participate in retrieval process. In order to retrieve data from database system queries are needed. The queries in database are of two types:

1) Well defined queries: The type of query in which user must know what they are intended to search.

2) Fuzzy queries: where properties of query objects are ambiguous. Therefore these queries are sub divided into:

a) semantic query in which indexing and pattern matching techniques are used.

b) keyword and image based queries: These are the simplest type of visual queries used in QBIC (query based by image context) through icon leading to content search in domain of image.

A. Components of a Multimedia System:

The Hardware and Software Components required for a multimedia system are:

(a) **Capture a device which has** a wide variety of range including Video Camera, Video Recorder, Audio Microphone, Keyboards, mice, graphics tablets, 3D input devices, tactile sensors, VR devices. Digitizing Hardware etc.

(b) **Storage Devices** such as Hard disks, CD-ROMs, DVD-ROM, etc.

(c) **Communication Networks** includes Local Networks, Intranets, Internet, Multimedia or other special high speed networks.

(d) **Computer Systems** like Multimedia Desktop machines, Workstations, MPEG/VIDEO/DSP Hardware etc.

(e) **Display Devices** like CD-quality speakers, HDTV, SVGA, Hi-Resolution monitors, Color printers etc.

II. CHALLENGES FOR MULTIMEDIA SYSTEMS

In multimedia networking, one can expect at least one of the three major difficulties

(a) Compared with traditional textual applications; multimedia applications usually require much higher bandwidth. A typical piece of 25-second 320x240 QuickTime movie could take 2.3MB, which is equivalent to about 1000 screens of textual data.

(b) Most multimedia applications require the real-time traffic. Audio and video data must be played back continuously at the rate they are sampled. If the data does not arrive in time, the playing back process will stop and human ears and eyes can easily pick up the artifact. In addition to the delay, network congestion also has more serious effects on real-time traffic.

(c) Multimedia data stream is usually busty. Just increasing the bandwidth will not solve the business problem. For most multimedia applications, the receiver has a limited buffer. If no measure is taken to smooth the data stream, it may overflow or underflow the application buffer. When data arrives too fast, the buffer will overflow and some data packets will be lost, resulting in poor quality. When data arrives too slowly, the buffer will underflow and the application will starve.

(d) Synchronization and inter-media scheduling is very necessary e.g. in Video and Audio applications Lip synchronization is clearly important for humans to watch playback of video and audio and even animation and audio.

(e) Sequencing within the media playing frames in correct order or time frame in video.

(f) Distributed Networks, Temporal relationship between data and Render different data at same time continuously are some other challenges of multimedia.

III. GENERIC ARCHITECTURE OF MULTIMEDIA DATABASE

Multimedia Databases require all the basic attributes of a database management system such as a transaction manager, query optimizer, recovery manager etc. as well as special storage structures and specialized search and querying modules [16]. An overview of architecture of a Multimedia Database application is shown in Figure 1 below:

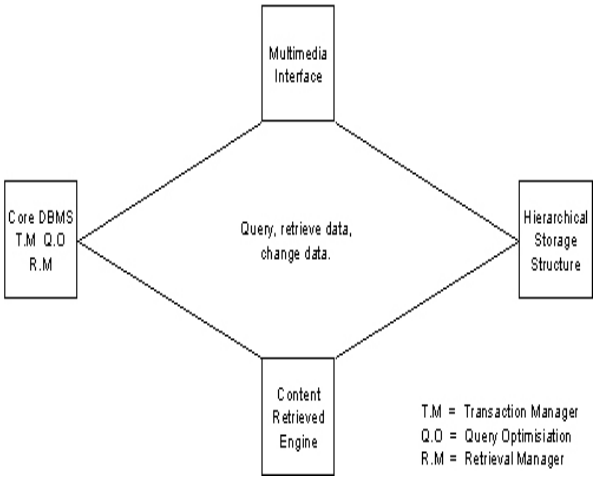

Figure1 An overview of Multimedia Database architecture

Since existing relational and OO (Object Oriented) databases comprise the basic requirements of any database, it is natural that many multimedia and imaging DB (Data Base) applications are constructed within such existing systems. In order to support such applications, many DBMS (Data Base Management Systems) vendors offer facilities suitable for MM (Multimedia). These include: long bit and byte strings, Content retrieval capabilities. In conventional relational and OODBs (Object Oriented Data Bases) querying is based on the attributes of objects. However, information retrieval and document imaging systems require searching the content of documents. This ability can be generalized to still images, audio and video.

A. Hierarchical Storage Management

It has already been pointed out that MM (Multi Media) objects can require a lot of memory for storage. It will also be necessary to have an appropriate storage mechanism so that the system can keep track of objects that are swapped between near-line and on-line and inform the user when an object is stored off-line. In order to do this, the preferred mechanism is that of hierarchical storage management shown in Figure.2 below. This is based on the idea of managing a hierarchy of on-line, near-line and off-line storage media. Each of these levels explained below have a particular performance, capacity and cost.

***RAM* -** Best performance, smallest capacity, highest cost, little permanence.

***Hard-Drive* -** good performance, reasonable capacity, fairly high cost, some online storage capabilities.

***Optical Storage* -** On-line with a drive or near-line with a jukebox. Acceptable performance when on-line but slow when near-line. High capacity, reasonable cost (less than preceding levels). Can be used for archiving which is permanent e.g. WORM devices, CD-ROM and recordable compact discs.

***Optical Media Stored off Line* -** Stored in Cabinets, on shelves etc. Unlimited capacity, very cheap, lasts much longer than magnetic media and therefore good for archiving. Poor performance in the sense that the user has to take the discs off the shelf and put them in the drive!

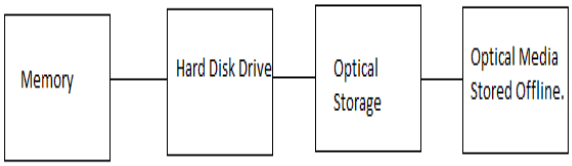

Figure.2 Hierarchical Storage Management

Keeping in view the nature and demands of media, a generic framework for multimedia database system had been proposed in Figure 3 in which solid lines represent media submission and dashed lines represent media search. Some of the key modules of the system are explained below:

(a) ***Feature Extractor:*** The main job of this module is to extract all possible features from a media file i.e. images, audio, video or text. It consists of number of different components. These components are special kind of filters that are applied on a media and can generate the corresponding features. The module is flexible in nature and can adapt to any new filter that is available. The media undergoes all of the filters one by one and generates a complete set of extracted features.

(b) ***Semantics Libraries:*** This module contains a number of classes that describe different features. Each class can have sub classes within it. This module is also flexible and new classes/sub classes can be added. Features in each class can be compared with the extracted features in order to classify a media. These classes can be of different type such as Buildings, Humans, and Animals etc. Taking an example of Building Class, there can be a number of sub classes such as Houses, Hotels, Offices, and Universities etc[13]. Furthermore a House Subclass can have another set of sub classes such as Bungalows, Villas, and Two Stories Houses etc.

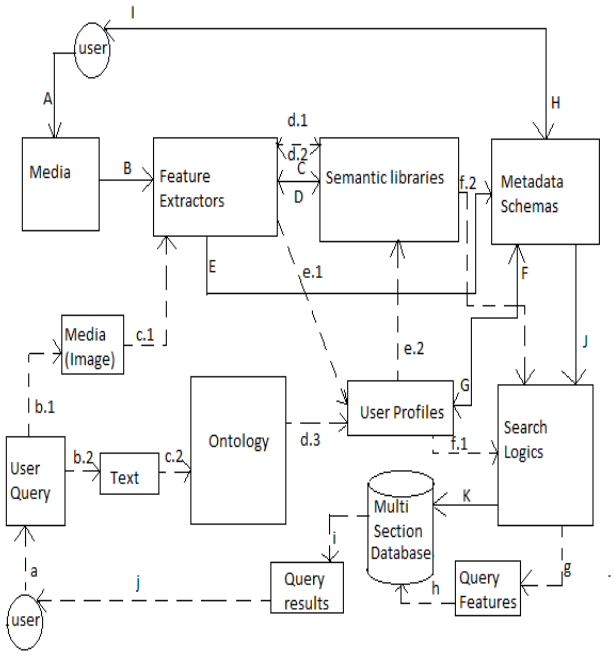

Figure 3. Complete Architecture

(c) ***Metadata Schemas:*** There are number of different Media Metadata Standards available but any one standard cannot be applied to all types of media. For example IEEE LOM Standards are used for multimedia files that are for Education purposes, where as MPEG 7 are used for Motion Pictures such as videos. Therefore to make the system as generic as possible, there can be more than one metadata standards. This module contains such Metadata Standards that are used to collect the metadata of a media. The process of gathering metadata is semiautomatic, where the user only needs to specify as few as possible i.e. with the help of "User Profiles".

(d) ***Ontology:*** Ontology contains a description of the learning concepts that will add meaning to it. It is a kind of a dictionary that contains knowledge representations that are very similar to "Libraries" in structure. Thus it consists of different classes that are used to expand the query keyword within a specific domain or class. The module is adaptable to new classes as well.

(e) ***User Profiles:*** The user needs to define profiles that can interact with the system. The definition of a profile is a context in order to specify a domain and some basic data about the user. A user can specify more than one profile according to his need. These profiles play key roles in the collection of metadata and by making a query more related to what is required.

(f) ***Search Logics:*** Search Logics is a kind of a search engine with all the possible components that are required for efficient search and retrieval of a media file. These components include indexing, hashing and ranking etc.

(g) ***Multi Section Database:*** This database contains files that have three different sections. The first section contains the media file reference, second has the metadata extracted using profiles and given by the user according to standards applied and the last section has the content metadata extracted automatically using Feature Extractor.

IV. MULTIMEDIA APPLICATION

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. Some of multimedia Applications are:

(a) **Education:** In education, multimedia can be used as a source of information. Students can search encyclopedias such as *Encarta*, which provide facts on a variety of different topics using multimedia presentations. Teachers can use multimedia presentations to make lessons more interesting by using animations to highlight or demonstrate key points. A multimedia presentation can also make it easier for pupils to read text rather than trying to read a teacher's writing on the board. Programs which show pictures and text whilst children are reading a story can help them learn to read; these too are a form of multimedia presentation.

(b) **Business:** Multimedia is used for advertising and selling products on the Internet. Some businesses use multimedia for training where CD-ROMs or online tutorials allow staff to learn at their own speed, and at a suitable time to the staff and the company. Another benefit is that this form of training saves the company money, as they do not have to pay the additional expenses of an employee attending a course away from the workplace.

(c) **Leisure:** People use the Internet for a wide range of reasons, including shopping and finding out about their hobbies. The Internet has many multimedia elements embedded in web pages and web browsers support a variety of multimedia formats. Many computer games use sound tracks, 3D graphics and video clips.

(d) **Journalism:** The requirement of multimedia is in the field of journalism and to be updated with the news the news channels have to constantly be in the field. The live reporting from the field and piece to camera is possible due to multimedia only. In print journalism as well there is a requirement of multimedia i.e. in a newspaper it's not only the text that we can see. It also contains Pictures, Advertisements; Graphs etc. and all these are possible with the help of Multimedia. e) **Home shopping**: With the help of softwares build in multimedia, by just clicking on the image one can order the product she wants.

(e) **Computer Games**: The local games industry also employs around 800 people, houses more than 20 games development studios, animation houses and games industry service providers, and offers a lower cost of game production.

(f) **Entertainment:** Virtual reality, Digital video editing and production systems. Video conferencing, Video-on-demand, Interactive TV etc are some sources of entertainment.

(g) **World Wide Web** is the most widely used application of Multimedia.

(h) **Multimedia Authoring**: e.g. Adobe/Macromedia Director, Hypermedia courseware,

V. CONCLUSION

This paper gives the general introduction of multimedia database, and types of queries used to retrieve the data from database. Some of the components and architecture of multimedia database being discussed. There occur a lot of challenges while designing, maintaining and retrieving data from multimedia database. Multimedia has emerged in every field so its applications are also being discussed. Compared with traditional textual applications, multimedia applications usually require much higher bandwidth. Just increasing the bandwidth will not solve the business application problem. For most multimedia applications, the receiver has a limited buffer. If no measure is taken to smooth the data stream, it may overflow or underflow the application buffer. When data arrives too fast, the buffer will overflow and some data packets will be lost, resulting in poor quality. When data arrives too slow, the buffer will underflow and the application will starve. This paper also devices the type of query named keyword and image based queries which are simple types of visual queries used in QBIC(query based by image context) through icon leading to content search in domain of image to retrieve data from database in future.

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