COLOR AND SHAPE BASED IMAGE RETRIEVAL

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ABSTRACT

Feature extraction is a key issue in content-based image retrieval (CBIR). There are number of features which we can use in image retrieval technique. The classification includes low level features, Spectral features and Spatial features. Out of these, low level features of image can be visualized by neked eyes [6]. Therefore, in this paper the color and shape features are compared for image retrieval system. Out of this Color is most dominant and distinguishing one of all features the reason behind this is human perception system can easily distinguish between colors. When the color features gets combined with shape features it will give good image retrieval result.

KEYWORDS: Image Retrieval, CBIR, Texture

INTRODUCTION

Nowadays, due to the availability of large storage spaces, huge number of images have been produced and stored around the world. With this huge image database, people want to search it and make use of the images in it. Here comes the challenge of image retrieval and researchers try to find out accurate ways of searching images. Basically, images can be retrieved in two ways, firstly, text based, and secondly, content-based or query by example based. Text based image retrieval approach is very well known and widely used [7]. In this process users are provided a text area to enter the key words on the basis of which image searching is done. It is widely used in Google web based image searching technique. Though the concept is very familiar to us, this approach has two notable drawbacks. (1) The images in database are annotated manually by annotators using key words, which is a very time consuming process [1] for a large database. (2) The retrieval solely depends on the human perception based text annotation as shown in fig 1.

As shown in this figure 1, the forth image is not the image of rose then also it is retrieved because it is annotated by name ‘Rose’. So, this is the biggest disadvantage of text based image retrieval system. The consequence is that there is significant inconsistency in understanding of image content by different annotators, for ex. An image containing grass and
flowers can be annotated as ‘grass’, ‘flower’ or ‘nature’, so the key words vary a lot and retrieval results are usually very poor.

To avoid the above mentioned problem, the second approach, Content-based image retrieval has been proposed by researchers. The term CBIR seems to have originated in the early 1990’s [1]. Since then it is an ongoing process. Different from text based image search, CBIR techniques use low-level features like texture, color, and shape to represent images and retrieves images relevant to the query image from the image database[8]. Among those low level image features, color feature has been shown very effective and subjective as human perception system can easily distinguish between colors. A variety of techniques have been developed for extracting texture features. The Color Selection exploited CBIR system [3], facilitates query-by-color. It is based on 11 color categories, used by all people, while thinking of and perceiving color. Then the low frequency DCT coefficients that are transformed from YUV color space as feature vectors are used for retrieval of images [4]. This system allows users to select its dominant feature of query images so as to improve the retrieval performance. But the technique is sufficient for performing effective retrieval by introducing users' opinions on the query images [9].

In this paper, a new color and shape based image retrieval technique is proposed. This technique combines advantages of both color-based image retrieval and shape-based image retrieval. In this paper we describe theory and implementation of technique with algorithm for color feature extraction and shape feature extraction.

The rest of paper is organized as following. In section II, we describe block diagram of system. In section III, Feature extraction algorithm is described. Advantages, disadvantages and applications will be shown in section IV. Section V concludes the paper.

**BLOCK DIAGRAM OF SYSTEM**

![Figure 2: Overall System Configuration[11]](image-url)

This system be formed 4 steps propose, preprocessing, extract of feature, store information of image and retrieval the Image. We used CSS (Curvature Scale Space) and HSI (Hue, Saturation, Intensity) to extract the feature points [10]. On pre-processing, implement the Image processing for next step. Extract the RGB of pixel color information for color feature and the gray-level of pixel information for shape feature. On extract of feature, can extract feature of visual, this is retrieval. This is consisting of vector of feature that base on the retrieval similarity measure from color and shape. Extract process of color information show up the progress that transfers from original image data RGB value to HSI value (as there
is the flexibility to represent in the 2-D format)[5]. On extract of shape, one of step for can get the CSS Image, extract edge after transfer inputted color image to gray-level (to eliminate high intensity values and deviation of the shape). Here every object is represented in x and y coordinates of its boundary (binary images) points. Obtain the CSS image after extract contour by progress of contour tracking (smoothening of edges) then, remove the noise by clustering (technique for statistical data analysis used to extract meaningful information). On storage information of image, efficiently can be storage and management the feature information of image and, store the vector and linked image file though the indexing progress on an image. Then, as last step, retrieval progress of image and measurement of similarity, extract and show up the best of quality. For example, user query by example image to here, first time extract maxima coordinates value store from between vector of feature and image database then, compare the vector with the CSS image of query image. After output the image follow the top priority.

**FEATURE EXTRACTION ALGORITHMS**

**Color Feature Extraction Algorithm**

1. Input Query Image.
2. Call ‘cal histogram’ function and get an hsv converted output along with histograms plotted as given below
a. Take Query Image in RGB. Using ‘input’ function ( input(enter query image, s) )

b. Change RGB to HSI using 'rgb2hsv' function, ( rgb2hsv(query image) ).

The calculations for HSI is done using

\[
H = \begin{cases} 
\theta & \text{if } B \leq G \\
360 - \theta & \text{if } B > G 
\end{cases}
\]

\[
\theta = \frac{1}{\omega_0} \left( \frac{1}{2} \left( \frac{B - g}{B - g + B} \right) \right)
\]

\[
I = \frac{1}{3} (r + g + b)
\]

\[
S = 1 - \frac{3}{(r + g + b)} \left[ \min(r, g, b) \right]
\]

c. For histogram calculation take size of HSV image, ( [M,N,ttt]=size(hsv image) ).

d. For plotting histogram keep range as 0-1 in steps of 0.1, and plotting is done.

e. Plotting is done by calculating the variables for histogram function by rounding off the HSV values.

3. Calculate length of histogram for training samples (in order to give same length for database images).
4. Upper and Lower Threshold values.
5. Apply Limits for mesh grid with range of 0-1 in steps of 0.1 and 0.05.
6. 3-d interpolation for query image. The Interpolation is done by using the function ‘interp3’.
7. Interpolation means, to Calculate value of a function between the values that are already known.
8. Now the Histogram Interpolation is done for query image and database images, by initializing threshold values as 0.01 and 0.8.
9. In the above two equations, first equation- calculates the difference between query image and database image histograms. While the second equation takes the color histogram intersecting with histogram intersection difference giving out the HSI values.
10. Go for all database images, and perform interpolation of each image in database with length equal to T samples.
11. Calculate Absolute value of query and database interpolated values using the given formulae as in variable ‘fine’.
12. Apply Lower Threshold for fine Variable output.
13. Store the upper threshold applied value as fine2.
14. Compute Similarity Measure using mean and length of the 2 threshold applied output.
15. Plot the similar Images and store it in other folder ‘shape’. Rename the query image as s2.jpg.
16. Call the Shape Feature.

**Shape Feature Extraction Algorithm**

1. Take Query Image in RGB. Using ‘input’ function ( input(enter query image, s) )
2. Change RGB to Gray level using ‘rgb2gray’ function, ( rgb2gray(query image) )
3. Convert gray level values in binary by calculating threshold for gray image using ‘graythresh(grayimage)’
4. Binarising is done using ‘im2bw(gray image)’.
5. Edge detection is done using function ‘edge(double(bw),’sobel’))’. Apart from edges we need to lines and disks (eg. leaf)

![Figure 5: Shape Extraction Feature](image)

1. Contour tracking is done by using Circularity formulae,

\[
\text{Circularity} = \frac{(\text{border length})^2}{\text{area}}
\]

2. Combine both edge and lines part using ‘imdilate’ function (imdilate(edge,strel)).

ADVANTAGES, DISADVANTAGES AND APPLICATIONS

Advantages
- As color is most dominant and distinguishing one feature of images it gives better retrieval results.
- The method is simple compared to Spectral and spatial analysis.
- By considering shape features of image in addition with color it provides better results.

Disadvantage
- For black and white image this system fails.

Applications
- Crime prevention
- Intellectual property
- Architectural and engineering design
- Medical diagnosis
- Cultural heritage
- Web searching

CONCLUSIONS

The footnotes are used like in this example. Color information on some of information by image makes usefulness but, as weakness of color information is that can search the similar color range, different image. On existing experiment, present method image DB retrieval by Image information [12]. But, as new trend experiment, put to practical use Image by the space information. This paper proposes that get the single shape-feature then, increase to the complex shape feature. A result of experiment, more get the accuracy 656 compare of single feature use and, get the accuracy result on rotation-
transition. Study the more result by some of feature like a color, shape and texture and, need to get quick retrieval and accuracy that method of figure up the similarity and improve method of store to DB.

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