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Preprocessing and Similarity Matching Trademark Images Based on Color and Shape

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Abstract: ***The basis of presenting this paper is the retrieval of images based on the color components presented in the query images and similar outer shape. Paper presents matching assessment of BMP images of trademark images by using color and shape. Trademark and logos are very important for product and services in the form of brand. For recognition in overall market companies are front of each other for establishing their name in global market.***

Keywords: CBIR, Curvlet feature, Region props, Curvelet coefficient, Mean curvature**.**

1. Introduction

Automatic image retrieval based on some similarity either by color or shape or both on trademark images has gained a significant recognition in worldwide business development and research area because they are exclusively prepared sign or marks to recognize a particular product or brand and define not only the attractive feature of products but also the position and status of companies [5]. Trademark for any organization play a significant and vital role in current market of developing world [5]. A company's trademarks are a essential element of its industrial property, similar trademark images arise doubtful case in identification. The logos images are remarkable things in world's largest business and trade applications.[5] A Trademark can be design of a small image, simple graphics, unique texture and combination of text and figures.

In this present age, all fiels of people's life like architecture, academics, hospitals, crime prevention, surveillance, fashion, engineering including commerce, and historical research use difference different images for reliable and best services [6]. A database of images is a collection in which image data are integrated and stored [6]. Registration of trademark images and its evaluation for particularity is thus becoming very heavy task for registration offices.[8]

The number of registered trademarks images keeps growing rapidly. Several trademarks for several brands and company already designed and registered in trademark registration office. So protecting a newly introduced trademark for any new or existed organization without infringement of the copyright is really very fractious task. The image retrieval techniques characterize images databases based on the some property such as color, shape, texture and object. The most important hindrance in image retrieval is in what way we determine strong features in order to gain more efficient and robust retrieval results.

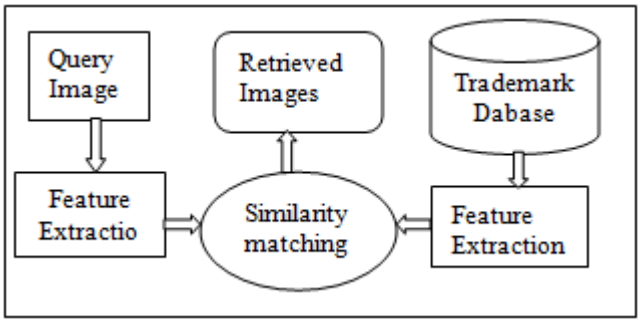

Figure 1: Basic Diagram for Trademark Retrieval System

In this paper we are working on color and shape. Colors are the basic characteristics of the images through which we can identify an image. In image processing colors are used in because they provide strong descriptors that can be used to determine and extract objects from a scene .Our eyes are sensitive to colors, and color features enable human to discriminate between objects in the images or different images from dataset.

Color property of an image provides influential information, and they are very effective for retrieval. Many techniques can be used to describe color feature such as color histogram of an image, color moments, scalable color descriptor, color structure descriptor [6]. Basically, color features are explained in three dimension color space [5]. In digital image purposes, RGB color space is the most popular. The main defects of the RGB color space is that it is perceptually non-uniform[6]. The HSV color space is an perceptive system, abstracts color by separating it from saturation and pseudo-illumination so this makes it good for real world application which describes a specific color by its hue, saturation, and brightness values .

2. Existing Trademark Retrieval Methods

A significant work has been done in the field of trademark images retrieval systems. The three most popular trademark retrieval systems are STAR , TRADEMARK and ARTISAN[8] . TRADEMARK system of Katos explain the image content automatically with the help of Graphical

features. STAR system proposed by Lam et al. used image retrieval techniques that mainly focus on both spatial layout and shape of image to determine the similarity between images[8]. Eakins developed ARTISAN, focuses on device-only marks images which contain graphical designs or figures and uses methods based on Gestalt psychology for matching of similar looking trademark imges.[8]

Many papers have been explained the concept of color and shape based retrieval . So for color many researcher used histogram and color autocorrelogram so in this paper researcher uses three feature extraction techniques i.e. Image color histogram for color based retrieval, image color coherence vector values for texture extraction of an image and Image edge detection using sobel edge detection technique for shape [3].

In this paper author is using wavelets image processing techniques used the curvature estimation of extracted shapes and contours and provide solution to the problem of measuring the similarity of trademarks images.[2]

In this paper, author proposed combine approach color, shape and texture features for content based image retrieval. In this approach investigated several feature extraction methods with several learning algorithm, used suitable extraction technique in color, shape and texture feature and choose 5-Nearest Neighbour as the learning algorithm [1].

This paper develops a hybrid content based trademark image retrieval system using region and contour features. The region features for any images are retrieved from a series of concentric circle and the contour features are determined by detecting the corners based on an enhanced SUSAN algorithm and the corner-tocentroid triangulations are used as the features [15].

In this paper, researcher propose a Color- Texture Based Retrieval System .The algorithm implement a general color-based search in trademark image dataset for query image, using Conventional Color Histograms (CCH).After that it extracts the similar images from image dataset by Quadratic Distance Metric [9].

So here some previous methods and techniques are discussed, which was used or implemented earlier. All the algorithm and techniques have some good advantage and provide good results.

3. Methodology or System Architecture

There So in paper there are different steps for define the work flow of the system start with the image processing . We start the processing and refining image dataset that we are using in our research. And one by one doing the entire step finally we get the result. So there are different steps describing as below

3.1 Trademark preprocessing

In order to conveniently compare with various different size images and consider the computer's speed, the size of all these images should be limited within 256*256 pixels. First, it's necessary to choose a proper color space to express a color trademark image HSV color space, which consisted of Hue, Saturation and Value, is much closer to human visual feelings. Value. Hue and saturation together refers to as chroma. HSV space is more easily acceptable and more intuitionistic. Therefore, RGB space is frequently transformed to HSV space as follows.

3.2 Color Feature Extraction

The theory of color feature extraction from digital images mainly depends upon the color representation, its space selection and quantization.

The most common color space is the RGB color space in which color are represented as combination of three colors namely Red (0-255) , Green (0-255) and Blue(0-255).which is the primary colors of this model. In this model desired colors can be produced by adding them together.

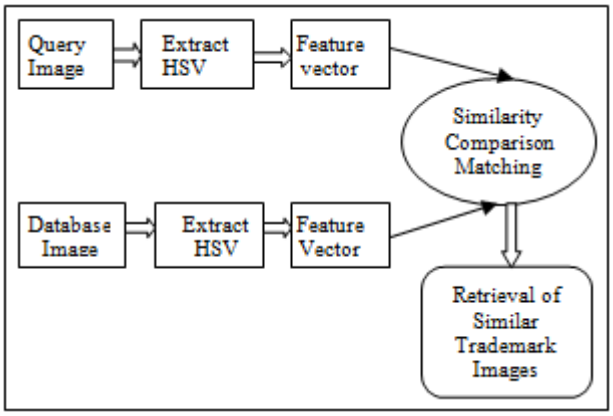

Figure 2: Proposed Approach For Color Retrieval

3.1 HSV Color Model

a) HSV color model stands for " Hue Saturation Value" model this model mainly deals with luminance.[4]
b) Hue – represents dominant wavelength in light and color
c) Saturation - represents intensity of color and the amoun of Color mixed with white.
d) Value –represents brightness or intensity of color and the amount to which that respective color is mixed with black.

3.2 Quantization Of Color Space

Quantization is the process of reducing the numbers of colors by putting similar color in the same[1] .For this we are using histogram to find out this. Normally, quantization reduces computational and comparison time of color feature. Since, in the proposed work first of all we convert RGB color space into HSV color space so we are cosidering quantization on the basis of number of bins. Here we are using totally 256 bins for very large color components and to give better results.

3.3 Converting RGB to HSV Color Model Color

HSV color are said to lie within a triangle whose vertices are defined by three primary colors in RGB which is obtained by finding the difference between the histogram and number of pixel counts as per requisite.[4] In general , color descriptor can be determined by color histograms, color coherent vector etc. and used for cbir According to performance of color histograms which represent the number of pixels that have colors in each range and the superior one is compared.

3.4 Euclidean Distance Measurement

It measures the similarity between the two different feature vectors [4]. Similarity comparison and matching procedure should be done using euclidean distance.

$$\text{Euclidean distance} = \sqrt{\sum} [Qi-Di]^2 \quad \ldots.(1)$$

$\sum = 1,2,\ldots.n$

For 0 finding color co-occurance matrix , here we are using dicrete wavelet transform method for matching the retrieved input/ query image matrix to the store database by dividing and segmenting into four segmented top left, top right bottom left and bottom right.

4. Shape Feature Extraction

In past many methods used for shape based retrieval of images .Now we are presenting our method for shape based trademark retrieval. Following steps are present in our proposed work.

Step.1- Extract HSV find histogram.
Step.2- Curvlet feature vector and finding the mean curvature.
Step.3- Edge detection by canny edge detection (matrix edges) and finding the region props using centroid and area for similarity matching.
Step.4- Indexing and retrieval on the basis of query image for requisite shape once at a time.
Step.5- Results of retrieved images on the basis of process.

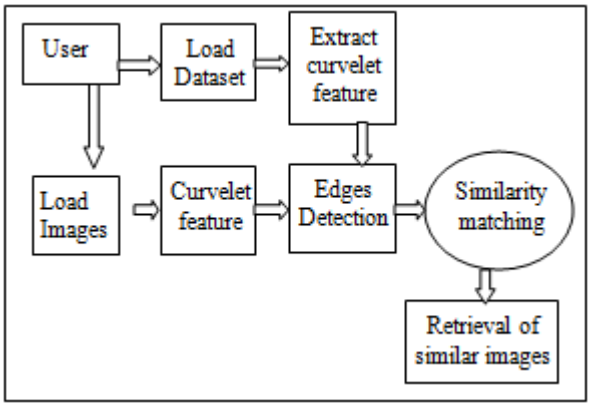

Figure 3: Proposed Work for Shape Retrieval

The theory of shape feature extraction mainly depends on the boundary region or region props of the shape, its features and curvature. Shape may be recognize in any form like circles, ellipse and square. For the propose work, here we use HSV methods & histogram to find the pixels range of the images. We use curvelet feature (**to extract curvlet coefficient and it's feature on the value of matrix size using mean function**) and boundary region for finding and compare the similar shape of the images from the database.

For finding shape cooccurance here we are using curvelet features and its coefficient wrapping for finding horizontal and vertical wedges **(bounded region captured when we find out edges)** or co-ordinates of the image matrix. Finally, we quadratic distance for measuring various features vector on the basis of edge and similarity comparison. And matching procedure would be done.

$$d^2 = (HQ - HI)(HQ - HI) \ldots\ldots(2)$$

The formula represents three terms. The first term determines the difference between color histograms **H** of images or it define number of pixels differences in each bin. The total number of bins in a histogram is calculated by number of vector column. The term **t** is vector transpose. **A** the another term is the Similarity matrix. Color distance between the two images is represented by **d.** If the images are similar then the distance would be zero closer to zero. Images with high distance are not similar.[9]

5. Experimental Result

Numbers of steps for extraction of images depends on color similarity are being used. Each image put in to the database is analysed and a color histogram is calculated which shows the number of pixels of each color within the image. Then this color histogram for each image is stored in the database. The matching process then retrieves those images whose color histograms match those of the query most closely.

We choose the dataset of different images of different color and shape provided by trademark registration office for testing our proposed method. In database, there are 70-80 images are present in the dataset. Our techniques to finding similar images are executed on Matlab system. Each trademark image went through the new approach to retrieve the color and shape feature. Now our System is ready for testing and extracting similar images based on color and shape.

For color retrieval here we are showing some result of images that are retrieved after similarity matching. In this we give a query image from the given dataset and after that our system searches most similar image of same color. Here some result on image retrieved of red color and white color .

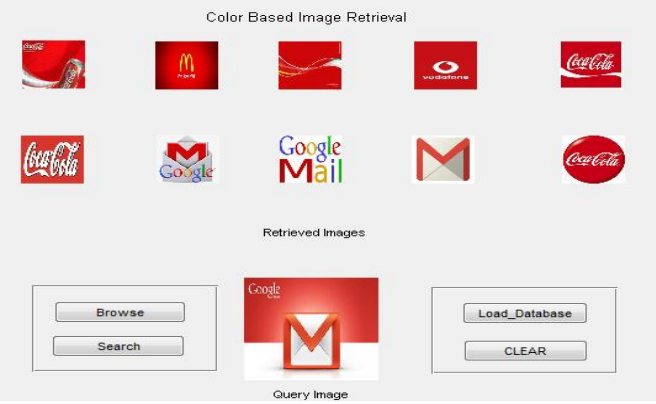

Figure 4: Image Retrieval Based On Similar Color

Figure 5: Snapshot for Circle Shape Image Retrieval

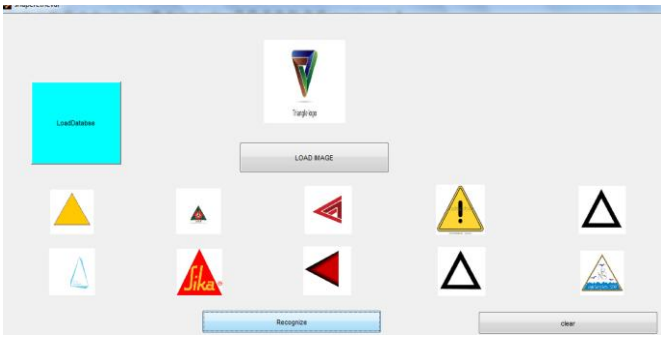

Figure 6: Snapshot for Triangle Shape Image Retrieval

Figure 7: Snapshot for Rectangle And Similar Shape Image Retrieval

6. Conclusion

Although CBIR has been a very active research area since 1990's, many challenges are issued because of the complexity of image data . most of the people have been completed to design some methods that deal with some difficulties and obtain the accuracy when extracting images and differentiating between them. Many previous methods use images to calculate features and use their features for similarity measurement. This paper proposes a new CBIR approach that uses the combination of HSV color space .Experimental results for query images showed that the proposed method has higher retrieval accuracy than previous methods. Because the method uses multi-features, which make use of each feature's unique advantages. In the future, we will focus on proposing a new method that combines the color and shape features with the texture feature to represent the complete image other than the trademark and logo images. Our approach will provide satisfactory results.

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