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Sketch4Match – Content-based Image Retrieval System Using Sketches

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***Abstract*-The content based image retrieval(CBIR) is one of the most popular, rising research areas of the digital image processing. Content-based image retrieval information systems use information extracted from the content of query. In these tools, images are manually annotated with keywords and then retrieved using text- based search methods. The goal of CBIR is to extract visual content of an image automatically, like color, texture, or shape. This paper aims to introduce the problems and challenges concerned with the design and the creation of CBIR systems, which is based on a free hand sketch (Sketch based image retrieval – SBIR). With the help of the existing methods, revealed that the proposed algorithm is better than the existing algorithms, which can handle the informational gap between a sketch and a colored image. Overall, the results show that the sketch based system allows users an intuitive access to search-tools. Experimental results show that the system retrieves the intended image with a high similarity score even from a partial or shifted query.**

***Index Terms*- k-medoids clustering algorithm, image similarity matching algorithm.**

I. INTRODUCTION

Content-based image retrieval system retrieves an image from a database using visual information such as color, texture, or shape. In most systems, the user queries by presenting an example image that has the intended feature [4,5,6]. Although this approach has advantages in effective query processing, it is inferior in expressive power and the user cannot represent all intended features in his query. Before the spreading of information technology a huge number of data had to be managed, processed and stored. It was also textual and visual information. Parallelly of the appearance and quick evolution of computers an increasing measure of data had to be managed. The growing of data storages and revolution of internet had changed the world. The efficiency of searching in information set is a very important point of view. In case of texts we can search flexibly using keywords, but if we use images, we cannot apply dynamic methods. Two questions can come up. The first is who yields the keywords. And the second is an image can be well represented by keywords. In many cases if we want to search efficiently some data have to be recalled. The human is able to recall visual information more easily using for example the shape of an object, or arrangement of colors and objects. Since the human is visual type, we look for images using other images, and follow this approach also at the categorizing. In this case we search using some features of images, and these features are the keywords. At this moment unfortunately there are not frequently used retrieval systems, which retrieve images using the non-textual information of a sample image. What can be the reason? One reason may be that the text is a human abstraction of the image. To give some unique and identifiable information to a text is not too difficult. At the images the huge number of data and the management of those cause the problem. The processing space is enormous. Our purpose is to develop a content based image retrieval system, which can retrieve using sketches in frequently used databases.

A. APPLICATIONS

- The CBIR systems have a big significance in the criminal investigation.
- The identification of unsubstantial images, tattoos and graffities can be supported by these systems

II. PREVIOUS WORK

Content Based Image Retrieval (CBIR) [10] is an automatic process to search relevant images based on user input. The input could be parameters, sketches or example images. A typical CBIR process first extracts the image features and store them efficiently. Then it compares with images from the database and returns the results. Feature extraction and similarity measure are very dependent on the features used. In each feature, there would be more than one representation. Among these representations, histogram is the most commonly used technique to describe features.

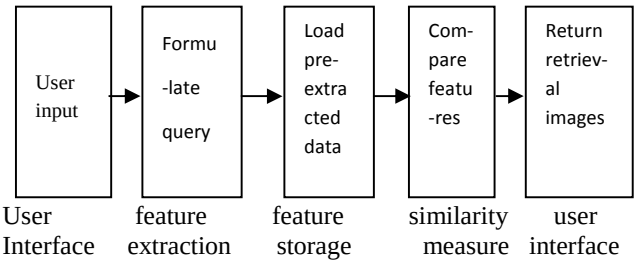

Fig.1 Flow chart of a typical CBIR process

Fig.1 describes the flow of a typical CBIR process although content based methods are efficient, they cannot always match user's expectation. Relevance Feedback (RF) techniques are used to adjust the query by user's feedback. RF is an

interactive process to improve the retrieval accuracy by a few iterations. RF algorithms are dependent on feature representations, in this chapter, RF process and its histogram weighting method will be introduced.

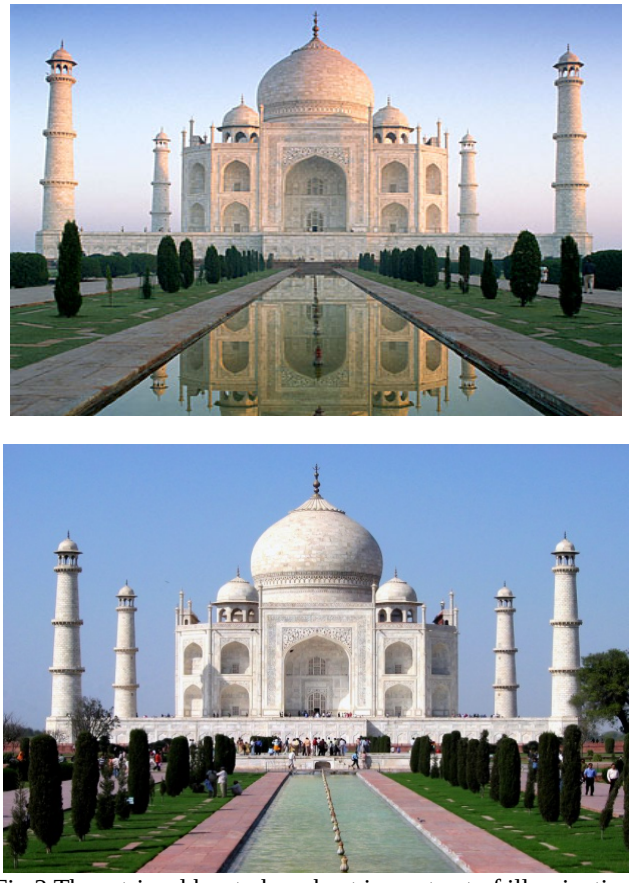

Fig.2 The retrieval has to be robust in contrast of illumination and difference of point of view

The system was designed for databases containing relatively simple images, but even in such cases large differences can occur among images in file size or resolution. In addition, some images may be noisier, the extent and direction of illumination may vary (see Fig. 2), and so the feature vectors cannot be effectively compared. In order to avoid it, a multistep preprocessing mechanism precedes the generation of descriptors.

A. ALGORITHM USED: k-mean

Disadvantage of k-mean algorithm-

- Does not work well with non globular clusters.
- ✓ Non-globular- in contrast to globular cluster do not have well defined centers. Non-globular cluster can have a chain like shape.
- Fixed no of clusters can make it difficult to predict what the K should be.
- Unable to handle noisy data and outliers.
- Used for small database.

III. PROPOSED ALGORITHM: K-MEDOIDS

The k-means method uses centroid to represent the cluster and it is sensitive to outliers. This means, a data object with an extremely large value may disrupt the distribution of data. K-medoids method overcomes this problem by using medoids to represent the cluster rather than centroid. A medoid is the most centrally located data object in a cluster. Here, k data objects are selected randomly as medoids to represent k cluster and remaining all data objects are placed in a cluster having medoid nearest (or most similar) to that data object. After processing all data objects, new medoid is determined which can represent cluster in a better way and the entire process is repeated.

Again all data objects are bound to the clusters based on the new medoids. In each iteration, medoids change their location step by step. Or in other words, medoids move in each iteration. This process is continued until no any medoid move. As a result, *k*
clusters are found representing a set of n data objects. An algorithm for this method is given below.

Input: '*k*', the number of clusters to be partitioned; 'n', the number of objects.
Output: A set of '*k*' clusters that minimizes the sum of the dissimilarities of all the objects to their nearest medoid.

Steps:

1. Arbitrarily choose '*k*' objects as the initial medoids;
2. Repeat,
   - Assign each remaining object to the cluster with the nearest medoid;
   - Randomly select a non-medoid object;
   - Compute the total cost of swapping old medoid object with newly selected nonmedoid object.
   - If the total cost of swapping is less than zero, then perform that swap operation to form the new set of k-medoids.
3. Until no change.

A. STRENGTH

More robust than k-means in the presence of noise and outliers because a medoid is less influenced by outliers or other extreme values than a mean.

IV. CONCLUSION

Among the objectives of this paper performed to design, implement and test a sketch-based image retrieval system. Two main aspects were taken into account. The retrieval process has to be unconventional and highly interactive. The robustness of the method is essential in some degree of noise, which might also be in case of simple images. Compared to k-mean, k-medoid is not sensitive to noisy data and outliers, but it has high computation cost. The average-time taken k-mean algorithm is greater than the time taken by k-medoid algorithm.

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