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CONTENT BASED IMAGE RETREIVAL: AN APPROACH

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Abstract: *In field of image processing and analysis Content based image retrieval is a very important problem as there is rapid growth in storing and capturing multimedia data with digital devices. Although extensive studies, conducted and image finding is desired from multimedia databases and it is very challenging and open issue. As CBIR has been used very widely and having many techniques. So this paper provides an overview of current research in image retrieval.*

Keywords: *Image Retrieval, CBIR, Features, Matching similarities*

1. INTRODUCTION

This is century of information technology where huge amount of data is being created and used. Because of INTERNET connection it is easy to every one to access information and pictures. Most common image search engine are Google image and yahoo image have to regularly updates their local database to reflect the dynamic nature of web. Image collection is semistructured, non-homogeneous and massive in volume[1]. There is need of methodology which may find the images from such huge amount of data within less time. Image retrieval system consist of text based, content-based, composite and interactive simple and interactive complex processing scheme. Composite processing method means it involves both content and text based processing. In Interactive simple method user interaction is introduced using single modalitiy which needs to be supported for system but in case of Interactive composite, user may interact system with more than one[1-3].

Image retrieval is broadly classified into two categories like text based searching and content-based searching.

Text based Searching: It involves query matching. This is old method with text annotation which describes the image. The description includes the representation of image itself as color, shape and what type of object were included in that image. But Image speaks thousand words. So it is very difficult to tag image with such description. It may took large image but space and processing problem may raised and it becomes somewhat tedious. Content-based image retrieval (CBIR), also known as query by image content (QBIC), content based visual information retrieval application which belongs to computer vision techniques for image retrieval. The main aim to search interested images from large database using visual content of image. Content Based means that search will analyze the actual content of image such as color, shapes, texture[1,3].

The paper is organized as following. Firstly we discuss about the Content-based image retrieval. Different visual feature are used in this technique and Features matching is given in section III and section IV respectively. Applications are discussed in section V and finally conclusion is given section VI.

2. CONTENT BASED IMAGE RETREIVAL

A typical content-based image retrieval system is consist of two parts, Features extraction and storing and Image matching of query image with databases. 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.

In CBIR we have to create the database which contains extracted features of an image. Firstly we have to extract image features and these are stored database which can mentioned as image database. When an image in question (query image) is given then the same features are extracted and then these are matched with the database for finding similarities. The figure 1 shows the processing of traditional image retrieval scheme.

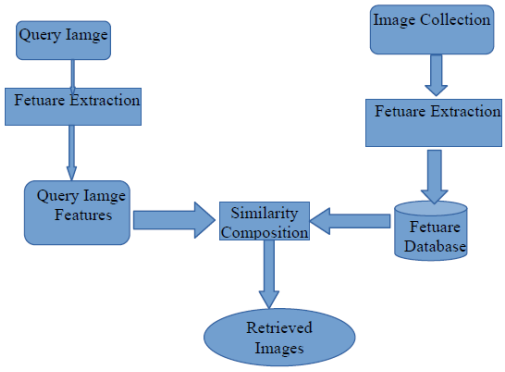

Figure I: A Typical Diagram for Image Retrieval

As image is

CBIR involves the following four parts in system realization: data collection, build up feature database, search in the database, arrange the order and deal with the results of the retrieval.

1. **Preparation of** data: Images are to be taken from Internet
2. **Feature Extraction and processing:** It is also called per-processing step. As an image is array of pixels then an image is required to represent mathematically for retrieval purpose. Currently, the features that use widely involve low level features such as color, texture and so on, the middle level features such as shape etc. Features can be extracted globally and locally. The CBIR system extracts the features of an image and prepare database.
3. **Matching: W**hen user gives input the sample image which need to be search, then the search engine will search the suited feature from the database and calculate the similar distance, then find several related images from data base which have minimum similar distance. Depending upon the types of signature different types of image similarity measures are used.
4. **Outputs:** after researching Index the image obtained from searching due to the similarity of features, then return the retrieval images to the user and let the user select. If the user is not satisfied with the searching result, he can retrieval the image again, and searches database again.

3. DFFERRENT TECHNIQUES OF CBIR

A lot of work has been done in the field of content based image retrieval. The retrieval of content based image involves following techniques.

1. Color based retrieval

Colors is most commonly used feature in content based image retrieval. Color feature have been found to be effective for measuring similarity between images. The extraction of color features from digital image depends on the understanding of theory of color and representation of color in image. Main aspect of color feature extraction is the choice of a color space.

Color Model: Each pixel of the image can be represented as a point in a 3D color space. There are some common color models such as RGB, HSV, CMY, HLS are used for image retrieval.

RGB color space is composed of three color components red, green and blue. It is a widely used color space for image display. These components are called "additive primaries" since a color in RGB space is produced by adding them together. RGB color space is not perceptually uniform.

CMY color space means three color components are cyan, magenta, yellow. It is called subtractive primaries as its produces by light absorption. CMY space is a color space primarily used for printing. The CIE spaces are device independent, consist of lightness components (Luminance) and having two chromatic components. Depending upon chromatic components CIE have two variations CIE L*a*a which is subtractive and CIE L*u*v is additive.

HSV Color Space: In field of computer graphics it is widely used and it is a more intuitive way of describing color. There are three color components (H,S,V) are hue, saturation (lightness) and value (brightness). As hue is changes with respect to camera direction therefore it is more suited for image retrieval [1].

Comparison of two images would be become difficult if we consider only color, so color histogram was introduced.

Color histogram: The color histogram for an image is constructed by counting the number of pixels of each color. It is most widely used color feature representation in IR. **I**n this technique comparing the color content of a query image to that of database images is that of comparing color histogram[1]. The Conventional color histogram(CCH) contains the occurrence of each color obtained by counting all pixels within that image having that color. In RGB color space or in HSV color space the pixel is shown by three components so histogram ire. the distribution of the number of pixels for each quantized bin, can be defined for each component. So therefore histogram with large number of bins increases computational time and also suitable method for building efficient indexes for image database. Color Quantization refers to the process of reducing the numbers of bins by putting colors that are all very similar to each other in same bins[1].

Color Moments: Based on color feature to differentiate images color moments are used. The basis of color moment lies in the assumption that the distribution of color in an image can be interpreted as probability distribution. Moments are provides a measurement for color similarity between images which are used in image indexing in an image database[5].

Color Correlogram:

The color Correlogram gives features of color information like spatial correlation of pairs of color which can used to describe global distribution of local spatial correlation of colors and distribution of color pixels. In color histogram first and second dimension are color of pixels and third dimension is their spatial distance. It It is simple to compute Correlogram. It is nothing one table indexed by color pairs where i^{th} entry for pixel(x,y) specifies finding pixel of color 'x' at distance I from a pixel of color 'y' in the image.

2. Texture based retrieval

Various texture representation are used in field of computer vision and in pattern recognition. Textures are represented by texels which are then placed into a number of sets, depending on how many textures are detected in the image. Texture is a difficult concept to represent due to presence in many real world images like cloud, bricks, fabric which have textual characteristics.. Texture are broadly categories into structural and statistical texture. Different types of textures are like coarseness, contrast, silky, roughness, regularity and so on. The problem is in identifying patterns of co-pixel variation and associating them with particular classes of textures such as *silky*, or *rough*. Many methods have introduced to extract features from texture. Gabor filter is widely used for extracting texture features from images and shows very efficient results.

3. Shape based retrieval

The shape feature of an object is also have been used in an image retrieval. The shape of on abject is nothing nut binary image representation. Human perception and understanding of objects and visual forms relies heavily on the shape properties. Shapes often be determined first applying segmentation or edge detection to image. Shape features can be divided into two categories, boundary based and region based. Shape descriptors may also need to be invariant to translation, rotation, and scale. There are different techniques like Moment invariants, Fourier descriptor are used for shape. Classical shape representation uses a set of Moments invariants.

Xiang wang [8] proposed new method using exponent moments descriptor and Localized angular phase histogram (LAPH) which is based on Fourier transform that provides efficient accuracy and computational complexity.

Dendsheng Zhang, Alywin Wong [8] used Gabour texture feature of the images for CBIR, applied method on texture image and natural images , Gabor filter used to find texture feature by calculating mean and median. [9] The author were proposed a method using texture and color feature, where firstly RGB components were extracted and discrete Cosine Transform(DCT) used to extract texture feature. Mary, Daisy [12] have proposed method in which Fourier descriptor is used to extract shape feature and used Gabor filter for extracting texture feature and used centroid distance.

4. FEATURE MATCHING

Content based image retrieval calculates the visual similarities between query image and images in database. So the retrieval result is not the single exact image but it can be give list of images having similarities of query which is input. Different ways to show similarities or distance between query image and image in databases may affect the performance of image retrieval. Depending upon the types of signature different types of image similarity measures are used. Most popular measurement is Euclidean distance. Also Mankowski-Form distances, Quadratic form distance, Mahalanobis distance, Canberra distance which can also be used for indexing based on distance between query and images in database[10], Manhattan distance etc. are used to compare result. Histogram intersection is one of way to compare histogram which calculates common part of two histogram.

Performance Measure:

CBIR performance is analyzed by computing the values of precision and recall which helps to improve the result of image retrieval. Precision and recall are calculated for proposed system for finding performance.

Precision: It is nothing but show how many retrieved images are relevant means percentage of retrieved images that are relevant to query.

Recall: It shows that how many are relevant images are retrieved from given databases means the percentage of all relevant images in search database which are retrieved.

5. CONCLUSION

In this paper we provide the overview in the field of Content-based Image retrieval. CBIR has been used extensively in large areas and have much scope for research as it have many techniques. By studying it observe that color based approaches are very common but if more that one features are combined then more

efficient and effective result will produced. Also there are different ways to calculate similarities and indexing retrieved images.

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