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A Review Paper on Content Based Image Retrieval

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Abstract: Image retrieval is a very important area of digital image processing. Image can be retrieve from a large database n the basis of text, color, structure or content. Content-based image retrieval uses the visual contents of an image such as texture, color, shape, and spatial layout to represent and index the image. In typical CBIR systems, the visual content of the images in the database are extracted and described by multi-dimensional feature vectors. The feature vector of the images in the database form a feature database. To retrieve the images, users provide the retrieval system with example images. The system then changes these examples into its internal representation of feature vectors.
In this paper we present the review on various content based image retrieval techniques.

Keywords: CBIR, SVM, Content based Image Retrieval, Image Retrieval.

I. INTRODUCTION

Image mining is a technique which handles the mining of information, image data association, or additional patterns not unambiguously stored in the images. It exploits methods from computer vision, image retrieval, image processing, data mining, machine learning, database, and artificial intelligence. There are two most relevant techniques. The first technique is to mine from huge amount of images alone and the second technique is to mine from the integrated collections of images and related alphanumeric data. Image Retrieval is in effect an extension of traditional information retrieval to include images. Image retrieval is the process of searching and retrieving images from a large database. As the images grow complex, retrieve the right images become a difficult problem. Content-Based Image Retrieval (CBIR), also known as query by image content (QBIC) is the process of retrieving images from a database on the basis of features that are extracted automatically from the images themselves. 'Content-Based' means that the search will analyze the actual contents of the image. In CBIR, a query is an image or portion of an image; relevant images are retrieved based on the similarity of the features of the query and the features of the individual images in the database. Possible features include texture, color, shape, orientation, or a combination thereof. Measures of image retrieval can be defined in terms of Precision and Recall. CBIR is used to reduce the semantic gap between low-level features and high-level user semantics.

Image Retrieval

The advent of the World Wide Web (WWW) and the development of highly economical devices for capturing, storing and transmitting images have led to the creation of huge image libraries. Thus, we are faced with the inevitable problem of having to retrieve useful information from these collections, both efficiently and effectively. This has led to a renewed interest in image retrieval and its practical applications.

Text Based Retrieval

Traditional image retrieval employed text as the primary means by which to represent and retrieve images from databases. Images were stored along with string attributes – keywords prepared by an annotator that reflected in a relatively broad manner the content of the image. Although text-based image retrieval took advantage of already well-established information retrieval algorithms and mechanisms, it disadvantages as an effective tool to retrieve images became readily apparent.

Color Based Retrieval

Since color is a low-level image feature that does not appear to classify images distinctly, few CBIR systems exist that utilize only color as the image retrieval feature. Yet color does have its advantages for image retrieval. It provides multiple measurements at a single pixel of the image, enabling categorization to be done without the need for complex spatial decision-making. Color content is also independent of view and resolution and is easy to extract from an image and to manipulate.

Content Based Retrieval

Initial research in the retrieval of images based on their inherent features has been reported. Content-based image retrieval utilizes representations of features that are automatically extracted from the images themselves. Allmost all of

the current CBIR systems allow for querying-by-example, a technique wherein an image (or part of an image) is selected by the user as the query. The system extracts the feature of the query image, searches the database for images with similar features, and exhibits relevant images to the user in order of similarity to the query. Content-based image retrieval systems attempt to exploit the visual information inherent in images, thus providing a more realistic perceptual representation of an image. In this context, content includes among other features, perceptual properties such as texture, color, shape, and spatial relationships. Many CBIR systems have been developed that compare, analyze and retrieve images based on one or more of these features. Some systems have achieved various degrees of success by combining both content-based and text-based retrieval. In all cases, however, there has been no definitive conclusion as to what features provide the best retrieval.

II. LITERATURE SURVEY

Amanbir Sandhu, Aarti Kochhar in 2012 Presents a technique for content based image retrieval using texture, color and shape for image analysis. In this paper they worked with the three features i.e. texture, color and shape and its different combinations. The GLCM is used for texture feature extraction, histogram for Color feature extraction and for shape different factors are found like area, Euler No., eccentricity and Filled Area.

Saroj Shambharkar and Shubhangi Tirpude in 2011 Proposed a technique for image retrieval using fuzzy-c mean clustering. In this they said an optimization model or objective function must be devised to search for the optimal partition according to the chosen objective function. The way that most researchers have solved the optimization problem has been through an iterative locally optimal technique, called the FCM algorithm and hence they suggested a fuzzy-c mean algorithm.

Manimala Singha and K.Hemachandran in 2012 [6] Presents a technique for content based image retrieval using color and texture. In this they proposed two algorithms for image retrieval based on the color histogram and Wavelet-based Color Histogram. They presented a novel approach for Content Based Image Retrieval by combining the color and texture features called Wavelet-Based Color Histogram Image Retrieval (WBCHIR). Similarity between the images is ascertained by means of a distance function. The computational steps are effectively reduced with the use of Wavelet transformation.

Ray-I Chang, Shu-Yu Lin, Jan-Ming Ho, Chi-Wen Fann, and Yu-Chun Wang in 2012 Proposed a novel content based image retrieval system using K-means/KNN with feature extraction. This paper first combines segmentation and feature extraction module, grid module, K-means clustering and neighborhood module to build the CBIR system. The problem with this technique is that the system architecture and modules proposed in this paper are not optimized properly.

Existing Techniques

Region Based Image Retrieval

In region based image retrieval image has to be segmented into regions. Texture Boundary Encoding based (TBES) is used for the automatic image segmentation [7]. It uses Dominant Color Descriptor (DCD) and Edge Histogram Descriptor (EHD) for feature extraction of image regions. To reduce retrieval time, the image database will be clustered based on color and texture. Self organizing map (SOM) algorithm will be used for clustering. The biggest advantage of using SOM is that it can be easily applied to the large amount of data and it automatically clusters the input space and it not sensitive to initialization.

Image Retrieval using wavelet Decomposition

This wavelet transform identifies the core pixels of the image that actually make up the image at different levels. Each level gets the wavelet and the image gets on condensing to get the actual pixels of the image out. Perform Simple wavelet decomposition on the image and now consider each pass as a vector value. This brings the wavelet vector. After this features are extracted using wavelet decomposition After this step Color Correlogram is applied to identify similarity of the images by the spatial distribution of the color of the image and then k- means clustering is performed on the database and cluster the images based on the associated vectors to retrieve relevant images.

Image Reterival using optimized hybrid clustering

This is the process in which the query image is compared with all the images present in the database on the basis of the similarity of their color feature space. The average RGB value of the images is calculated. The RGB value of the query image is compared with each RGB values of the database images. Then Images are hierarchically grouped based on their similarity levels. This results in random groups of images.

III. CONCLUSION

As discussed in this paper, we present a general method of image retrieval system. Various approaches for image retrieval has been discussed in detail. It is concluded that a lot of work is required to be done in this area. Presented techniques shows very low accuracy hence cannot be used in the real world applications. Existing techniques shows good results only on small dataset but accuracy decreases considerably on large dataset. In future a system should be developed so that it can retrieve the images from a large data set efficiently in minimum amount of time.

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