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Content Based Image Retrieval using Mean Method

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Abstract

In this paper a Content Based Image Retrieval CBIR is introduced, a color value is one of the important features in the image processing and CBIR. The mean value is used to extract features of a query image to compare with image features stored in database, the mean method gives best results. This technique was applied on WANG database of image test 100 images from the database 10 images from each class.

Keywords: Image Processing, Image Retrieval, Mean, Content Based Image Retrieval.

I. Introduction

Images are an increasingly important class of data, especially as computers become more usable with greater memory and communication capacities. Evaluation in digital photography has led to a huge collection of still images that are stored in digital format. As the demand for digital images increases, that is appear the need to save and retrieve images in an efficient way. So, the field of content-based image retrieval has stand out as an important research domain in computer vision and image processing. As the amount of collections of digital images increases, the problem finding a desired image becomes a hard job. There is a need to expansion an efficient method to retrieve digital images, CBIR is a hotspot of digital image processing techniques, CBIR research started in the early 1990's and is likely to continue during the first two decades of the 21st century. Many scientists and research groups in leading universities and companies are actively worked in this area and a fairly large number of prototypes and commercial products are already available. However, the solutions are still far from reaching the optimal goal [1].

II. Literature Review

Many papers and researches are published related to the CBIR, such as Mann-Jung Hsiao, (2010), introduced an approach partitioning images into a number of regions with fixed absolute locations. Each region is represented by its low-frequency of Discrete Cosine Transform DCT coefficients in the YUV color space. Two policies are provided in the matching procedure: local match and global match. In the local match, the user formulates a query by selecting the interested region in the image. Candidate images are then analyzed by inspecting each region in turn to find the best matching region with the query region with help of friendly GUI. This system also allows users of any experience level to effortlessly get interested images from database [2].

The T.V. Saikrishna (2012) and at el, are propose a color image retrieval method based on color moments. Firstly, an image is divided into four segments. Then, the color moments of all segments are extracted and clustered into four classes. The mean moments of each class are considered as a primitive of the image. They used all primitives as features and each class mean combined into single class mean. The distance between query image mean with the corresponding database images are calculated by using Sum Absolute Difference (SAD) method. Color histograms and color moments are considered for retrieval. The retrieval efficiency of the color descriptors was investigated by means of recall and precision. Their Experiment results shows the most of the images categories color moment's gives better performance than the local histogram method [3].

P. A. Hemalatha, K. S. Ravichandran and B. Santhi (2013) uses Statistical Region Merging (SRM) algorithm for image segmentation and uses Discrete Cosine Transform (DCT) to determine the shape and color features vectors are obtained by RGB component values. These features vectors are used to retrieve the similar images from the image database in analogy with the query image. Their work enhances the retrieval efficiency by retrieving the images based on both shape and color where the retrieval is refined with most similar images, the mean precision of three categories of the query image around 80% [4].

III. CBIR STRUCTURE

Content-based retrieval uses the contents of images to represent and access images. Atypical content-based retrieval system is divided into off-line feature extraction and online image retrieval. A conceptual framework for content-based image retrieval is illustrated in Figure (1).

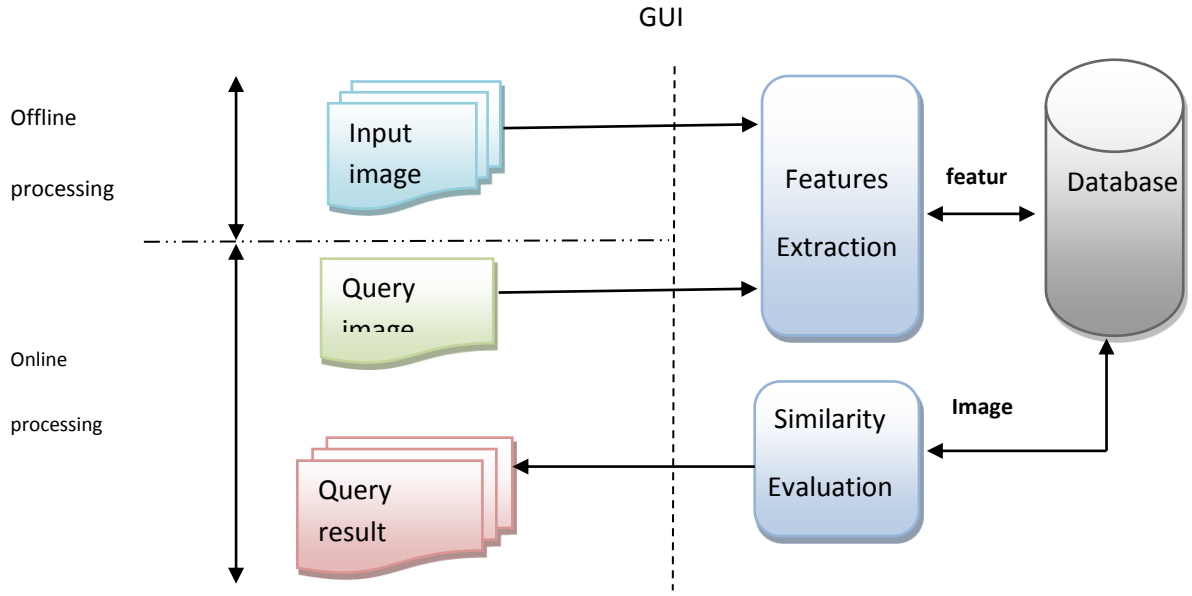

Figure 1: CBIR Structure

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 in a different database within the system called a feature database. The feature data (also known as image signature) 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 abstraction (compact 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. However, 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 desired images. The system represents this example with a feature vector, the distances between the feature vectors of the query image and those of the media in the feature database are calculated and ranked to provide an efficient way of searching the image database retrieval is conducted by applying an indexing scheme. Finally, the system ranks the search results and then returns the results that are most similar images to the query image. If the user is not satisfied with the search results, he can provide relevance feedback to the retrieval system, which contains a mechanism to learn the user's information needs [5].

IV. K-means

K-means is one of the simplest unsupervised learning algorithms that solve the well known clustering problem. The procedure follows a simple and easy way to classify a given data set through a certain number of clusters (assume k clusters) fixed a priori. The main idea is to define k centroid, one for each cluster. This centroid should be placed in a cunning way because of different location causes different result. So, the better choice is to place them as much as possible far away from each other. The next step is to take each point belonging to a given data set and associate it to the nearest centroid. When no point is pending, the first step is completed and an early group age is done. At this point we need to re-calculate k new centroid as bar centers of the clusters resulting from the previous step. After we have these k new centroid, a new binding has to be done between the same data set points and the nearest new centroid. A loop has been generated. As a result of this loop we may notice that the k centroid change their location step by step until no more changes are done. In other words centroid do not move any more. Finally, this algorithm aims at minimizing an objective function, in this case a squared error function.

V. Image Database

The visual studio 2010 is used to implement the proposed method. This system tested on a general purpose WANG database containing 1000 core images in JPEG format of size 384 x 256 or 256 x 384. The image set comprises 100 images in each of 10 categories. The experiment selected 100 images randomly, containing 10 images in each category and the images are resized to 256 x 384. Within this database, it is known whether any two images are of the same category. In particular, a retrieved image is considered a match if and only if it is in the same category as the query. The following Figure (2) sample of Wang database images [9].

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VI. Results and Analysis

The results of a retrieval system can be measured in terms of its precision and recall. Precision measures can be defined as the ability of the system to retrieve only models that are relevant, while Recall measures is defined as the ability of the system to retrieve all models that are relevant at which defined as number of relevant images retrieved, in this paper we test 10 images in each class of database to retrieve 10 similar image for each category.

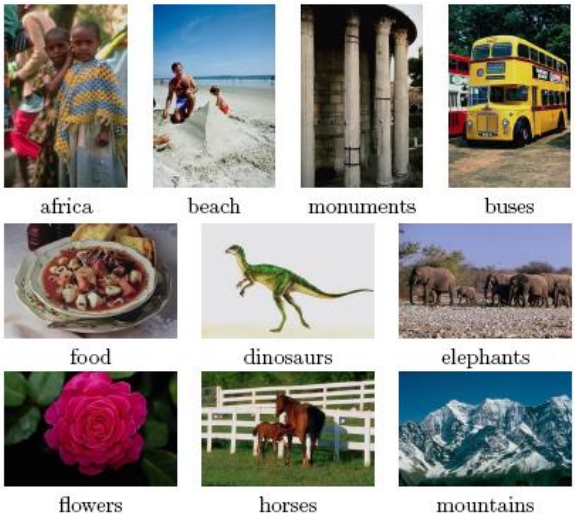

Figure 2. Sample Of Images For WNAG Database

$$\text{Precision} = \frac{Number\ of relevent\ image\ retrived}{Total\ number\ of\ images\ retrived} = \frac{A}{A+B} \quad (1)$$

$$\text{Recall} = \frac{Number\ of\ relvent\ image\ retrived}{Total\ number\ of\ rlevent\ image\ in\ database} = \frac{A}{A+C} \quad (2)$$

Where *A* represents the number relevant images that are retrieved, *B* represents the number of irrelevant items and *C* is the number of relevant items that were not retrieved in database.

Table 1: The Precision Result

Class	African	Beach	Building	Buses	Dinosaurs	Elephants	Flowers	Horses	Mountains	Food	Average
K-means	0.92	0.46	0.61	0.85	0.97	0.67	0.65	0.85	0.54	0.72	72.4

VII. Conclusions

The content image retrieval extracts visual data from an image such as spatial layout, texture, shape, and color. In this paper the color content of an image is used to retrieve image. The experimental results show that the K-means algorithm get best results when it's used in content based image retrieval. Since the implemented algorithms works on color features and values of the image, therefore the dividing of image into blocks or parts gave more ability for retrieving the required images.

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