CONTENT BASED IMAGES RETRIEVAL BASED ON FEATURES OF TEXTURE AND COLOR STRING

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ABSTRACT

We propose a practical image retrieval scheme to retrieve images efficiently. We succeed in transferring the image retrieval problem to sequences comparison and subsequently using the RGB color sequences comparison along with the texture feature of Gray Level Co-occurrence matrix to compare the images of database. Thus the computational complexity is decreased obviously. Our results illustrate it has virtues of both the content based image retrieval system and a text based image retrieval system. Experimental results reveal that proposed scheme is better than the conventional methodologies.

KEYWORDS—RGB color space, Gray Level Co-Occurrence Matrix, Color Sequence Coding.

1. INTRODUCTION

The tremendous growth of digital image and video on internet, so the traditional text-based retrievals based on keywords are not sufficient to resolve image retrieval. Content-based image retrieval is a technique of computer vision to solve the problem of image retrieval from large-scale image databases based on user’s query [1][2][3][13]. The CBIR system retrieve relevant images from images database by the means of derived features to enhance the accuracy and efficiency of image retrieving. Multimedia data such as image and video has been widely spreading on account of internet prevalent. In the recent years, Content-based image retrieval (CBIR) has been an active research area in image processing. Content-based image retrieval has many application areas such as, architectural design, education, commerce, military, medical diagnosis, biomedical and web image classification. The tremendous growth of digital image and video on internet, so the traditional text-based retrievals based on keywords are not sufficient to resolve image retrieval. CBIR can greatly enhance the accuracy and efficiency of retrieving and managing the data of image. CBIR manipulate on different principles from keyword indexing. Some commercial CBIR systems are now available. The CBIR system like IBM’s QBIC[1][2][5][14], based on distribution and characteristics of colour, shape, texture, sketch and example to retrieve image. Chabot system employs text along with color histogram and integrates a relational database to retrieve image. VisulSEEK system developed at Columbia University Center for Telecom Research, employs color percentage from color and spatial layout region of colors to retrieve image. The features of content-based image such as color, shape, texture and outline are used for image retrieval. texture and outline are used for image retrieval. Among these features, color is an important feature in CBIR, which is invariant on size, orientation and complexity. In this paper, we proposed the novel feature extraction technique using color sequence of RGB color space associate with the retrieval features of GLCM to compare the images of database for image retrieval.

II. RGB COLOR SPACE

A color space is a multidimensional space in which the different dimensions represent the diverse components of color[12]. The color feature is one of the most widely used visual features in image retrieval in virtue of its easy and fast computation. The color histogram is one of the most commonly used color feature representation in image retrieval. It consists of three primary colors Red, Green and Blue. The range of values of each of this components lies within 0 to 255.. We proposed an efficient scheme to retrieve images. First of all to resize all images to 20x20 pixels normalized size. We resize all images to reduce the effects of variation in size, and accelerate the speed. Since the images are allowed to have different sizes, so all images are normalized to a standard size (i.e. 20 × 20 pixels) in this step. Since RGB color space is a 3-dimensional vector space and each pixel, p (i), is defined by an ordered triple of red, green, and blue coordinates. Herein, all frames of image are resized by the bicubic interpolation technique. We realize that the values of r, g, and b are totally different with the altered illumination conditions. However, the relative values between r (i), g (i), and b (i) are very similar. Moreover, the number...
of the permutations of R, G. Since RGB color space is a 3-dimensional vector space, and each pixel, p (i), is defined by an ordered triple of red, green, and blue coordinates, (r (i), g (i), b (i)), which represent the intensities of red, green, and blue light color respectively. We realize that the values of r, g, and b are totally different with the altered illumination conditions. However, the relative values between r (i), g (i), and b (i) are very similar. Moreover, the number of the permutations of R, G, and B is only 6 (RGB, RBG, GRB, GBR, BGR, and BGR). We append white color series and black color series to let them become 8 series. We utilize 8 rules to transfer each image to a color chain as below:

1. if a pixel 235 =< r (i) =< 255, 235 =< g (i) =< 255, and 235 =< b (i) =< 255, then assigns the pixel as 'W'
2. if a pixel 0 =< r (i) =< 20, 0 =< g (i) =< 20, and 0 =< b (i) =< 20, then assigns the pixel as 'K';
3. if a pixel r (i) > g (i) >= b (i), then assigns the pixel as 'R'; (the first series of "Red" colors)
4. if a pixel r (i) >= b (i) > g (i), then assigns the pixel as 'G'; (the first series of "Green" colors)
5. if a pixel g (i) > r (i) >= b (i), then assigns the pixel as 'S'; (the second series of "Red" colors)
6. if a pixel g (i) > b (i) >= r (i), then assigns the pixel as 'H'; (the second series of "Green" colors)
7. if a pixel b (i) > r (i) >= g (i), then assigns the pixel as 'B'; (the first series of "Blue" colors)
8. if a pixel b (i) > g (i) > r (i), then assigns the pixel as 'C'; (the second series of "Blue" colors)

III. CO-OCCURRENCE

Gray Level Co-Occurrence Matrix (GLCM)[9][10][11] proposed by Haralick [8]. We proposed scheme based on both the features of color and texture to combines a color sequence coding and GLCM instead of the single feature of image information which is not easy to get the comprehensive properties of the content of image) can determine properties about the spatial distribution of image whose elements are the relative frequencies of occurrence of grey level combinations among pairs of pixels in the texture. GLCM creates a co-occurrence matrix by calculating how often a pixel with the gray-level value i occurs in a specific spatial relationship to a pixel with the value j. Texture features are then extracted from the statistics of this matrix. GLCM of an image is computed using a displacement vector, defined by its radius ranging from 1 to 10 and orientation for every pixel of eight adjacent pixels offering eight choices of 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°. It is composed of the probability value, which describes the probability of a pair pixels (i, j) at direction θ and the distance d. It is defined by p(i, j | d, θ). In order to estimate the similarity between different gray level co-occurrence matrices, We employ four statistical features GLCM statistical measures namely Energy, Entropy, Contrast and Homogeneity.

Energy is a texture measure of gray-scale image represents homogeneity changing, reflecting the distribution of image gray-scale, the sum of squared elements or angular second moment, a measure of textural uniformity of an image. Energy gives the sum of squared pixel values of GLCM as defined in eq. 1

\[
\text{Energy} = \Sigma_i \Sigma_j P(i, j)
\]  

Entropy, as defined in eq. 2, measures the disorder of an image and it achieves its largest value when all elements in P matrix are equal. When the image is not texturally uniform many GLCM elements have very small values, which imply that entropy is very large

\[
\text{Entropy} = \Sigma_i \Sigma_j -P(i, j) \log P(i, j)
\]

Contrast, as defined in eq. 3, gives the local variations in GLCM, is the difference moment of P matrix and it measures the amount of local variations in an image

\[
\text{Contrast} = \Sigma_i \Sigma_j (i-j)^2 P(i, j)
\]

Homogeneity, as defined in eq. 4, homogeneity is the closeness of distribution of elements, measures local changes in image texture number. p(i, j) is the gray-level value at the coordinate (i, j). Determined value that measures the closeness of the distribution of elements

\[
\text{Homogeneity} = \Sigma_i \Sigma_j \frac{1}{1+(i-j)^2} P(i, j)
\]

IV. PROPOSED METHOD-

We propose a scheme which combined features using color and texture features and address the unique algorithm to extract the color pixel features by the RGB color space and the texture features of GLCM. First of all to resize all images to 20x20 pixels normalized size. For each color’s scope of images is nonuniform, the three primary colors of R, G and B possess more scope than the other colors, we segment the scope of the hue which the components of RGB color space into six nonuniform classes including
three primary color and the scope interposed between two primary colors, each class depending on the value of saturation of the components of RGB color space divides two subclasses along with the color of “white” and “black” according to the value on saturation and value of the components of RGB color space, the total is 14 classes. Each pixel of the images from query and database assigned the quantized color code. Compare quantized color code between each pixel of three components of RGB color space of the images (20x20 pixels) from query and database, we obtain the weight of the quantized color code has compared. Sort the weight value of similarity feature vector and the retrieval images are presented if searching is completed. The weight value between two retrieval features adjusted on account of two characteristic combined features which include RGB color space and GLCM features. The ratio of 65 to 35 between the similarity measurement of RGB color space and the GLCM obtained better performance through experiments. Finally sort the weight value of similarity feature vector and the retrieval images are presented if searching is completed. The performance of an information retrieval system can be measured in terms of its recall and precision. Precision is the fraction of retrieved documents that are relevant. Recall in information retrieval is the fraction of the documents that are relevant to the query that are retrieved correctly.

V. RESULTS AND CONCLUSION

We proposed and address the unique algorithm to extract the color pixel features by the RGB color space and the texture features of GLCM instead of the single feature of image information which is not easy to get the comprehensive properties of the content of image. The RGB color space and the GLCM features are extracted and compared with the features of the images in the database if querying images. Both color and GLCM features of querying images are compared with the color and GLCM features in the database. The experimental database contains 1200 images including animals, sceneries, plants and flowers taken from internet and 1000 test images from SIMPLicity paper [6] of Wang’s image database showed as figure 1. Compare the proposed scheme showed as figure 2 and the scheme[4].showed as figure 3., the retrieval results obviously different for the same query image. The outcome of the experiment can be achieved by the scheme we proposed. Our results illustrate it has virtues both of the content based image retrieval system and a text based image retrieval system. Experimental results reveal that proposed scheme is better than the conventional methodologies.

![Fig.1 Wang’s image database](image1)

![Fig.2 Retrieval result based on proposed scheme.](image2)

![Fig.3 Retrieval result based on the scheme[4]](image3)
REFERENCES


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