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An Overview on Multimedia Data Mining and Its Relevance Today

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ABSTRACT

Over the past few decades, data quarrying or mining has been an effective approach for extracting concealed knowledge from huge collections of regulated digital data stored in databases. Multimedia data mining (MULTIMEDIA DATAMINING) refers to the analysis of large amounts of multimedia information in order to find patterns or statistical relationships. Rapid changes in information technology have drastically changed the functions and activities of multimedia. It includes audio, video, speech, text, web, image and combinations of several types are becoming increasingly available and are almost unstructured or semi structured data by nature, which makes it difficult for human beings to extract the information without powerful tools.. This paper sight sees survey of the current state of multimedia data mining and knowledge discovery, data mining efforts aimed at multimedia data, current approaches and well known techniques for mining multimedia data.

Keywords:- Data Mining, Multimedia Data Mining, Data Warehouse, Architectures, Applications, Models.

I. INTRODUCTION

With the recent progress in electronic imaging, video devices, storage, networking and computer power, the amount of multimedia has grown enormously, and data mining has become a popular way of discovering new knowledge from such a large data sets The goals of Multimedia Data Mining are to discover useful information from large disordered data and to obtain knowledge from the information. . Extracting the required information from the multimedia database is not a simple thing. The solution is to develop mining tools to operate on multimedia directly.

1.1 What is Multimedia Data Mining:

Multimedia mining is a subfield of data mining which is used to find interesting information of implicit knowledge from multimedia databases. Mining of multimedia data requires two or more data types such as text and video or text video and audio. Mining in multimedia is referred to automatic annotation or annotation mining

1.2categories Of Multimedia Data Mining:

Multimedia data are classified into five types; they are (i) text data, (ii) Image data (iii) audio data (iv) video data and (v) electronic and digital ink. Figure 1 illustrates multimedia data mining, in particular, various aspects of multimedia data mining

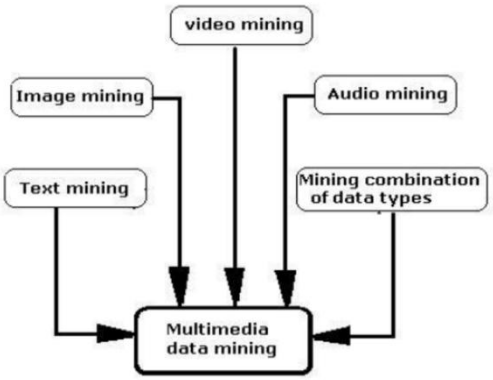

Fig 1: Categories of Multimedia data mining

Text mining

Text Mining also referred as text data mining and it is used to find meaningful information from the unstructured texts that are from various sources. Text is the foremost general medium for the proper exchange of information [3]. Text Mining is to evaluate huge amount of usual language text and it detects exact patterns to find useful information.

Image mining

Image mining systems can discover meaningful information or image patterns from a huge collection of images. Image mining determines how low level pixel representation consists of a raw image or image sequence can be handled to recognize high-level spatial objects and relationship [14]. It includes digital image processing, image understanding, database, AI and so on

Video Mining

Video mining is unsubstantiated to find the interesting patterns from large amount of video data; multimedia data is video data such as text, image, and metadata, visual and audio. The processing are indexing, automatic segmentation, content-based retrieval, classification and detecting triggers. It is commonly used in various applications like security and surveillance, entertainment, medicine, sports and education programs .

Audio mining

Audio mining plays an important role in multimedia applications, is a technique by which the content of an audio signal can be automatically searched, analyzed and rotten with wavelet transformation. Band energy, frequency centroid, zero crossing rate, pitch period and band-width are often used features for audio processing [2]. It is generally used in the field of automatic speech recognition, where the analysis efforts to find any speech within the audio.

II. DATA MINING AND DATA WAREHOUSING

2.1Data mining

Data Mining is defined as the procedure of extracting information from huge sets of data. In other words, we can say that data mining is mining knowledge from data. The information or knowledge extracted so can be used for any of the following applications −

- Market Analysis
- Fraud Detection
- Customer Retention
- Production Control
- Science Exploration

Extraction of information is not the only process we need to perform; data mining also involves other processes such as Data Cleaning, Data Integration, Data Transformation, Data Mining, Pattern Evaluation and Data Presentation. Once all these processes are over, we would be able to use this information in many applications such as Fraud Detection, Market Analysis, Production Control, Science Exploration, etc.

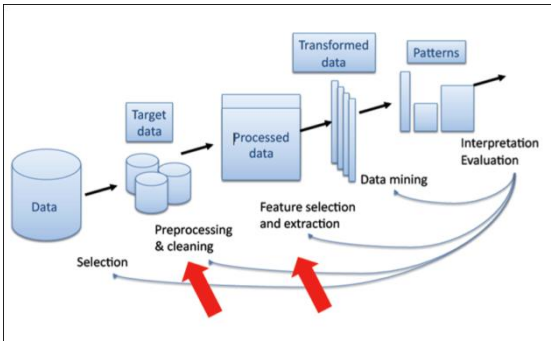

Fig 2:Data Mining Process

2.2 Data Warehouse

A Data Warehouse consists of data from **multiple heterogeneous data sources** and is used for analytical reporting and decision making. Data Warehouse is a central place where data is stored from different data sources and applications.

The term Data Warehouse was first invented by Bill Inmom in 1990. A Data Warehouse is always kept separate from an Operational Database.

A Data Warehouse is used for reporting and analyzing of information and stores both historical and current data. The data in DW system is used for Analytical reporting, which is later used by Business Analysts, Sales Managers or Knowledge workers for decision-making

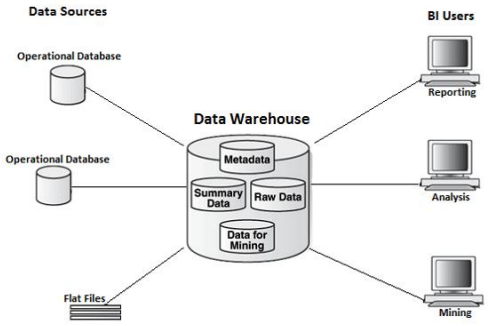

Fig 3: A DataWarehouse

III. ARCHITECTURES FOR MULTIMEDIA DATA MINING

Various architectures are being examined to design and develop a multimedia data mining system. The first architecture includes the following. Extract data or metadata from the unstructured database. Store the extracted data in structured database and apply data mining tools on the structured database

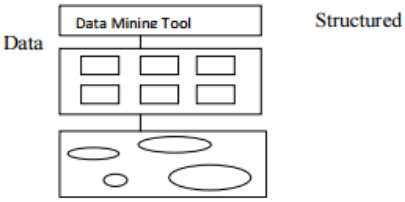

Fig 4: Converting unstructured data to structured data for Mining

Figure 5 present architecture of applying multimedia mining in different multimedia types. Data collection is the starting point of a learning system, as the quality of raw data determines the overall achievable performance. Then, the goal of data pre-processing is to discover important features from raw data. Data pre-processing includes data cleaning, normalization, transformation, feature selection, etc. Learning can be straightforward, if informative features can be identified at pre-processing stage. Detailed procedure depends highly on the nature of raw data and problem's domain. In some cases, prior knowledge can be extremely valuable.

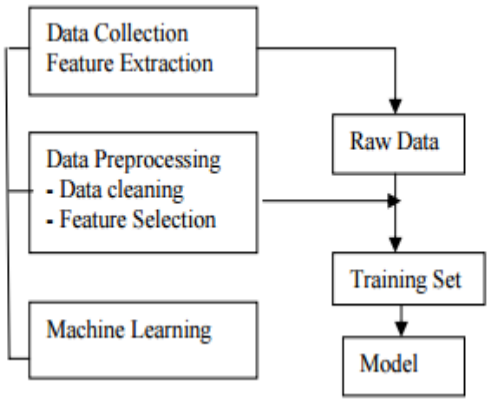

Fig 5: Multimedia mining process

For many systems, Domain experts conduct these stages. Training set is the product of data pre-processing. A learning model has to be chosen to learn from training set. The steps of multimedia mining are iterative. In order to improve the results the analyst jump back and forth between major tasks . Here the main stages of the data mining process are (1) domain understanding; (2) data selection; (3) leaning and preprocessing; (4) discovering patterns; (5) interpretation; and (6) reporting and using discovered knowledge. The domain understanding stage requires learning how the results of datamining will be used so as to gather relevant prior knowledge entirely before mining

Domain Understanding: It requires learning how the results of data-mining will be used so as to gather all relevant prior knowledge before mining.

B. Data selection: This stage requires the user to target a database or select a subset of fields or data records to be used for data mining.

C. Learning and Pre-processing: Integrating data from different sources and making choices about representing or coding certain data fields is the task of this stage. It serves as input to the pattern discovery stage. Because certain fields may contain data at levels of details which are not considered suitable for the pattern discovery stage representation choices are needed. In MULTIMEDIA DATAMINING the preprocessing stage is of considerable importance given the unstructured nature of multimedia data.

D. Discovering Patterns: The pattern discovery stage is the heart of the entire data mining process. The hidden patterns and trends in the data are actually uncovered in this stage. Several approaches of pattern discovery stage includes association, classification, clustering, regression, time-series analysis and visualization.

E. Interpretations: To evaluate the quality of discovery and its value to determine whether previous stage should be revisited or not this stage of data mining process is used.

F. Reporting and using discovered knowledge: This final stage reporting and putting to use the discovered knowledge to generate new actions or

products and services or marketing strategies as the case may be.

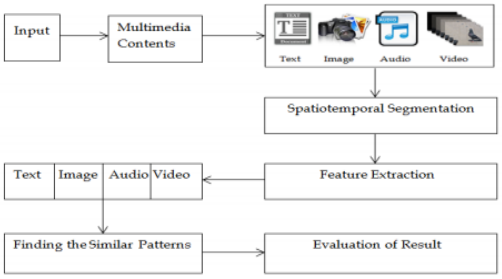

Fig 6: Multimedia data mining architecture

1. Input stage comprises which multimedia database is used for finding the patterns and to perform data mining process.
2. Multimedia Content is the data selection stage which requires the user to select the databases, subset of fields or data to be used for data mining.
3. Spatio-temporal segmentation is nothing but moving objects in image sequences in the videos and it is useful for object segmentation.
4. Feature extraction is the pre-processing step that involves integrating data from various sources and making choices regarding characterizing or coding certain data fields to serve when inputs to the pattern finding stage. Such representation of choices is required because certain fields could include data at various levels and not considered for finding the similar pattern stage. In Multimedia Data mining the preprocessing stage is significant since the unstructured nature of multimedia records.

   Finding the Similar pattern stage is the heart of the whole data mining process. The hidden patterns and trends in the data are basically uncovered in this stage. Some approaches of finding similar pattern stage contain association, classification, clustering, regression, time-series analysis and visualization.

   Evaluation of Results is a data mining process used to evaluate the results and this is important to determine whether prior stage must be revisited or not. This stage consists of reporting and makes use of the extracted knowledge to produce new actions or products and services or marketing strategies

IV. MODELS FOR MULTIMEDIA MINING

The models which are used to perform multimedia data are very important in mining. Commonly four different multimedia mining models have been used. These are classification, association rule, clustering and statistical modeling.

4.1 Classification

Classification is a technique for multimedia data analysis, can learn from every property of a specified set of multimedia. It is divided into a predefined class label, so as to achieve the purpose of classification. Classification is the process of constructing data into categories for its better effective and efficient use, it creates a function that well-planned data item into one of many predefined classes, by inputting a training data set and building a model of the class attribute based on the rest of the attributes. Decision tree classification has a perceptive nature that the users conceptual model without loss of exactness. Hidden Markov Model used for classifying the multimedia data such as images and video as indoor-outdoor games [6].

4.2 Association Rule

Association Rule is one of the most important data mining technique which helps to find relations between data items in huge databases. There are two different types of associations in multimedia mining: association between image content and non-image content features [1]. Mining the frequently occurring patterns between different images becomes mining the repeated patterns in a set of transactions. Multi-relational association rule mining is used to display the multiple reports for the same image. In image classification also multiple level association rule techniques are used.

4.3 Clustering

Cluster analysis divides the data objects into multiple groups or clusters. Cluster analysis combines all objects based on their groups. Clustering algorithms can be divided into several

methods they are hierarchical methods, density-based methods, grid-based methods, and modelbased methods, k-means algorithm and graph based model [3]. In multimedia mining, clustering technique can be applied to group similar images, objects, sounds, videos and texts.

4.4Statistical Modeling

Statistical mining models are used to regulate the statistical validity of test parameters and have been used to test hypothesis, undertake correlation studies and transform and make data for further analysis. This is used to establish links between words and partitioned image regions to form a simple co-occurrence model [9].

IV. APPLICATIONS OF MULTIMEDIA DATA MINING

There are various applications of MULTIMEDIA DATAMINING some of which are as follows:

In Digital Libraries: The retrieval collection storage and preservation of digital data is performed in the digital library. To fulfil this purpose, there is a need to convert different formats of information such as text, images, video, audio, etc. While conversion of the multimedia files into the libraries data mining techniques are popular.

For Traffic Video Sequences: To discover important but previously unknown knowledge the analysis and mining of traffic video sequences such as vehicle identification, traffic flow, queue temporal relations of the vehicle at intersection, provides an economic approach for daily traffic monitoring operations.

C. For Automated event analysis of suspicious movements: Surveillance system to monitor movements of employees, visitors and machines are used in many government organizations, multi-nationals companies, shopping malls, banks. Which has an ultimate objective to detect suspicious person based on their movements to maintain security and avoid any casualty?

D. In medical analysis: Application of Data Mining techniques for Medical Image Classification is used.

E. Media Production and Broadcasting: Proliferation of radio stations and TV channels makes broadcasting companies to search for more efficient approaches for creating programs and monitoring their content.

F. Customer Insight: It includes collecting and summarizing information about customer‘s opinions, products or services, customers‘complains, customer‘s preferences, and the level of customer‘s satisfaction of products or services. Many companies have help desks or call centres that accept telephone calls from the customers. The audio data serve as an input for data mining to pursue the following goals: Topic detection Resource assignment Evaluation of quality of service

G. Surveillance: Surveillance consists of collecting, analyzing, and summarizing audio, video, or audiovisual information about a particular area, such as battlefields, forests, agricultural areas, highways, parking lots, buildings, workshops, malls, retail stores, offices, homes, etc. [10]. Which is associated with intelligence, security, and law enforcement and the major uses of this technology are military, police, and private companies that provide security services.

There are several goals of surveillance data mining:

1. Objector event detection/recognition

2. Summarization

3. Monitoring

H. Intelligent Content Service: The Intelligent Content Service (ICS) is ―a semantically smart content-centric set of software services that enhance the relationship between information workers and computing systems by making sense of content, recognizing context, and understanding the end user‘s requests for information‖ The MULTIMEDIA DATAMINING techniques can help to achieve the following goals: Indexing Web media and using advanced media search Advanced Web-based services

I. Knowledge Management: Many companies consider their archives of documents as a valuable asset. They spend a lot of money to maintain and provide access to their archives to employees. Besides text documents, these archives can contain drawings of designs, photos and other images,

audio and video recording of meetings and multimedia data for training.

V. CONCLUSION

This paper proposes a survey of multimedia data mining. The key idea is to provide review of MULTIMEDIA DATAMINING, which is an active and growing area of research. We first described the motivation for multimedia-data mining with applications and then discussed different approaches for mining multimedia mining. This paper also describes well known techniques for multimedia mining.

VI. FUTURE WORK

Our review provides analysis of MULTIMEDIA DATAMINING, methods for MULTIMEDIA DATAMINING and compares the result of them. In future we explore the effect of Multimedia techniques on multimedia database to mine the multimedia components and improve the multimedia database environment. Researchers in multimedia information systems, in the search of techniques for improving the indexing and retrieval of multimedia information, are looking for new methods for discovering indexing information

REFERENCES

[1] https://www.tutorialspoint.com//data_mining/index.html

[2] Arasu, A. and Garcia-Molina, H., Extracting structured data fromWeb pages. SIGMOD-03, pp. 337-348, 2003.

[3] Chang, C.-H., Kayed, M., Girgis, M. R., Shaalan, K., A Survey of Web Information Extraction Systems, IEEE TKDE (SCI, EI), Vol. 18, No. 10, pp. 1411-1428, Oct. 2006.

[4] Hsu, C.-N. and Dung, M., Generating finitestate transducers for semistructured data extraction from the web. Journal of Information Systems 23(8): 521-538, 1998.

[5] Han, J., Kamber, M. Kamber. "Data mining: concepts and techniques". Morgan Kaufmann Publishers, 2000.

[6] Inamdar, S. A. and shinde, G. N. 2010. An Agent Based Intelligent Search Engine System for Web Mining. International Journal on Computer Science and Engineering, Vol. 02, No. 03.

[7] Darshna Navadiya, Roshni Patel, Web Content Mining Techniques-A Comprehensive Survey, International Journal of Engineering Research & Technology (IJERT) Vol. 1 Issue10,December- 2012 ISSN: 2278-0181

[8] S. K. Madria, S. S. Bhowmick, W. K. Ng,and E. P. Lim, "Research Issues in Web Mining", in proceding of data mining and knowledge discovery, 1st International conference, DaWk 99, pp 303-312, 1999.

[9] .Manjunath T.N, Ravindra S Hegadi, Ravikumar GK, "A Survey on Multimedia Data Mining and Its Relevance Today" IJCSNS International Journal of Computer Science and Network Security, VOL.10 No.11, November 2010.

[10] Sarla More, Durgesh Kumar Mishra, "Multimedia Data Mining: A Survey" Pratibha: International Journal of science, spirituality, business and technology (ijssbt) , vol. 1, no.1, march 2012 issn (print) 2277—7261.

[11] Manjunath R, S. Balaji, "Review and Analysis of Multimedia Data Mining Tasks and Models"InternationalJournal of Innovative Research in Computer and Communication Engineering Vol.2, Special Issue 2, May 2014.

[12] Bhavanithuraisingham, "Managing and mining multimedia Databases" International Journal on Artificial Intelligence Tools Vol. 13, No.3 (2004) 739-759.

[13] JanuszSwierzowicz,"Multimedia Data Mining Trends and Challenges"