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Image Retrieval from Database using Different Image Features

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Abstract— Image retrieval from the database is emerged due to the increased growth in number of images and also the application in several fields. Color, Edge, Texture, Contour, Autocorrelogram, Color Moments, Gabor wavelet are the some of features that represent the images and also these features are utilized for indexing of image. These features are seen as global and local. Gabor wavelet is used to extract texture feature. These features are referred as local features of an image. Color component is also a one of the feature called as global feature.HSV color model is used in this paper. Matching algorithm is used to match similarity between features stored in the database and query image features. The paper deals with image retrieval from the database using combined feature. Columbia Object Image Library (COIL) is a database used in this project.COIL-100 database is used for the experimental purpose.

Index Terms—CBIR, HSV, RGB,COIL-100

INTRODUCTION

Now a days have seen rapid increase in collection of digital images.Giga-bytes of images has been generated in many applications including military and civilian equipment every day. A large amount of information is available there. Image retrieval has turned into an active research area from 1970s, with the thrust from two major research communities, database management and computer vision. These two research communities help to study the image retrieval from different angles, it may be either text-based or the visual-based[1].

In the early 90's because of the emergence of the large scale image collection, difficulties faced by manual approach becomes more and more acute. To overcome from these difficulties content based image retrieval method (CBIR) was proposed. In this approach instead of searching by text-based keywords, images would be indexed by visual content like color,corner,edge,texure etc.These features can be two types local or global. The global features refer to the visual content of the entire image. So the global features fail in describing the important features of the components of that image. This makes the global features unsuitable for retrieving images based on parts of whole image. This drawback of the global features is overcome by the local features like interest point detectors. These interest points are preferred since they provided locally rich information about the image.[2]

RELATED WORK

The general methodology of our proposed work is focused in this section and is shown in Figure 1. Initially we extract the features like auto corellogram, color moments, texture and color feature the HSV color features are extracted using the histograms. These features are stored in the database. In the real time phase the user provides the query image for which the color auto correlogram, color Moments, gaborwavelet and HSV color features are extracted. The three individual features of the query image are compared with the four individual features of the database image features. Then the features are combined and the images are ranked after sorting these combined feature. The most relevant images are displayed as the resultant images.

FEATURE EXTRACTION

In our current work we have employed three different features namely HSV color, Color auto correlation ,color moments and the Gabor wavelet features. In the following sections these techniques are discussed.

A. Color Feature

One of the most commonly used visual feature for image retrieval is the color feature. There are many color models like RGB, HSV, HIS used to represent the color models. Since the HSV color space is more similar to human vision system, we have used this colorimetric approach. In our work we have adopted the global color histograms for extracting the color features. The image in the general RGB (Red, Green, and Blue) color space is converted into the HSV (Hue, Saturation, and Value) color space. Further the HSV color space is quantized to form 11 bins each for the H, S, V components.[1]

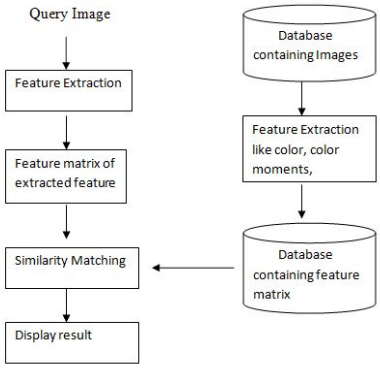

Figure 1.System Architecture

A. Color Feature

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B. Color auto Correlation

The use of autocorrelograms as feature vectors in content based image retrieval (CBIR) systems outperformed color histograms and other types of feature vectors.In this work we show that the use of the HSV color space instead of the RGB space can further improve the performance of autocorrelograms in CBIR systems, making it more robust to varying illumination conditions.[3]

C. Color Moments

Color moments are measures that characterize color distribution in an image in the same way that central moments uniquely describe a probability distribution. Color moments are mainly used for color indexing purposes as features in image retrieval applications in order to compare how similar two images are based on color. Usually one image is compared to a database of digital images with pre-computed features in order to find and retrieve a similar image. Each comparison between images results in a similarity score, and the lower this score is the more identical the two images are supposed to be. First extract color channels such as R ,G and B separately and then compute 2 first color moments from each channel i.e., compute mean and standard deviation for each color component R,G and B. Finally compute color moments of an image

D. Gabor Wavelet

Nowadays, Gabor functions are frequently used for feature extraction, especially in texture-based image analysis (e.g., classification, segmentation or edge detection) and more practically in face recognition. Many of image processing tasks can be seen in terms of a wavelet transform. Informally speaking, the image can be seen under the lens with a magnification given by the scale of a wavelet. In doing so, we can only see just the information that is determined by the shape of the used wavelet. The Gabor atoms can also be seen in the words of a wavelet transform . Specifically, Gabor wavelets are created from one particular atom by dilation (and rotation in two-dimensional case). These Gabor wavelets provide a complete image representation.[4].

SIMILARITY MATCHING

The hsv component of an image are extracted and this data is stored in the feature vector hsv. Similarly other features like auto correlation, color moments,gabor wavelet are extracted and stored in respective feature vectors. All these vectors are grouped as a set and stored in database.in the same way for the query image above mentioned procedure is applied. For comparing the feature vectors, Euclidian distance is used.

EXPERIMENT RESULT

The Columbia Object Image Library (COIL-100) dataset was used for the experimental purpose. COIL-100 is a database of 504 color images of 7 objects. This corresponds to 72 different orientation of each object. The sample database of COIL-100 is shown in Figure. 2.

Figure 2. Category of Database Images

The results prove that the combination of Autocorrelogram, Color Moments, Gabor wavelet are substantially better than the individual feature .The Fig. 3 shows the input query images and the resultant images of the soap and tomato.

A. Precision and Recall

Precision is the fraction of retrieved instances that are relevant, while Recall is the fraction of relevant instances that are retrieved. In simple terms, high precision means that an algorithm returned substantially more relevant results than irrelevant, while high recall means that an algorithm returned most of the relevant results.Figure 4 and Figure 5 shows precision and recall graph against category of images used.

Figure3. Query Image and Searched Images

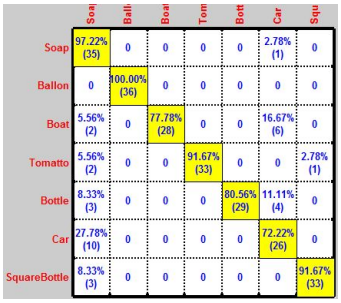

Figure 4.Confusion Matrix

B.Confusion Matrix

It is a table used to visualize the performance of the system. Figure 4 shows the confusion matrix for the proposed system. Each row defines the instances in an actual class and each column represents instances in predicted class. In this matrix system predicts 35 images are soap out of 36 images. One image belongs to car.

CONCLUSION AND FUTURE WORK

In our current work we have carried out experiments with the combination global and local feature.The experiments were applied on the seven categories of images each with seventy two different orientations from COIL-100 image database. In our work HSV color Autocorrelogram, Color Moments, Gabor wavelet feature taken into consideration. The results show significant improvement over the existing systems. The future work includes database population and the consideration of the other features of the images to enhance the retrieval process.

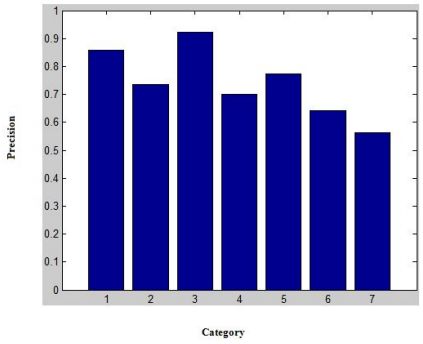

Figure 5. Precision Vs Category

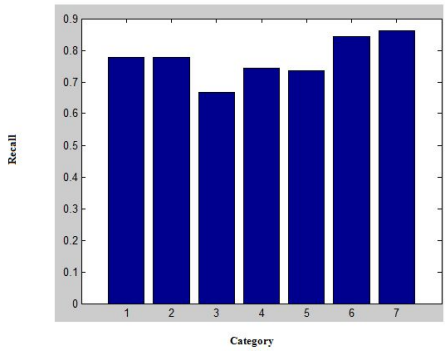

Figure 6. Recall Vs Category

REFERENCES

[1]. H. Kavitha1, and Dr. M. V. Sudhamani, T, "Object Based Image Retrieval From Database using Combined Feature ," Fifth International Conference On Signal and Image Processing,2014.

[2]. Mehwish Rehman, Muhammad Iqbal, Muhammad Sharif and Mudassar, "Content Based Image Retrieval:Survey",COMSATS Institute of Information Technology,Wah Cantt, Pakisthan

[3]. Robson Barcellos,Rogerio Oliani Saranz,"Content Based Image Retrieval using Color Auto Corellogram in HSV Color Space".

[4]. David Barina "Gabor Wavelets in Image Processing.