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REVIEW ON MANAGING AND MINING WEB MULTIMEDIA DATABASE

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ABSTRACT

The huge amount of unstructured data available on the web and the multimedia manages and storage technologies have led to incredible growth in very large and detailed multimedia database. Multimedia mining has proved to be a successful approach for extracting hidden knowledge from huge collections of structured digital data stored in databases. Also it is an inter disciplinary endeavor that draws upon expertise in multimedia retrieval, classification and data mining. Managing and mining web multimedia database is a framework that manages different types of data potentially represented in a wide diversity of formats on a wide array of media sources. It provides support for multimedia data types, and facilitate for creation, storage, access, managing and control of a multimedia database. The purpose of this paper is to provide overview of multimedia mining, categorizing the web multimedia database with various data mining techniques. This article also represents the important concepts of the multimedia databases on the web and how these databases have to managed and mined to extract patterns and trends.

KEYWORDS: Web Mining, Multimedia database, text, image, audio, video mining.

INTRODUCTION

A multimedia database system includes a managing web multimedia database system, which manages and also provides support for storing, manipulating, and retrieving multimedia data from the multimedia database, a large collection of multimedia objects, such as image, video, audio, and text data.

Data in Web databases are both structured and unstructured. Structured databases include those that have some structure such as relational and object databases. Unstructured databases include those that have very little structure such as text, image, audio, and video databases. In general, multimedia databases are unstructured. Some text databases are semi-structured databases, meaning that they have partial structure. The developments in multimedia database management systems have exploded during the past decade. While numerous papers and some texts have appeared in multimedia databases, more recently these databases are being mined to extract useful information [1].

A. Managing multimedia databases

A multimedia database management system (MM-DBMS) manages the multimedia data may include structured data as well as semi-structured and unstructured data. An MM-DBMS provides support for storing manipulating, and retrieving multimedia data from a multimedia database. In a sense, a multimedia database system is a type of heterogeneous database system, as it manages heterogeneous data types. Heterogeneity is due to the media of the data such as text, video, audio etc. It support and manages multimedia data types. An MM-DBMS is essentially a DBMS that manages the multimedia data. Therefore, all of the issues in designing a DBMS apply for an MM-DBMS. That is, we need architectures for MM-DBMSs. These architectures could be loose coupling architectures where the DBMS manages the metadata and the file manager manages the multimedia data or they could be tight coupling architectures where the DBMS and the file manage are integrated.

B. Architectures for an MM-*Database*

Various architectures are being examined to design and manage the multimedia database. In one approach, the DBMS is used just to manage the metadata, and multimedia data. Then there is a module for integrating the DBMS and the multimedia file manager. This architecture is based on the loose-coupling approach and is illustrated in Figure 1. In this case, the MM-DBMS consists of the three modules: the DBMS managing the metadata, the multimedia file manager and the module of integrating and data manager [2].

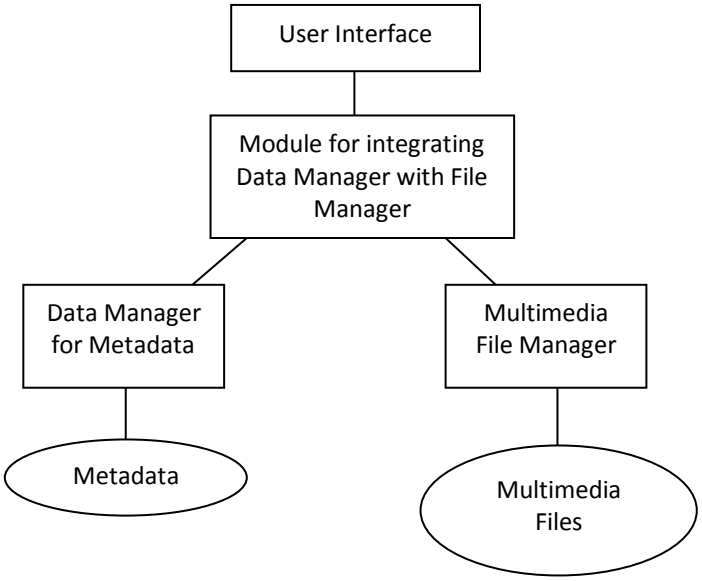

Figure1. Loose coupling architecture.

The second architecture, illustrated in Figure 2, is the tight coupling approach. In this architecture, the DBMS manages both the multimedia database as well as the metadata. That is, the DBMS is an MM-Database. The tight coupling architecture has an advantage because all of the DBMS functions could be applied on the multimedia database. This includes query processing, transaction management, metadata management, storage management, and integrity management.

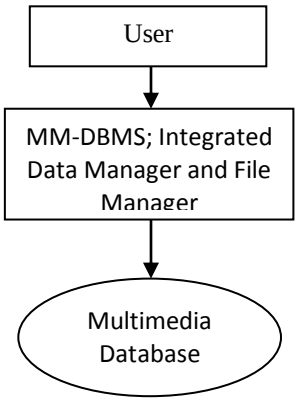

Figure2. Tight coupling approach

PRIOR STUDIES

This section discusses some of the significant literatures towards mining web multimedia database. The data management support for multimedia data using temporal elements. The integration of temporal elements is believed can improve the multimedia data management process.

The proposed model [development of the temporal based multimedia data management] provides a new discovery for archiving multimedia data in the more systematic way based on time-information data. The concept of temporal data management must be introduced into multimedia data management to ensure that event and transaction of multimedia information record can be managed accurately. Furthermore, temporal elements such as valid time and transaction time are integrated into multimedia database application to allow an efficient process in monitoring historical data; past, present and future [3]. Knowledge extraction from unstructured data contained in textual documents is possible with a clustering approach, and that the implementation of a web Portal for described

Knowledge Discovery in Database process allow to deal with the information overloading problem. The context analysis step and the classification step are realized with heuristics and can be re-designed to improve performances of Vertical Corporate Portal, as well as it's possible to extend the text mining phase integrating different techniques. Measures proposed in general, and can be used for evaluate performance for all clustering techniques [4]. In this work describes well known techniques for multimedia mining. In text mining there are two open problems: polysemy, synonymy. Polysemy refers to the fact that a word can have multiple meanings. Distinguishing between different meanings of a word (called word sense disambiguation) is not easy, often requiring the context in which the word appears. Synonymy means that different words can have the same or similar meaning. In audio and video mining, a fundamental open problem also remains: The combination of information across multiple media (combining video and audio information into one comprehensive score). In image mining an open problem remains: the combination of different types of image data. Documents from an OCR library and a video library need to be presented in a single ranked list.The application of data mining and knowledge discovery techniques to WWW server access logs. The World Wide Web serves as a huge, widely distributed, global information service center for news, advertisements, consumer information financial management, education, government, e-commerce, and many other services. It also contains a rich and dynamic collection of hyperlink information, and access and usage information, providing rich sources for data mining. Web mining includes mining web linkage structures, Web contents, and Web access patterns. This involves mining the Web page layout structure, mining the Web's link structures to identify authoritative Web pages, mining multimedia data on the Web, automatic classification of Web documents, and Web usage mining. Data mining is an evolving technology going through continuous modification and enhancements [5].

ISSUES IN MULTIMEDIA DATA MINING

Multimedia data mining develops into a conventional, mature and trusted discipline; many still-pending issues have to be addressed. These issues pertain to the multimedia data mining approaches applied and their limitations. Multimedia data consists of a variety of media formats or file representations including TIFF, BMP, PPT, IVUE, FPX, JPEG, MPEG, AVI, MID, WAV, DOC, GIF, EPS, PNG, etc. Because of restrictions on the conversion from one format to the other, the use of the data in a specific format has been limited as well. Usually, the data size of multimedia is large such as video; therefore, multimedia data often require a large storage. Multimedia database consume a lot of processing time, as well as bandwidth. Some multimedia data types such as video, audio, and animation sequences have temporal requirements that have implications on their storage, manipulation and presentation, but images, video and graphics data have spatial constraints in terms of their content[6].
Major Issues in MDM includes content based retrieval and similarity search which are integrated with mining methods, generalization and multidimensional analysis, classification and prediction analysis, and mining associations in multimedia data [7]. Multimedia data mining include content based retrieval and similarity search, generalization and multidimensional analysis, classification and pre diction analysis, and mining associations in multimedia data [8].

APPROACHES TO MANAGING AND MINING WEB MULTIMEDIA DATABASE

The approaches of managing and mining web multimedia database, storage and search techniques need to be integrated with standard data mining methods. Promising approaches include the Construction of multimedia data cubes, the extraction of multiple features from multimedia data, and similarity based pattern searching.

A. Multimedia data cube - which facilitates multiple dimensional analyses of multimedia data, primarily based on visual content.
   - A multimedia data mining system prototype, Multimedia Miner has been designed and developed which includes the construction of a multimedia data cube which facilitates multiple dimensional analysis of multimedia data, primarily based on visual content and the mining of multiple kinds of knowledge, including characterization (summarization), discrimination (comparison), classification, association and clustering, in image and video databases [9].
   - Managing Database - The database management system manages the multimedia database; where the two approaches in DBMS. In the loose coupling approach, the DBMS is used to manage only the metadata, and a multimedia file manager is used to manage the multimedia data. The loose coupling approach is that one can use various multimedia file systems to manage the multimedia data. In tight coupling architecture, the DBMS manages both the multimedia database and the metadata. Tight coupling architecture can be applied all DBMS functions on the multimedia database. This includes query management, transaction processing, metadata management, storage management. [1].

- File Format and Size: As mentioned, multimedia data is comprised of text, images, graphics, video, audio, etc. There is an overwhelming number of file representations for these different types of data, including TIFF, BMP, PPT, IVUE, FPX, JPEG, MPEG, AVI, MID, WAV, DOC, GIF, EPS, PNG, etc. In addition to the fact that multimedia objects are complex in their file formats.

B. Extraction of multiple features - Feature extraction takes the information contained in multimedia data to extract patterns and derive knowledge from large collections of images, audio, video. It takes the information contained in multimedia data. Some features that are used include short-time energy, pause rate, zero-crossing rate, normalized, fundamental frequency, frequency spectrum, bandwidth, and band energy ratio.

C. Similarity based pattern searching- Current multimedia databases play an important role on the Web, "There is the desire for Internet multimedia search engines capable of searching and locating the relevant sources containing the desired media types given a description of the specific content". Therefore, users will want to know how to search and manage multimedia data on both the Internet and intranet, and how to keep up with the explosive increase in multimedia databases.

MINING MULTIMEDIA DATABASE

In this section we discuss the issues involved in mining and extracting useful information from multimedia databases

A. Processing Text:

The Unstructured text documents can be represented as "bag-of-words" such as huge feature vectors, where each feature encodes the presence or absence of a word from the dictionary common to all documents. a naive Bayesian classifier is used for such vectors to be analyzed to classify documents into

- Extract data and/or metadata from the unstructured databases possibly by using tagging techniques, store the extracted data in structured databases, and apply data mining tools to the structured databases.
- Integrate data mining techniques with information retrieval tools so that appropriate data mining tools can be developed for unstructured databases.
- Multi-valued attributes, which corresponds to some parts of the document instead of single term for filtering e-mails this approach was used.

Ning Zhong, Yue feng Li, and Sheng-Tang Wu [10] say that there is lot of information is in the textual form. This could be library data or electronic books or web data. The one problem face by text data is, it is not well structured as relational data. In many cases it can be unstructured or it may be semi-structured. So the "Text Mining" is useful for describing the application of data mining techniques to automated discovery of useful and interesting knowledge from unstructured or semi-structured text.)Raymond J. Mooney and Un Yong Nahm [1] describes that, there are several techniques are proposed for text mining. That are conceptual structure, association rule mining, episode rule mining, decision trees and rule induction method with attachment to this Information Retrieval technique is widely use for performing task such as document matching, ranking and clustering. From large text database, extraction of patterns and association is done by text mining. For text document, identifying the keywords that summarizes the content is needed. Words can occur frequently, Such as "the", "is", "in", "of" are no help at all, since they are avoided in every document. During the pre-processing stage these common English words can be removed using "stop-list" Bhavani Thuraisingham [11] describe that One can form association from the keywords. In one article the keyword can be "Belgium, nuclear weapons" and keyword in another article can be "Spain, nuclear weapons". The data mining could make the association that author from Belgium and Spain write articles on nuclear weapon. Xinchen ,Mihaela Vorvoreanu,and Krishna Madhvan[12] give knowledge full information for those students or people who spend their more time on social media sites such as twitter, Facebook and you tube .And their elder ones worry about them, but by mining video also student can be focus on their study also. The focus of the paper is highly on the engineering students.

B. Processing Images:

Image categorization classifies images into semantic databases that are manually pre-categorized. In the same semantic databases, images may have large variations with dissimilar visual descriptions (e.g. images of persons, images of industries etc.). In addition images from different semantic databases might share a common background (some flowers and sunset have similar colors). Three types of feature vectors for image description: 1) pixel level features, 2) region level features, and 3) tile level features. Pixel level features store spectral and textural information about each pixel of the image [13]. Therefore, one could say that image mining deals with making associations

between different images from large image databases. The challenge, then, is to determine what type of mining outcome is most suitable. One can mine for associations between images, cluster images, classify images, as well as detect unusual patterns.

Nearly the techniques use for all types of multimedia data mining are identical, But the structure of various multimedia types are different, so according to that, the process of the mining of various multimedia type is different. Sometimes question get arises, if there is an availability of image processing so exactly what is the use of image mining? Image processing applications are in various domains, such as medical imaging for detection of cancer, Satellite images processing for space and intelligence application. Images include the geographical area, structure of biology. Tao Jiang ,Ah-Hwee Tan[14] explains that, important application of Image mining is, image mining not only detect the outcome from unusual pattern in image but also identify recurring themes in image, both these thing are done at the level of raw images and with higher-level concept. to find existence of pattern within a given description, the Matching technique is used. A. Hema,E. Annasaro[15] says that In the field of image mining, image matching is the vital application. There are so many techniques have been developed till today and still research for developing the optimized matching technique is going on. Nearest neighbourhood technique, least square method technique, coefficient of co-relation technique, relational graph isomorphism technique all these are matching techniques. Nearest neighbourhood technique is an important technique used in applications where objects to be matched are represented as n-dimensional vector.

C. Processing Audio:
Audio data play an important role in multimedia applications. Music information has two main branches: symbolic and audio information. Attack, duration, volume, velocity and instrument type of every single note are available information. Therefore, it is possible to easily access statistical measures such as tempo and mean key for each music item. Some of the most frequently used features for audio classification are:

- Total Energy: The temporal energy of an audio frame is defined by the rms of the audio signal magnitude within each frame.
- Zero Crossing Rate (ZCR): ZCR is also a commonly used temporal feature. ZCR counts the number of times that an audio signal crosses its zero axis.
- Frequency Centroid (FC): It indicates the weighted average of all frequency components of a frame.
- Bandwidth (BW): Bandwidth is the weighted average of the squared differences between each frequency component and its frequency centroid.
- Pitch Period: It is a feature that measures the fundamental frequency of an audio signal [16].

Cory McKay. David Bainbridge[17]describes that Music information basically have two categories. a) Symbolic and b)Audio information. Audio is now became the continuous media type like videos. The techniques used in audio mining is similar to techniques used in video mining audio data can be available in any form such as speech, music, radio, spoken language etc. The primary need for mining the audio data is the conversion of audio into text, using speech transcription technique this process can be done. Other techniques are also available for this such as keyword extraction and then mining the text. Audio mining is that type of technique which is used to search audio files. K.A.Senthildevi, Dr.E.Chandra[18] explains that there are two main approaches of audio mining. 1) Text based indexing and 2) Phoneme based indexing. Text based indexing deals with the conversion process of speech to text. And Phoneme based indexing doesn't deals with conversion from speech to text, but instead works only with sound.

D. Processing Video:
In video mining, there are three types of videos: a) the produced (e.g. movies, news videos, and dramas), b) the raw (e.g. traffic videos, surveillance videos etc), and c) the medical video (e.g. ultra sound videos including echocardiogram).
Higher-level information from video includes:

- detecting trigger events (e.g. any vehicles entering a particular area, people exiting or entering a particular building)
- determining typical and anomalous patterns of activity, generating person-centric or object centric views of an activity
- classifying activities into named categories (e.g. walking, riding a bicycle),
- clustering and determining interactions between entities [19].

Video is the combination of images so the first step for successful video mining is to have a good handle on image mining. Ajay Divakaran, Kadir A. Peker, Shih- Fu Chang, Regunathan Radhakrishnan, Lexing Xie[20]says that, In terms of feature extraction, video feature extracted for each shot based on detected shot boundries. There are totally five video feature extracted for each shot, namedas, pixel_change, histo_change, background_mean, background_var,anddominant_color_ratio. When the raw data is taken for the information extraction in video mining these five features are help for mining the video.) Mei-Ling Shyu, Zongxing Xie, Min Chenand Shu-Ching Chen [21] describes The basic techniques for video data mining, that are pre-processing of raw data, classification and association. In pre-processing of raw data technique, the important terms are get considered, that are, video shot detection and classification, video text detection and recognition, camera motion characterization, and salient audio event detection. Now in association Mining technique there are three terms are get considered that are video data transformation, definition and terminology, and video association mining. Video mining is day after day improving their techniques in various ways.

MODELS FOR MULTIMEDIA DATABASE TECHNIQUES AND ALGORITHMS

The algorithm and techniques employed to perform multimedia data mining are most important. Data mining techniques are numerous. Many of these techniques may also be applied for multimedia data mining. Within the supervised framework, three data mining methods have been used. These are classification, association modeling. Within the unsupervised learning, clustering is another data mining methodology used.

A. Classification models

In this approach, they concentrate on discovering the semantic structures. The classification rule approaches to perform data mining process because these approaches only induce absolutely accurate rules. An early example of this is the work of Yu and Wolf [23 22], They used one dimensional Hidden-Markov Model for classifying images and video as indoor-outdoor games [23]. A recent work in this area is due to Shu-Ching Chen et al. presented a new multimedia data mining framework for the detection of soccer goal shots by using combined multimodal (audio/visual) features and classification rules using Decision Tree[24].

B. Clustering models

Clustering is a process of organizing objects into groups whose members are similar in some way. It is one of the data mining techniques is an unsupervised learning. In unsupervised classification, the problem is to group a given collection of unlabeled multimedia files into meaningful clusters according to the multimedia content without a priori knowledge. A recent work in this area is due to Lei wang et al [22], who introduced a clustering method based on unsupervised neural nets and self-organizing maps. Another recent work in this area is due to Jessica Lin et al. have presented an approach to perform incremental clustering at various resolutions, using the Haar wavelet transform using k-means as clustering algorithm.

C. Association Rules

Association rule learning is a popular and well researched method for discovering interesting relations between variables in large databases. There are different types of associations: association between image content and non image content features. An early example of applying association rule mining for image annotation is provided by the work of Ordonez and Omiecinski [25], who consider segmented images to compute the co-occurances of regions that are deemed similar [22]. Another recent work in this area is due to Tseng et al.[26], who proposed a new image classification method by using multiple-level association rules based on the image objects. Another recent work in this area is due to Ankur M. Teredesai et al [27], who presented a multi relational extension to the FP-tree algorithm to accomplish the association rule mining task effectively. The motivation for using multi-relational association rule mining for multimedia data mining is to exhibit the potential accorded by multiple descriptions for the same image (such as multiple people labeling the same image differently).

D. Predication

Regression technique can be adapted for predication. Regression analysis can be used to model the relationship between one or more independent variables and dependent variables. In data mining independent variables are attributes already known and response variables are what we want to predict.

Unfortunately, many real-world problems are not simply prediction. For instance, sales volumes, stock prices, and product failure rates are all very difficult to predict because they may depend on complex interactions of multiple predictor variables. Therefore, more complex techniques (e.g., logistic regression, decision trees, or neural nets) may

be necessary to forecast future values. The same model types can often be used for both regression and classification. For example, the CART (Classification and Regression Trees) decision tree algorithm can be used to build both classification trees (to classify categorical response variables) and regression trees (to forecast continuous response variables). Neural networks too can create both classification and regression models.

E. Statistical Modeling

Statisticians were the first to use the term "data mining." Originally, "data mining" or "data dredging" was a derogatory term referring to attempts to extract information that was not supported by the data. Now, statisticians view data mining as the construction of a statistical model, that is, an underlying distribution from which the visible data is drawn. Suppose our data is a set of numbers. This data is much simpler than data that would be data mined, but it will serve as an example. A statistician might decide that the data comes from a Gaussian distribution and use a formula to compute the most likely parameters of this Gaussian distribution. The mean and standard deviation of this Gaussian distribution completely characterize the distribution and would become the model of the data. Statistical mining models are used to determine the statistical validity of test parameters and can be utilized to test hypothesis, undertake correlation studies and transform and prepare data for further analysis. Pattern matching is used to find hidden characteristics within data and the methods used to find patterns with the data include association rules [12].

CONCLUSION

A wide variety of researches have been made on managing multimedia databases. Each work has its own technique, contribution and limitations. As a review paper, we might not include each and every aspect of individual works; however attempt has been made to deal with a detailed review of the most common traditional and modern managing multimedia database. This paper addresses overview and use of multimedia database management systems. And discuss on mining for multimedia data, process of application of multimedia mining followed by models for multimedia mining classification and issues. We believe that as development is made on managing multimedia data and data mining, we will begin to see tools emerge on mining multimedia data. At present, data mining tools work largely on relational databases However, in the future we can expect to see multimedia data mining tools as well as tools for mining object databases.

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