ISSN No. 0976-5697

Volume 5, No. 6, July-August 2014

International Journal of Advanced Research in Computer Science

RESEARCH PAPER

Available Online at www.ijarcs.info

IRetrieval : Image Retrieval Based on Color Feature and Texture Feature

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Abstract: Content Based Image Retrieval is an interesting field in the area of Image Processing. It is use for retrieval of images based on its contents i.e. color, texture and shape. In content based image retrieval system an image is provided as a query or input image and similar images are search from the database as an output. These similarities are based on Color of an image, Texture of an image and shape of an image. In this paper, we are proposing a method which is based on color feature of the query image and texture feature of the query image. Color feature extraction is performed by calculating mean value of each color component whereas texture feature extraction is performed using gray level co-occurrence matrix. Visual similarities between query image and database images are calculated by using Euclidean distance measure.

Keywords: CBIR, features, Color, Texture, Euclidean distance, Gray Level Co-occurrence matrix.

I. INTRODUCTION

The Content Based Image Retrieval (CBIR) is a research area due to the enormous increase in digital images in various areas. The content-based image retrieval system is used to retrieve the images stored in the database. It compares the features of the query image with the images which are already stored in the database of images. The CBIR system first extracts the features of query image and then it go through all images in the database and compare the features of query image with the features of each image in the database. The results are the images having features most similar to the features of the query image. Today, in many areas like government, academia and hospitals digital images are being created. But only way of searching these images was using keyword indexing or by simply browsing. Early work on image retrieval can be traced back to the late 1970s. Content-based image retrieval is a technique which uses visual contents to search images from large scale image databases according to users' interests, has been an active and fast advancing research area since the 1990s. It is thought that, the years 1994–2000 are the initial phase of research and development on retrieval of image by content [1] [2]. The rapid growth of the Internet and fast advancement in color imaging technologies has made digital color images more and more readily available [3].

Image retrieval can be grouped into two main types: Text Based Image Retrieval and Content Based Image Retrieval. In the early years Text Based Image Retrieval was popular, but nowadays Content Based Image Retrieval has been a topic of research. Text Based Image retrieval is the traditional image retrieval system. In traditional retrieval systems features are added by adding text strings describing the content of an image. Commercial image catalogues use manual annotation and rely on text retrieval techniques for searching particular images. But the problem with manual annotation is that it is very time consuming and user of Text Based Image retrieval must describe an image using nearly the same keyword that were used by the annotator in order to retrieve the image.

In a content Based Image Retrieval (CBIR) system, features are extracted automatically and there is no manual intervention [4]. CBIR technology is now beginning to move into the market, in the form of commercial products like QBIC [5] and Virage [6]. However, the technology is not yet being used on a significant scale [7].

An image can be represented as a set of visual features like color, shape and texture features. In this paper, we discuss the color and texture features of an image and retrieval of images based on color and texture.

II. COLOR FEATURE EXTRACTION

Color is the most important feature of an image. Several methods are available for retrieving images on the basis of Color similarities. Most of the color images are in the RGB color space. Color features are easily computed from the intensity of the pixel. Color is composed of three different components i.e. Red, Green and Blue color components. We can compute the red, green and blue components by finding mean. We can use the following Matlab command for computing each RGB component and mean of RGB color space.

```
i=imread(img_name);
        R=i(:,:,1);
        G=i(:,:,2);
        B=i(:,:,3);
        Mean_R=mean2(R);
        Mean_G=mean2(G);
```

```
Mean_B=mean2(B);
```

.

III. TEXTURE FEATURE EXTRACTION

Texture is having important information about structural arrangement of surfaces. It is easy to identify texture feature but very difficult define it. Cloud, leaves, fabric, bricks are some of the examples of structure. In this paper we are proposing a way to compute texture feature which uses Gray Level Co-occurrence Matrix (GLCM) method. Gray Level Co-occurrence Matrix (GLCM) is a statistical method used for extracting texture feature from images. In this paper we are computing following important features from Gray level Co-occurrence Matrix. .

A. Contrast:

Contrast returns a measure of the intensity contrast between a pixel and its neighbour over the entire image. It indicates the variance of the gray level. Following is the formula used for calculating Contrast.

$$contrast = \sum_{i=1}^{K}\sum_{j=1}^{K}(i-j)^2\ p_{ij}$$

Contrast is 0 for constant images.

B. Energy:

Energy is the sum of squared elements in the GLCM. Energy is 1 for a constant image.

$$energy = \sum_{i=1}^{K}\sum_{j=1}^{K}p_{ij}^2$$

C. Correlation:

Correlation returns a measure how a correlated a pixel is to its neighbor over the entire image. Correlation is 1 or -1 for a perfectly positively or negatively correlated image, respectively.

$$correlation = \sum_{i=1}^{K}\sum_{j=1}^{K}\frac{(i-m_r)(j-m_c)p_{ij}}{\sigma_r\sigma_c}$$

$$\sigma_r \neq 0\ ;\ \sigma_c \neq 0$$

D. Homogeneity:

It returns a value that measures the closeness of the distribution of elements in the GLCM to the diagonal of GLCM. Homogeneity is 1 for a diagonal.

$$homogeneity = \sum_{i=1}^{K}\sum_{j=1}^{K}\frac{p_{ij}}{1+|i-j|}$$

E. Entropy:

Entropy is a measure of randomness. It measures the disorder of the image or the loss of information.

$$entropy = -\sum_{i=1}^{K}\sum_{j=1}^{K}p_{ij}\log_2 p_{ij}$$

Following Matlab code can be used to compute above mentioned features.

```
i=imread(img_name);
i=rgb2gray(i);
i1=imresize(i , [128 128]);
glcm=graycomatrix(i1);
s=graycoprops(glcm);
e=entropy(glcm);
```

IV. SIMILARITY COMPUTATION

In this paper, the similarity features between query or input image and database image are computed using Euclidean distance.

V. EXPERIMENTAL RESULTS

A database is having various different types of images. The relevant images from the database are retrieved based on color feature and texture feature.

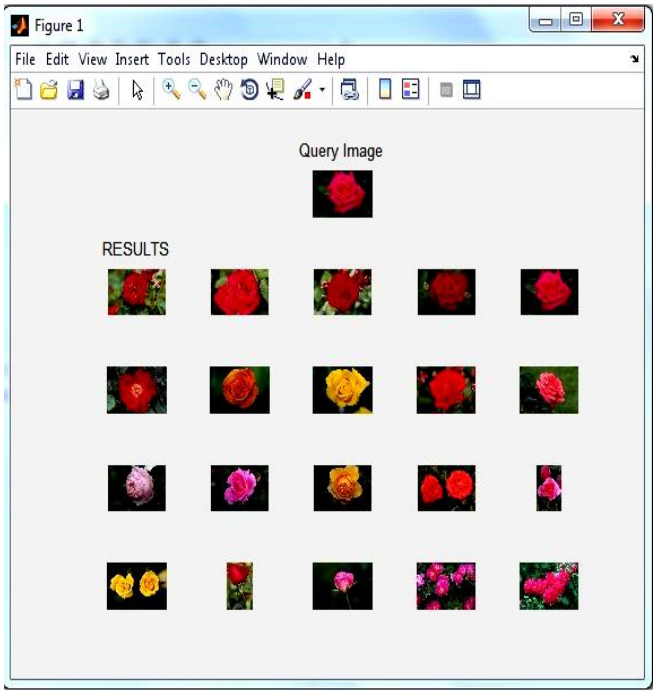

Figure 1: Retrieval result based on Color features

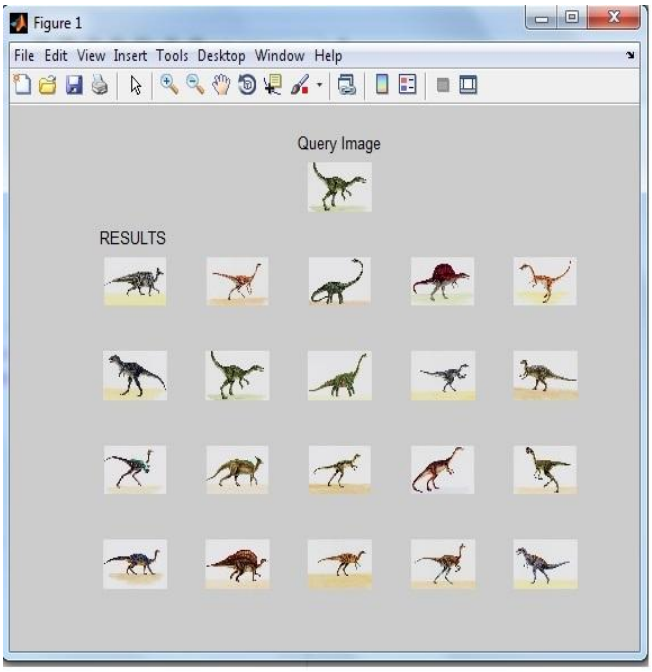

Figure 2: Retrieval result based on Texture feature

VI. CONCLUSION

By considering the visual features of an image, we can eliminate the limitations of Text based image retrieval. A query image is provided as an input to the Image Retrieval System and numbers of visually similar images are produced as an output from the image database. The image features like color mean and texture features are considered for extracting visually similar images. The result accuracy can be improved by extracting another different image features.

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