A Comparative Study of Audio and Video Query Retrieval Approaches in Multimedia Databases

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Abstract: The tremendous increase in the use of internet has lead towards the need of systems that support wide variety of media. As a result of this requirement for large type of media has given rise to many challenges in the storage, retrieval and presentation of such large amount of data. Along with these challenges, the size of data also goes on increasing, it becomes more and more complex and thus increasing the maintenance overhead. In this paper, we present a comparative study of the existing Query Retrieval techniques in Multimedia Databases. We analyze briefly the Content based retrieval approach , as well as propose a brief comparison of this technique with the other two retrieval techniques namely Semantic based retrieval and Keyword based retrieval, focusing mainly on audio and video data. This analysis will therefore conclude the better approach towards multimedia data retrieval.

Keywords: - Query Optimization techniques, Semantic based retrieval, Multimedia Database, Content based retrieval , Keyword based retrieval.

I. INTRODUCTION

With the advancements in the use of internet from last decade, the demand for multimedia database has grown exponentially. There is a need for databases that support large collections of images, videos, audios texts etc.[17].The access to the data in the databases is now no longer limited to query in the form of keywords but can also be achieved using content viz attributes and features of the object or using semantics viz similar object like the one to be searched.

Multimedia Database are considered to be the system that has a large volume of objects that are indexed, searched, modified, retrieved [11].Multi-media retrieval depends highly on the type of data. They are broadly categorized as Continuous data and Discrete data. Continuous data is time dependent for example audio or video data, whereas Discrete data is time independent for example text, still images and graphics [9].

Query processing in traditional database is rather simple as compared to the multimedia database. The search criteria in traditional database is very accurate and the retrieval is very simple process as in ;the user requests the data to the database and receives the result in the form of table. On the other hand, the query processing in the multimedia database is a bit complex containing various phases. Figure 1 describes these phases in brief [5][17]. The second phase namely query processing consist of intermediate steps like Complilation, Optimization and Execution of the query.In this paper ,we focus on Query Optimization Techniques and later comparision of the techniques.
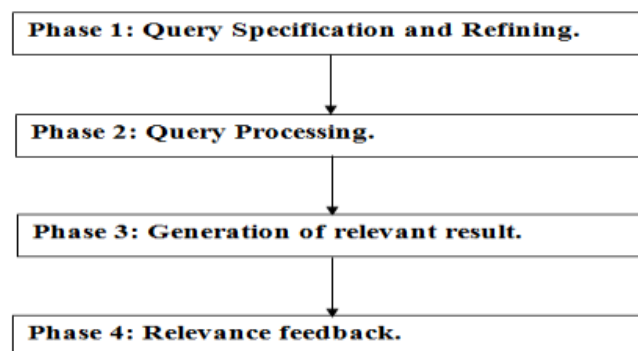

Figure 1:Phases of Query Processing

II. QUERY PROCESSING IN MULTIMEDIA DATABASE

Query processing in multimedia database is different from the one in the traditional database. This difference in the processing methods is due to reason that the multimedia data is content dependent metadata. As described earlier, there are two types of multimedia data. This data require significant approach for storage, retrieval and presntation in multimedia database. According to research done earlier, there are various major challenges in the retrieval of multimedia data.

This challenges are differences in the processing techniques of both traditional data and multimedia data and also the nature of the multimedia data.The difference in the nature of data resulted in the need for query optimization to speed up the process of retrieval. Multimedia Optimization Techniques are briefly classified as:

    a.   Content –Based Retrieval
    b.   Semantic Based Retrieval
    c.   Keyword Based Retrieval[mm3]

A. Content based Retrieval for Audio:

Content basedRetrieval is the most powerful optimization technique. It stores multimedia objects in digitized format.[12]. Audio data are characterized in the following ways either by using metadata or by using specific features. Metadata explains the content of the object and extracted features dstheobject using frequency, amplitude, period etc. These featurs are extracted using signal processing techniques.[6]

The indexing technique for audio in CBR focuses to obtain small fragment called frames or windows which is obtained by segmenting the signal in time. These frames so obtained are homogeneous viz their amplitude, speed and wave length are constant. Once the segmentation has completed, the audio is now sequence of windows .The next step now focuses on xtracting features from windows thus obtained. Since, this approach fails to fulfill practicality, various compression techniques like Discrete Fourier Transform etc needs to be applied. In order to answer the query, DFT needsto be applied to every query.[17]

B. Content based retrieval for video:

The video content is described as a tuple of set of objects of interest in the video, the set of significant activities and an application that demonstrates that the objects and applications that are associated with each video frame. A video is composed of shots from frame sequences known as scene sequence. A frame is a still picture whereas a shot is a clip representing continuous action. A video database is a assume to be a collection of 5-entry tuple containing various parts like: the video record indentifier, the video content, the number of frames in the video, relations that describe the whole video and its physical location. Main queries refer segments, objects, activities and several features that appear in a video. To manipulate a video it will be divided logically in homogeneous segments. The video segmentation techniques get the record and determine where the shots have been concatenated, or spatially/chromatically composed. After segmentation the videos are presented compactly as FS or RS trees[13].

C. Semantic based Retrieval for audio and video:

This technique is defined as type of searching that basically aims at comparing the given multimedia object with the already present object in database. As compared toCBR, this technique examines large number of features of the object in order to prfomcomparison.[13]Various information   about the object like video components, metadata etc. forms the semantic content that this approach uses.

Keeping in view various issues of SBR and also to handle large and rich data, a visualized semantic data model needs to be constructed. The most important and prominent disadvantage of this method is that the content required for analysis are difficult to extract.

D. Keyword or Metadata based retrieval:

It is most common approach as well as it is considered to be the traditional method for data retrieval. Metadata is the additional information that can be used to uniquely describe any object. It describes content, quality, condition of the data.

The metadata needs to properly determine the content. The more precise the met data the more accurate is the result of the query. There are several schemes for metadata retrieval like MPEG-7, Dublin Core and IEEE LOM. [17]

III. COMPARISON OF TECHNIQUES

The following table shows the comparision of optimization techniques on the basis of advantages and disadvantages of each over other.[17]

Table 1: Comparision table

Type of Index	Advantages	Disadvantages
1. CBR	1) Provides ease of query formulation and interpretation. 2) This technique is suitable and flexible for formulating queries.	1) Provides data dependency between multimedia data. 2) User dependency 3) Performance is lacking when queries are executed on large datasets.
2. Semantic Based Retrieval	1) Large amount of computation time can be saved compared to the index structures because of the simpler and overlap-free characteristics 2) The technique can be easily extended to all transforms available.	1) It cannot support queries on generalized concepts. 2) The retrieval is not precise enough for the process.
3. Metadata	1) Rich metadata are very effective in assisting users to navigate and find desired content items. 2) High quality metadata is important for reliable and effective Web applications.	1) The more data become available, the harder and difficult to identify and extract metadata. 2) The absence of meaningful metadata due to lack of users' attention in providing the information.

IV. CONCLUSION

In this paper, we have described query processing   in multimedia databases along with briefly describing the query optimization techniques focusing mainly on CBR. We also formulated the audio and video retrieval techniques in CBR. At the mere end, we simply proposed a small table that compares these techniques on their advantages and disadvantages.

We can conclude that all the techniques provide good results on individual basis but for better results they need to used in a hybrid form.

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