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CONTENT BASED IMAGE RETRIVAL USING FRACTAL SIGNATURE ANALYSIS

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ABSTRACT*-Content-based image retrieval has become a reliable tool for digital image applications, especially for image retrieval purposes. There are several advantages of the image retrieval techniques compared to other simple retrieval approaches such as text-based retrieval techniques. This paper proposes an offline Content-based image retrieval system implemented using "Fractal Signature Analysis" and "Foreground Feature Extraction". The image containing the object in an appropriate background is pre-processed, and the foreground object is extracted. A unique fractal signature is developed for each one of the RGB color component, which is used to retrieve images saved on a local computer by giving a query image to the system. The system is suitable for retrieving query images even in distortion cases such as noise.

Keywords- *Digital image, Fractal signature, Foreground extraction, RGB color component.*

I. INTRODUCTION

Content-Based Image Retrieval (**CBIR)** is the application of computer vision techniques to the image problem, that is, the problem of searching for digital images in large databases. Image retrieval has traditionally been based on manual caption insertion describing the scene which can then be searched using keywords. Caption insertion is a very subjective procedure and quickly becomes extremely tedious and time consuming, especially for large image databases which are becoming ever more common with the growing availability of digital cameras and scanners. There is thus an urgent need for effective content-based image retrieval (CBIR) systems."Content-based" means that the search will analyze the actual contents of the image rather than the metadata such as keywords, tags, and/or descriptions associated with the image. The term content' in this context might refer to colors, shapes, textures, or any other information that can be derived from the image itself. Every content-based image retrieval system consists of three main stages: pre-processing, feature extraction and similarity measurement (classification). Pre-processing becomes necessary when we have images that are corrupted by some kind of distortion. Images with noise, bad illumination, blurred are some examples when preprocessing is needed. For example, the median filter is a commonly used pre-processing technique. It is advantageous to make use of a prior object extraction technique to reduce the complexity of the fractal signature generation process, as well in comparisons between two images. A segment of the image provides a much better basis for computing the fractal signature, rather than using complete image. However, it is essential to be able to extract the required information from the image. As the object of intrest is in the foreground, foreground object extraction is used. This isolates the segment of the image containing the object.

II. RELATED WORK

Content-**B**ased **I**mage **R**etrieval (CBIR), also known as query by image content (QBIC) and content-based visual information retrieval (CBVIR) is the application of computer vision techniques to the image retrieval problem, that is, the problem of searching for digital images in large databases without using textual data as the search query but an image itself. The term 'content' in this context might refer to colors, shapes, textures, or any other information that can be derived from the image itself. CBIR is desirable because most web based image search engines rely purely on metadata and this produces a lot of garbage in the results. Also having humans manually enter keywords for images in a large database can be inefficient, expensive and may not capture every keyword that describes the image. Thus a system that can filter images based on their content would provide better indexing and return more accurate results. There is a growing interest in CBIR because of the limitations inherent in metadata-based systems, as well as the large range of possible uses for efficient image retrieval. Textual information about images can be easily searched using existing technology, but requires humans to personally describe every image in the database. This is impractical for very large

databases, or for images that are generated automatically, e.g. from surveillance cameras. It is also possible to miss images that use different synonyms in their descriptions.

III.PROPOSED SOLUTION

The main aim of this paper is to provide the effective performance of the image retrieval system through feature extraction system. Possible feature representation of images may include color, shape and texture. It is very difficult to achieve satisfactory image retrieval results using only a single feature. Hence, **C**ontent-**B**ased **I**mage **R**etrieval systems use more than one feature to improve the retrieval performance. To classify the query using the extracted feature values, a similarity checking is performed between the query image and the database images. Basically, this procedure is a clustering process where the query image is compared with the stored images and the most similar images are obtained. The most common method for comparing two images in **C**ontent **B**ased **I**mage **R**etrieval (typically an example image and an image from the database) is using an image distance measure or Euclidean distance measure. An image distance measure compares the similarity of two images in various dimensions such as color, texture, shape, and others. For example a distance of 0 signifies an exact match with the query, with respect to the dimensions that were considered. A value greater than 0 indicates various degrees of similarities between the images. Search results then can be sorted based on their distance to the queried image. In this paper, fractal scanning technique is implemented along with a powerful feature set.

A. Foreground Object Extraction

Initially, pre-processing techniques are applied to the image, to remove noise. The foreground object extracted, as the object of interest is contained in the foreground of the image.

B. Signature Formation

The extracted foreground object is then processed with the fractal scanning procedure to extracts 1-D image signatures corresponding to each one of the image color components. Hilbert's space filling curve is used for fractal scanning. The Hilbert's curve scans continuously every neighboring cell in the image sample mage and therefore maps the image neighboring regions in continuous samples in the 1-D signature. Thus, by using Hilbert's curve, we get a mapping of the 2-D image sample into 1-D signature space, while retaining most of the spatial information contained in the image.

C. Feature Generation

Two transformations the "Discrete cosine transform (DCT)" and the "Fourier descriptor (FD)" are used to describe features that are extracted from these signatures that allow effective content-based image retrieval of color images. DCT and FDs offer not only powerful features but also the features extracted have desirable characteristics for an image retrieval system.

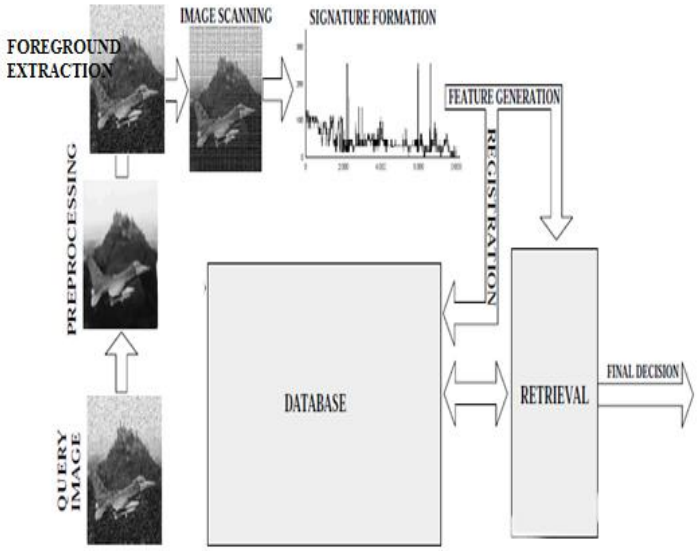

Figure1-System Block Diagram

D. Retrieval process

The aforementioned features are extracted from the three 1-D signatures which are formatted using fractal scanning, one for each primary color component. Then they are normalized as described in the previous section, grouped and registered into the database. For each new query image the same procedure is followed so that its features will be compared, relative to similarity, with those of all registered images. For the feature similarity measurement the Euclidean distance is used, which reflects the square of the abstraction of every registered feature values with those extracted from the query image. The Euclidean distance measurement is defined as follows

$$D_i = \sqrt{\sum_{j=1}^{n} [f_{ij} - P_j]^2}, \quad i = 1, 2, \ldots, m,$$

where m is the number of registered images, fij the registered features and Pj the features of the query image. Such a distance measurement is based on the assumption that two images are similar only if their individual features pairs are similar too, that is the

distance Di is small enough. After the calculation of all distances, they are ranked and the retrieval results are given starting from the image that corresponds to the smallest distance value (Rank 1).However, when we want to make a decision whether there is an image in the database identical as possible with the query image, we proceed with a ‘‘best match’’ procedure that can be viewed as a recognition process. This procedure is based on two threshold values T1; T2 for the Euclidean distances of the features vectors that define the following recognition categories:

$T_1 \geqslant \text{minimum } [D_i]$ “Very possible”
$T_1 < \text{minimum } [D_i] \leqslant T_2$ “Possible”
$T_2 < \text{minimum } [D_i]$ “Reject”

The values of T1 and T2 resulted after testing the system with a variety of images and they differ in proportion to the type of features used for retrieval. We have found that the optimal values for T1 and T2 . An image is characterized as ‘‘best match’’ if it found as ‘‘very possible’’ more than three times using both feature sets.

IV. CONCLUSION AND FUTURE ENHANCEMENTS

The dramatic rise in the sizes of images databases has stirred the development of effective and efficient retrieval systems. The development of these systems started with retrieving images using textual connotations but later introduced image retrieval based on content. Systems using content based image retrieval retrieve images based on visual features such as color, texture and shape, as opposed to depending on image descriptions or textual indexing. The content based image retrieval system developed by us retrieves image based on fractal signatures of the image. Fractals of a particular object are unique and hence an unique signature is obtained for an image .Content based image retrieval systems are generally developed for a specific databases. In such cases which involve a very specific set of images. Our system is developed to retrieve wide range of images. The content based image retrieval system developed by us retrieves images efficiently over wide range of databases. The constraints of our system are single object in simple background. To achieve an effective search of images for wide range of images, an efficient and robust foreground extraction is required. Foreground extraction without training or human intervention is still under research. Hence the efficiency and range of images in databases can be achieved.

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REFERENCES

[1] Agouris, P., Carswell, J., Stefanidis, A., 1999. “*An environment for content-based image retrieval from large spatial databases*”. ISPRS Journal of Photogrammetry and Remote Sensing 54 (4), 263–272.
[2] Androutsos, D., Plataoniotis, K.N., Venetsanopoulos, A.N., 1998. *“Distance measure for color image retrieval*”. IEEE International Conference on Image Processing 2, 770–774.
[3] Chung, K.L., Tsai, Y.H., Hu, F.C., 2000. *“Space-filling approach for fast window query on compressed images*.” IEEE Transactions on Image Processing 9 (12), 2109–2116.
[4] Drew, M.S., Wei, J., Li, Z.N., 1999. *“Illumination-invariant image retrieval and video segmentation*”. Pattern Recognition 32, 1369–1388.
[5] Flickner, M., Sawhney, H., Niblack, W., Ashley, J., Huang, Q., Dom, B., Gorkani, M., Hafner, J., Lee, D., Petkovic, D., Steele, D., Flickner, P.Y., 1995. *“Query by image and video content: the QBIC system”*. Computer 28 (9), 23–32.
[6] Funt, B.V., Finlayson, G.D., 1995. *“Color constant color indexing”*. IEEE Transactions on Pattern Analysis and Machine Intelligence 17 (5), 522–529.
[7] Gonzalez, R.G., Woods, R.E., 1993. “*Digital Image Processing*”. Addison-Wesley, Reading, MA.Hafner, J., Sawhney, H.S., Equitz, W., Flickner, M., Niblack, W., 1995.
[8] Huang, C.L., Huang, D.H., 1998. *“A content-based image retrieval system. Image and Vision Computing* “16, 149–163.
[9] Kankanhalli, M.S., Mehtre, B.M., Huang, H.Y., 1999. “*Color and spatial feature for content-based image retrieval*”. Pattern Recognition Letters 20, 109–118.
[10] Lin, H.C., Wang, L.L., Yang, S.N., 1999. “Regular-texture image retrieval based on texture-primitive extraction”. Image and Vision Computing 17 (1), 51–63.