Accountability of Content - Based Image Retrieval (CBIR) in Comparison with Traditional Text - Based Image Retrieval (TBIR) to Facilitate Pattern Recognition

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***Abstract*—** Pattern recognition, which is the computerized recognition of patterns in data, is of high demand today. This paper focuses on the accountability of Content-Based Image Retrieval (CBIR) in comparison with traditional Text-Based Image Retrieval (TBIR) to facilitate better pattern recognition. Even though using both TBIR and CBIR, several images can be retrieved from a large database collection, the efficiency of these systems differ in many ways. The paper describes the traditional TBIR including the challenges and then proceeds with the fundamental aspects of CBIR. As part of the paper, a brief description of features for image retrievals like colour, texture, and shape are portrayed. The paper also discusses the similarity measures based on which matches are made and images are retrieved, along with the significance of CBIR.

***Keywords*—** Content Based Image retrieval (CBIR), Image retrieval, Query image, Text Based Image Retrieval (TBIR)

INTRODUCTION

Recently there has been an exponential increase in the size of multimedia files because of the extensive increase of reasonably priced memory storage and the widespread usage of the World Wide Web (WWW). This scenario led to the crucial requirement of retrieval of a large number of images from huge databases. To nurture the need for this situation, wide-ranging researches into image retrieval systems in an effective way has gained a lot of demand. From the chronological viewpoint, the earlier image retrieval systems were rather text-based with the thrust from the database management community since the images were required to be annotated and indexed accordingly [1]. Nevertheless, with the considerable rise of the images and size of the image database, the task of user-based annotation became very unwieldy and to a great extent biased. Since in TBIR, the text often fails to convey the affluent structure of images, the necessity of a better system for efficient information retrieval has come up. This directed to the introduction of CBIR, where retrieval is based on the automating matching feature of query language with that of image database through some image – image similarity evaluation in which images will be indexed according to their visual content such as colour, texture, and shape.

THE REQUIREMENT OF AUTOMATIC PATTERN RECOGNITION

All of us are quite familiar with the human capability of pattern recognition. Automatic pattern recognition is typically considered as an engineering area studying the development and evaluation of systems that imitate or assist the human ability to recognize patterns. It can also be considered as a science which studies the natural phenomenon that human beings and conceivably other biological systems are able to ascertain, differentiate and describe patterns in their environment, and recognize new remarks consequently. Automatic pattern recognition deals with patterns' regularities, uniqueness or qualities that can be discussed on a low level of dimensions such as pixels in an image and on high-level concepts such as faces in images. The below-mentioned diagram depicts the main components of a pattern recognition system.

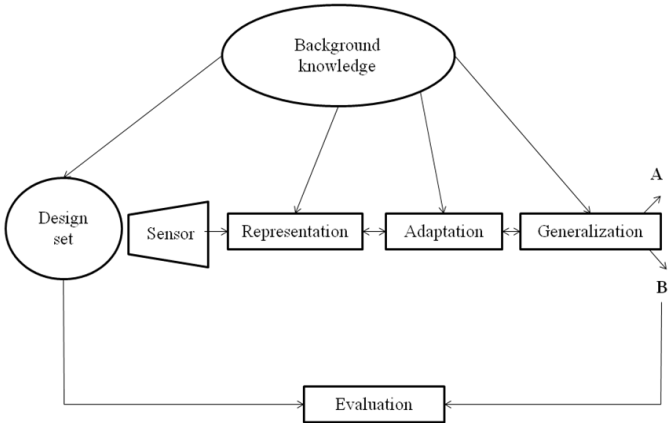

Fig. 1: Components of a Pattern Recognition System

CHALLENGES OF TRADITIONAL TEXT-BASED IMAGE RETRIEVAL

Text-Based Image Retrieval (TBIR) can be used in most of the web image retrieval systems. The text-based method is based on a keyword-based search. This approach makes use of the text associated with an image to carry out image retrieval from an image database. In this structure, images are explained by text and then image retrieval is performed from the database. Search engines such as Google, Yahoo etc. are built on this type of methodology. Text-based methods are fast and give reliable result when images are well interpreted or explained. However, these search engines are fast and robust but sometimes fails to retrieve relevant images because manual remarks are not accurate or adjoining text may not be proper to describe the image. The difficulty arises from the intrinsic difference between the text and image in representing and expressing information [3]. Content-Based Image Retrieval (CBIR) came into the picture to overcome this dilemma encountered in Text-based image retrieval. Text-based retrieval techniques are extremely limited to search the metadata that is tagged to the image or video. When the same word has different meanings or when the two concepts have the same name with an entirely different semantic idea, the image retrieval done by TBIR will not be effective. When the volume of image collections is large, in TBIR, image retrieval is very time-consuming. Another challenge of TBIR is connected with the user's perception in annotating an image. Diverse people may perceive the same image in, unlike ways. The discernment bias and interpretation impreciseness of TBIR may cause unrecoverable mismatches in later retrieval processes. To overcome the various challenges of TBIR, a vital role is played by the CBIR system, in which images are searched based on their visual contents such as colour, shape, and texture.

IMPLICATION OF CBIR

Content-Based Image Retrieval (CBIR) is any technology that in standard helps to systematize digital image collection by their visual matter. Everything ranging from an image comparison function to a strong image annotation falls under the apprehension of CBIR The most common form of CBIR is an image search based on the illustration. The increasing amount of digitally produced images requires new methods to record and access this data. Conservative databases allow for textual searches on only Metadata. Content-Based Image Retrieval (CBIR) is a technique which uses visual illustrations, usually called as features, to explore images from huge image databases according to users' requests in the form of a query image [8]. Other than the customary features like colour and texture, a new characteristic extraction algorithm called edge histogram is introduced for more efficient pattern recognition.
Edges express vital information to a picture and as a result, can be applied to image retrieval. The edge histogram descriptor captures the spatial distribution of edges. This model requires the input as Query by Example (QBE) and any combination of features can be selected for retrieval. The objective is to make a general CBIR system using the retrieval of system-level features such as mean, median, and standard deviation of Red, Green, and Blue channels of colour histograms. Followed by this, the texture features such as contrast, energy, correlation, and homogeneity are retrieved. Finally, the edge features such as vertical, horizontal, 45 degrees diagonal, 135 degrees diagonal and isotropic are added [2]. Human being understands images, sound and any other information by observing, hearing, awareness and analysis.
Human arbitrates resemblance of images and sounds based on their semantic contents. In fact, the retrieval methods based on text or keywords for digital multimedia cannot meet up the natural way by which the human being gets multimedia information exactly. As more and more multimedia information appears on the Internet, there is a growing demand for exact and fast retrieval based on the contents [3]. This has made image retrieval as one of the key aspects of multimedia information retrieval research. Existing colour – based general – purpose image retrieval systems roughly fall into three categories based on the signature extraction strategy used such as histogram, colour layout, and region-based search.
CBIR includes the following components in system realization, for instance, data collection, build up feature database, searching in the database and processing & indexing the results of the retrieval. Data collection using the Internet is a spider program that can collect webs automatically to interview Internet and do the collection of the images on the web site, through the URLs[4]. Repeating this process leads to the collection of all the images which were reviewed into the server. To extract the feature information, build up a feature database using an index system program do an analysis for the collected images [4]. At present, the features that use extensively involve system-level features for instance colour, texture etc. along with the middle-level features like shape. During searching the database, the system obtains the feature of an image that waits for search when the user inputs the image sample that requires a search. Followed by this, the search engine will search the appropriate feature from the database and do the necessary calculations. Finally, processing and indexing the results will be conducted subsequent to researching index of the image obtained from searching due to the resemblance of features [5]. The system then returns the retrieved images to the user for the user to select. If the user is not satisfied with the searching result, he/she can redo retrieval of the image, and searches database again. In Content-Based Image Retrieval, for ensuring efficient image retrieval, images are retrieved based on colour, texture, and shape [6]. The CBIR system uses these features for retrieval of images and the technique for getting these features is known as Feature Extraction [7]. The retrieval of the content based image includes the below-mentioned systems:

Colour-based retrieval

Colour feature is the most perceptive and understandable feature of the image. The colour feature generally adopts histograms to illustrate it. Colour histograms method has the advantages of promptness, least requirement of memory space. The colour histogram is not sensitive with the images' changes in the size and rotation. It gains broad significance consequently.

The retrieval based on texture feature

In this method of retrieval, the images' texture statistical feature, structure feature and the features which are based on other special domains are considered and are changed into the frequency domain.

The retrieval based on shape feature

During the retrieval based on shape feature, various shape attributes area, bounding rectangle, aspect ratio, roundness or circularity, compactness, elongation, and convexity are considered [4]. The semantic feature of shape is stronger than texture for image retrieval.

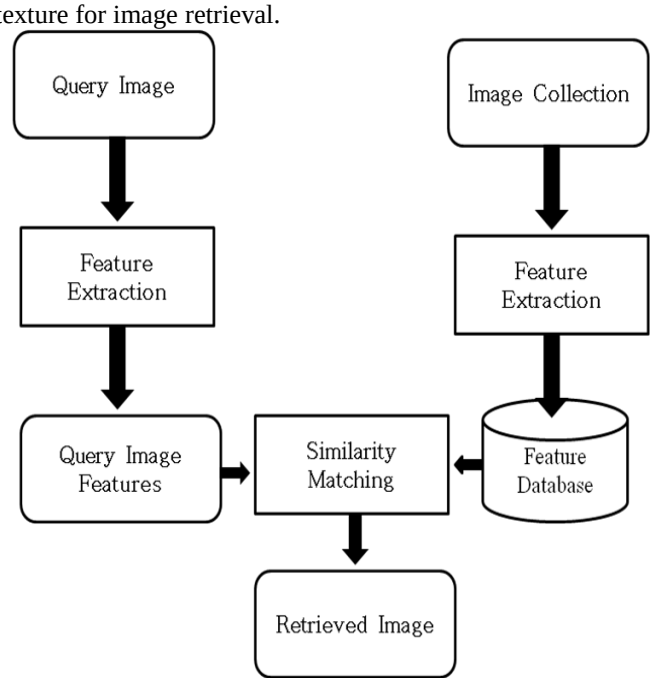

Fig. 2: Architecture of CBIR System

CONCLUSION

Content-Based Image Retrieval (CBIR) is a method that helps in probing a user preferred information from an enormous collection of image files and interpret user intentions for the desired information. CBIR is suitable in bridging up the gap between system-level features and high-level semantics. CBIR reduces human interference during image retrieval and does the task in a short span of time compared to TBIR. CBIR has received substantial research interest in the last decade and has evolved and developed into a distinct research field.

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