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A Research Paper on Content Based Image Retrieval System using Improved SVM Technique

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Abstract-Content-based image retrieval utilizes representations of features that are automatically extracted from the images themselves. Allmost all of the current CBIR systems allow for querying-by-example, a technique wherein an image (or part of an image) is selected by the user as the query. The system extracts the feature of the query image, searches the database for images with similar features, and exhibits relevant images to the user in order of similarity to the query. In this context, content includes among other features, perceptual properties such as texture, color, shape, and spatial relationships. Many CBIR systems have been developed that compare, analyze and retrieve images based on one or more of these features. Some systems have achieved various degrees of success by combining both content-based and text-based retrieval. In all cases, however, there has been no definitive conclusion as to what features provide the best retrieval. In this paper we present a modified SVM technique to retrieve the images similar to the query image.

Keywords : CBIR , SVM , Content Based Image Retrieval, Modified SVM

I. Introduction

Content-based retrieval uses the contents of images to represent and access the images. A typical CBIR system is divided into online image retrieval and off-line feature extraction. A conceptual framework for content-based image retrieval is illustrated in Figure 1.2. In off-line stage, the system automatically extracts visual attributes (color, shape, texture, and spatial information) of each image in the database based on its pixel values and stores them in a different database within the system called a feature database. The feature data, for each of the visual attributes of each image is very much smaller in size compared to the image data, thus the feature database contains an abstract form of the images in the image database. One advantage of a signature over the original pixel values is the

significant compression of image representation. A more important reason for using the signature is to gain an improved correlation between image representation and visual semantics.

In on-line image retrieval, the user can submit a query example to the retrieval system in search of relevant images. The system represents this example with a feature vector. The distances (i.e., similarities) between the feature vectors of the query example and those of the media in the feature database are then computed and ranked. Retrieval is directed by applying an indexing scheme to provide an efficient way of searching the image database. Finally, the system rank the search results and then returns the results that are most similar to the query example. If the users are not satisfied with the search results, he can provide relevance feedback to the retrieval system, which contains a technique to learn the user information needs.

Content-based image retrieval uses the visual contents of an image such as texture, color, shape, and spatial layout to represent and index the image. In typical CBIR systems, the visual content of the images in the database are extracted and described by multi-dimensional feature vectors. The feature vector of the images in the database form a feature database. To retrieve the images, users provide the retrieval system with example images. The system then changes these examples into its internal representation of feature vectors.

ii. Components of CBIR System

The CBIR system consists of the following components:

1) Query image

It is the image to be found in the image database, whether the similar image is present or not. And how many are similar kind images are exist or not.

2) Image database

It consists of n number of images depends on the user choice.

3) Feature extraction

It separates visual information from the image and saves them as features vectors in a features database. The feature extraction finds the image detail in the form of feature value (or a set of value called a feature vector) for each pixel. These feature vectors are used to compare the query image with the other images and retrieval.

4) Image matching

The information about each image is stored in its feature vector for computation process and these feature vectors are compared with the feature vectors of query image which helps in measuring the similarity.

5) Resultant retrieved images

It finds the previously maintained information to find the matched images from database. The output will be the similar images having same or closest features as that of the query image.

iii. Kinds of CBIR

There are two kinds of CBIR:

1.General

2.Application specific

General: We try to match a query image to an arbitrary collection of images.

Application specific: We try to match a query image to a collection of images of a specific type e.g. Finger prints, X-ray images of a specific organs.

iv. Literature Survey

By Kannan in 2010 [1] In this paper author describes that image mining is the main concept which can extract potential information from the collection. For color based image extraction RGB model is used, RGB component taken from each and every image. Images are stored by mean values of Red, Green, blue components of target images. The top ranked images are further regrouped according to texture features. The gray level co-occurrence matrix (GLCM) used texture calculations (contrast, dissimilarity, homogeneity).The images are classified into clusters with the help of GLCM based on Low texture, average texture and high texture. Texture based classification is simply easy and efficient for real time applications as compared to Entropy method. The authors also evaluate the performance with the help of precision v/s recall graph. Recall value 1 just by retrieving all images and precision value kept in a higher value by retrieving only few images.

By Kun-Che in 2009 [2] In this paper Pixel-wised image characteristics were extracted and changed into a database like table which permits a variety of data mining algorithms to make explorations on it.

By Silakari in 2009 [3] In this paper a framework of unsupervised clustering of images based on the color feature of image. Clustering of images based on color moment and Block Truncation Coding to extract features from an image database is proposed. K-means clustering algorithm is conducted to group the dataset in various clusters.

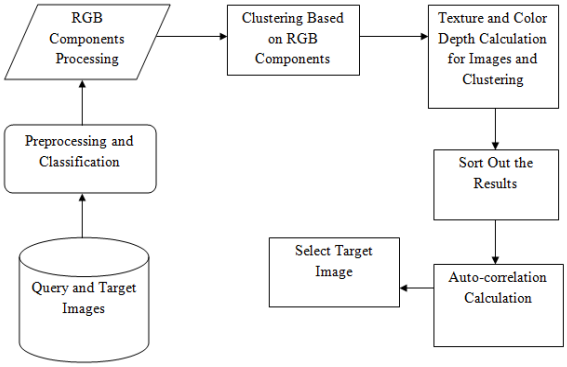
Amanbir Sandhu, Aarti Kochhar in 2012 [4] Presents a technique for content based image retrieval using texture, color and shape for image analysis. In this paper they worked with the three features i.e. texture, color and shape and its different combinations. The GLCM is used for texture feature extraction, histogram for Color feature extraction and for shape different factors are found like area, Euler No., eccentricity and Filled Area.

V. Proposed Methodology

Image contains lot of information which cannot be defined using text. Every image contains lot of information, using which lot of information can be mined. Various methods are proposed by researchers. In this method the images are preprocessed before they are stored in database. This preprocessing enhances the image quality and removes the noise. Then these images are clustered using various components of RGB model, after which the top ranked images are again clustered using support vector machine algorithm(SVM). Then, the query image and the

target images are compared using these features and the similar image is retrieved.

The following diagram represents overall working of the proposed system



Vi. Steps of image retrieval system of proposed System

Image Retrieval from the image collections involves the following steps-

1. Pre-processing
2. Image Classification based on a true factor
3. RGB Components processing
4. Preclustering
5. Texture feature extraction
6. Similarity Comparison
7. Target image selection

Vii. Results and Discussion

We used a database of 9000 images for testing our system. During the first stage, queries were tested in a limited database against images in the database that were duplicates, different, or transformations. The analysis was performed on whether or not the appropriate image was returned as the top most result.

Once the initial validation was completed, group of images were added to the database. Then the query image was matched visually with groups of images from the database and the database images were ranked according to how similar they were perceived to be to the query. These groups serve as the expected relevant results during testing.

Results Achieved After Performance Evaluation -

Results Achieved for Image Set

Name of the query image	No. of relevant images retrieved	Precision	Recall
606.jpg	4	0.8	4.5
619.jpg	4	0.8	4.5
624.jpg	4	0.8	4.5
630.jpg	4	0.8	4.5
634.jpg	4	0.8	4.5
635.jpg	4	0.8	4.5

Viii. Conclusion

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. This came to be known as Content Based Image Retrieval or CBIR. Systems using CBIR retrieve images based on visual features such as texture, colour and shape, as opposed to depending on image descriptions or textual indexing. The main objective of this paper is to retrieve the images from database in a fast and an efficient manner using modified Support vector method(SVM).

Ix. Future Scope

In future this system is also implemented in the field of computer Vision which is concerned with the automated processing of images from the real world to extract and interpret information on a real time basis. In future this system is used in Astronomy to the study of celestial objects (such as stars, comets, nebulae, planets, star clusters and galaxies). Further time to retrieve the system can also be reduced in future.

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