

A Comprehensive Survey of Modern Content Based Image Retrieval Techniques

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Abstract-The content based image retrieval (CBIR) is one of the most popular and heart favorite research areas of the digital image processing. All the existing image search tools, like Google, Bing, Yahoo are based on textual annotation of images. In these tools, all the images are manually annotated with keywords and then retrieved using text-based search methods. Therefore performances of these systems are not satisfactory. The basic objective of content based image retrieval is to extract visual content of an image automatically, like color, texture, or shape. The CBIR technology can be used in several applications such as forensic laboratories, crime detection, and image searching sites. One most probable application is matching a forensic sketch to a set of previously available set of images. The research area of retrieving images which are based on the visual content of the query picture intensified recently. Also it demands on the quite wide methodology spectrum on the area of the image processing. In this paper, we will propose a more comprehensive survey of popular content based image retrieval techniques. We will discuss pros and cons of each CBIR methodology.

I. INTRODUCTION

Day by day processors becoming powerful, also the cost of memories becoming cheaper, so the deployment of large image databases for a variety of applications have now become realizable. Even the databases of satellite and medical imagery have been attracting more and more users in various professional fields [1]. Effectively accessing desired images from large and varied image databases is now a necessity. The CBIR extracts the visual content of the images in the database and described by multidimensional feature factors.

"Content-based" means that the search will analyze the actual contents of the image other than the metadata such as tags, keywords or descriptions linked with the image. Here the 'content' refers to colors and textures information that can be derived from the image itself. The Content Based Image Retrieval has become essential because most web based image search engines rely purely on metadata and this produces a lot of false detection in the results [2,3]. Also having humans manually enter keywords for images in a large database can be inefficient and may not capture every keyword that describes the image.

II. LITERATURE SURVEY

Jaiswal, Kaul [8] concluded that content based image retrieval is not a replacement of to text based image retrieval. But integration of the two can result in

satisfactory retrieval performance. Both author reviewed the main components of a content based image retrieval system. Authors also analyzed image feature representation, and indexing . Also highlighted the past and current technical achievement.

Ivan Lee, et.al. (1996) [10] have present the analysis of the CBIR system with the human controlled and the machine controlled relevance feedback. They proposed an analytical study over different network topologies including centralized and distributed content search. The experimental results for the interactive relevance feedback using RBF. They observed a higher retrieval precision by introducing the semi-supervision to the non-linear Gaussian shaped RBF relevance feedback.

Verma, Mahajan, (2012) [13] have used canny and sobel edge detection algorithm for extracting the shape features for the images. Firstly the shape feature are extracted and then the classified images are indexed and labeled for making easy for applying retrieval algorithm in order to retrieve the relevant images from the database. The retrieval of the images from the huge image database as required by the user can get perfectly by using canny edge detection technique according to results.

Ryszard S. Chora's (2007) [16] contributes their work for the identification of the problems existing in CBIR and Biometrics systems describing image content and image feature extraction. Authors proposed a possible approach to mapping image content onto low-level features. In [16], they investigated the use of a number of different color texture and shape features for image retrieval in CBIR and Biometrics systems.

Pattanaik , Bhalke (2012) [17] has worked to prove that Content Based Image Retrieval has overcome all the limitation of Text Based Image Retrieval by considering the contents or features of image. By using this technique, query image can be retrieved efficiently from a large database. They worked on Database consists of different types of images has implemented on the system. Several features such as histogram is taken into consideration for extracting similar images from the database. The experimental result have shown that combined features can give better performance than the single feature. Therefore the selection of feature is one of the important issues in the image retrieval. This system is said to be efficient if semantic gap is minimum.

Zhao, Grosky (2002) [18] view that bridging the semantic gap between the low-level features and the high-level semantics is within the interface between the user and the system. The second research direction is towards improving aspects of CBIR systems by finding the latent correlation between visual features and semantics and then integrating them into a unified vector space model.

Peter Stanchev, et.al. [19] proposed that Several visual descriptors exist for representing the physical content of images. It is found that depending on the specific characteristics of a data set there may be some features which can be more effective than others when performing similarity search. The descriptors based on color representation might be effective with a data set containing mainly gray color images.

From [20] a study conclude that a system based on the fuzzy c-means clustering algorithm. The proposed CBIR system fuses color and texture features in image segmentation. Novel technique to form compound queries based on the combined features of different images is introduced. The proposed technique allows users to have a better control on the search criteria. So it is clear that by using such techniques a higher retrieval performance can be achieved.

The Color Selection exploited CBIR system [6] facilitates query-by-color. The method is based on 11 color categories used by all people. After that the low frequency DCT coefficients that are transformed from YUV color space as feature vectors are used for retrieval of images [7]. This newly proposed model allows users to select its dominant feature of query images so as to improve the retrieval performance. This technique is sufficient for performing effective retrieval by introducing users' opinions on the query images. Region of Interest Image Indexing System [4] allows the user to select the region of interest and the system will search all the images in the database to find the all related regions among the database. Universal Model for Content-Based Image Retrieval combine three feature extraction methods namely color, the feature and the edge histogram descriptor [5]. All the image properties analyzed in this work are by using computer vision and image processing algorithms. The color the histogram of images are computed for texture co-occurrence matrix based entropy, energy are calculated and for edge density it is Edge Histogram Descriptor (EHD) that is found. A novel idea is developed based on greedy strategy to reduce the computational complexity for the image retrieval. All these existing approaches required large storage space and lot of computation time to calculate the matrix of features. So authors proposed the efficient content based image retrieval using advanced color and texture feature extraction is deployed. In such scheme the color features are extracted using three color moments and texture features are extracted directly from block based DCT coefficients which are in transform domain. Therefore it does not need any complex computation for texture feature extraction. This newly proposed method can be directly applied to image in the compressed domain, this solve the storage space problem.

CBIR is the retrieval of images based on visual features such as color, shape and text. There are many CBIR systems currently exist, also are being constantly developed. Color Selection exploited CBIR system [6] facilitates query-by-color. Such system is based on 11 color categories. The low frequency DCT coefficients that are transformed from YUV color space as feature vectors are used for retrieval of images [7]. It allows users to select its dominant feature of query images. But the technique is sufficient for performing effective retrieval by introducing users' opinions on the query images.

III. CONCLUSION

The CBIR technology can be used in several applications such as image search, social networking sites, and forensic labs. CBIR system is a computationally expensive task. Also it requires a lot of accuracy in the output. This paper proposed a critical review of modern CBIR methods. The merits and demerits of each CBIR methods are discussed.

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