Chapter 22
Data Mining–Based CBIR System

Shruti Kohli
Birla Institute of Technology, India

Vijay Shankar Gupta
Birla Institute of Technology, India

ABSTRACT

Multimedia mining primarily involves information analysis and retrieval based on implicit knowledge. The ever increasing digital image databases on the internet has created a need for using multimedia mining on these databases for effective and efficient retrieval of images. Contents of an image can be expressed in different features such as Shape, Texture and Intensity-distribution (STI). Content Based Image Retrieval (CBIR) is the efficient retrieval of relevant images from large databases based on features extracted from the image. The emergence and proliferation of social network sites such as Facebook, Twitter and LinkedIn and other multimedia networks such as Flickr has further accelerated the need of efficient CBIR systems. Analyzing this huge amount of multimedia data to discover useful knowledge is a challenging task. Most of the existing systems either concentrate on a single representation of all features or linear combination of these features. The need of the day is New Image Mining techniques need to be explored and a self-adaptable CBIR system needs to be developed.

INTRODUCTION

Data mining is the process of extracting useful non-trivial knowledge from huge data repositories. These techniques have gained popularity in various application domains including medicine where a huge amount of data is available in the form of medical images. However, the subjective analysis of these images by radiologists is vulnerable to inter and intra-observer variability. These variations depend upon image quality as well as the expertise of the radiologists. Computer-aided diagnosis (CAD) systems are therefore employed as second readers to improve upon the precision in diagnosis; thereby enhancing the survival rates. Hence, there is a considerable interest among researchers to develop medical image mining techniques to design efficient CAD systems using medical images obtained through various imaging modalities, like X-Ray, Computed Tomography (CT), Magnetic Resonance Imaging (MRI) and Ultrasound (US).

Images are the effective medium for presenting visual data in many applications of industry and academia. With the development of technology, a large amount of images are being generated every day. Therefore, managing and indexing of images become essential in order to retrieve similar images effectively. In conventional systems, images are generally indexed with textual annotation. However, as the database grows larger, the use of keywords based method to retrieve a particular image becomes inefficient. Besides, skilled manual labor is required to annotate every single image with appropriate keywords. As consequences, it becomes a time-consuming and tedious task. Seeing these limitations in the conventional system, content based image retrieval (CBIR) systems came into existence. Content-based image retrieval (CBIR) or Content-base visual information retrieval (CBVIR) is an application of computer vision technique. In CBIR, retrieval of images is based on their visual attributes / features such as color, texture, and shape etc (R.Senthil Kumar et al., 2013). In CBIR, each image that is stored in database has its features extracted and compared to the features of the query image. It involves two steps:

- **Feature Extraction:** The first step in the process is extracting image features to a distinguishable extent.
- **Matching:** The second step involves matching these features to yield a result that is visually similar (Shadma Parveen et al., 2013).

Based on the matching criteria, images can be retrieved from a larger database efficiently. This technique can be used successfully in the following areas:

- **Security Check:** Finger print or retina scanning for access privileges.
- **Medical Diagnosis:** Using CBIR in a medical database of medical images to aid diagnosis by identifying similar past cases.
- **Crime Prevention:** Automatic face recognition system, used by police forces.
- Automated Inspections system for the manufacturing industries.

NEED OF MULTIMEDIA MINING

Recent explosion in the quantity of multimedia data stored in social networks and other multimedia sites has engendered the need for new and better techniques for accessing data specifically images. Indexing and retrieval are at the core of multimedia system design— the knowledge potential of huge quantity of multimedia data may lay unexplored in the absence of effective tools for easy access to the collected information. Once collected, the data must be organized efficiently. The object of the retrieval process is to obtain limited information to meet the needs of a user at a particular time, within particular domain applications. Often it is extremely difficult to achieve this objective in actual practice. A major challenge, therefore, lies in developing techniques that can "interpret" the multimedia contents in large data collections so efficiently as to extract all information items relevant to the user query (Meenakshi Shruti Pal, et al.,2013). Multimedia mining deals with the extraction of implicit knowledge; in other words, it looks for multimedia data relationships or other patterns that are not explicitly stored in multimedia files. Multimedia mining is more than just an extension of data mining; it is an interdisciplinary endeavor that draws upon expertise in computer vision, multimedia processing, multimedia retrieval, data mining, machine learning, database and artificial intelligence. Rapid progress in digital data acquisition and

Related Content

The Art and Science of User Engagement: Personalization and Recommendations in the OTT Era
Nitesh Behareand Daman Jeet (2024). *The Rise of Over-the-Top (OTT) Media and Implications for Media Consumption and Production (pp. 130-159).*
www.irma-international.org/chapter/the-art-and-science-of-user-engagement/337670

The Rise of Digital Celebrities: Analyzing the Impact and Sustainability of Stardom on OTT Platforms
Archan Mitraand Sayani Das (2024). *Exploring the Impact of OTT Media on Global Societies (pp. 55-73).*
www.irma-international.org/chapter/the-rise-of-digital-celebrities/340634

Audiovisual Facial Action Unit Recognition using Feature Level Fusion
Zibo Meng, Shizhong Han, Min Chenand Yan Tong (2016). *International Journal of Multimedia Data Engineering and Management (pp. 60-76).*
www.irma-international.org/article/audiovisual-facial-action-unit-recognition-using-feature-level-fusion/149232

Location-Aware Caching for Semantic-Based Image Queries in Mobile AD HOC Networks
Bo Yangand Manohar Mareboyana (2012). *International Journal of Multimedia Data Engineering and Management (pp. 17-35).*
www.irma-international.org/article/location-aware-caching-semantic-based/64629

Situated Multimedia for Mobile Communications
J. Hakkilaand J. Mantyjarvi (2008). *Multimedia Technologies: Concepts, Methodologies, Tools, and Applications (pp. 151-163).*
www.irma-international.org/chapter/situated-multimedia-mobile-communications/27079