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Color Matching of Images by using Minkowski-Form Distance

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Abstract- Content-based image retrieval (CBIR) is an important issue in the computer vision community. Color feature is one of the most important visual feature in CBIR. It is very difficult to recognize object from only shape feature because without color a shape of object looks like many other different objects, so there is need of other features like color. Using both features color and shape we can recognize object efficiently. Color histogram is widely used for image indexing in content-based image retrieval (CBIR). In this paper, we propose color histogram for different eight colors i.e. Black, White, Red, Green, Blue, Yellow, Magenta and Cyan to increase the efficiency of proposed algorithm. The distance between different histogram of the query image with the corresponding histogram of database images are calculated by using Minkowski-Form Distance. Experiment results prove that the CBIR using our new measure has better performance.

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I. INTRODUCTION

As processors become increasingly powerful, and memories become increasingly cheaper, the deployment of large image databases for a variety of applications have now become realizable. Databases of art works, satellite and medical imagery have been attracting more and more users in various professional fields like geography, medicine, architecture, advertising, design, fashion, and publishing. Effectively and efficiently accessing desired images from large and varied image databases is now a necessity. One of the most important features that make possible the recognition of images by humans is color. Color is a

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property that depends on the reflection of light to the eye and the processing of that information in the brain. Usually colors are defined in three dimensional color spaces. These could either be RGB (Red, Green, and Blue), NTSC, YCBCR, HSV (Hue, Saturation, and Value) or HSB (Hue, Saturation, and Brightness). The last two are dependent on the human perception of hue, saturation, and brightness. Due to advances in internet and image databases, Content Based Image Retrieval (CBIR) has become a challenging research area. In CBIR paradigm[1] images are automatically indexed using visual contents of an image which are mainly color, texture and shape. These visual features are useful in characterizing an image[2] although they can't capture any semantic information of an image. Content-based image retrieval plays a central role in the application areas such as multimedia database systems in recent years. The work focused on using low-level features like color, texture, shape and spatial layout for image representation. Among all the visual features, color is perhaps the most distinguishing one in many applications. It may be represented by a color histogram [3], color moments [4], color correlogram [5].

In this work we are used Micro-Soft image database. This image database free available for academic and research purpose only, we mentioned in references [6] the link of(also segmented or pixel labeled) image database.

II. MINKOWSKI-FORM DISTANCE

If each dimension or image features vector is independent of each other and is of equal importance, the Minkowski- form distance L_p is appropriate for calculating the distance between two images., Let $D(I, J)$ be the distance measure between the query image I and the image J in the database; and $f_i(I)$ as the number of pixels in bin i of I . This distance is defined as:

$$D(I, J) = (\sum |f_i(I) - f_i(J)|^p)^{1/p} \quad (1)$$

When $p=1, 2, \dots, \infty$, $D(I, J)$ is the L_1, L_2 (also called Euclidean distance and L_∞ distance respectively. Minkowski-form distance is the not widely used metric for image retrieval.

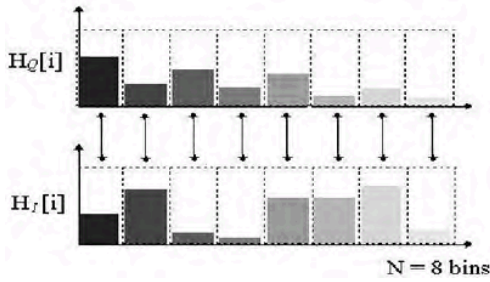


Fig.1 Histogram of Minkowski-form distance

Where H_0 is histogram of query image and H_1 is histogram of database image[10].

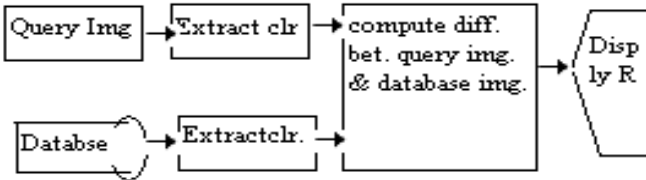


Fig.2 Block Diagram of Image Retrieval system

III. EXPERIMENTATION

When we take query image, convert color map into HSV. Then separate the pixels of each eight color for histogram of query image. Then do the same process for database image and then by using above equation compute the difference between the two histogram for eight color of query image and first database image then compute the sum of the difference of the eight colors, in this way you get one (first database image) difference. In the same way compute the n differences for n database images and retrieve ten images which has smallest difference.

a) *Algorithm*

- A. Read Query Image.
- B. Convert color map into HSV map and Separate each pixel of the image for eight colors (bins). [i.e. color feature extraction].
- C. Take first image from database, convert color map into HSV color map and separate each pixel of the database image for eight colors (bins). [i.e. color feature extraction].
- D. Calculate the difference of pixels for each color by using equation – 1. [comparing color features of query image and database image].
- E. Display images which has minimum distance. [display better color matching images, i.e. closest to query image].
- F. *Your Sub Section heading here here here*

b) *Experimental Results*

For this experiment we used Micro Soft research database which is free for academic research purpose. This database also contains pixel labeled images. To evaluate the test results we use the values precision rate and recall rate are defined as follows
 precision = number of relevant images selected / total number of retrieved images
 recall = number of relevant images selected / total number of similar images in the database.



Fig.3 Retrieved Images and upper side of images shows the difference in pixels

$$\text{difference} = \frac{\text{query image pixel} - \text{database image pixel}}{\text{total number of pixel in image}}$$

| Retrieved Images | Difference with Query Image |
|------------------|-----------------------------|
| 1 st | 36800 pixels |
| 2 nd | 39206 pixels |
| 3 rd | 39934 pixels |
| 4 th | 43254 pixels |
| 5 th | 43816 pixels |

Table 1 Shows differences of retrieved images with query images in pixels

IV. CONCLUSION

Here we propose eight bin histogram of eight colors for retrieve similar color images using Minkowski-Form Distance. Also we can use more than eight colors but the computation is slow when we increase color. There are different techniques for calculating histogram as mentioned above. HSV color space is similar to human perception color system so here we propose HSV color space for histogram. In place of Minkowski distance we can use Quadratic Distance approach.

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