ISSN : 2494-9150 Vol-02, Issue 02, MAY 2016.

Image Retrieval Using Sketches.

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Abstract — nowadays, content-based image retrieval (CBIR) is the mainstay of image retrieval systems. To be more profitable, relevance feedback techniques were incorporated into CBIR such that more precise results can be obtained by taking user's feedbacks into account. However, existing relevance feedback-based CBIR methods usually request a number of iterative feedbacks to produce refined search results, especially in a large-scale image database. Most of the available image search tools, such as Google Images and Yahoo! Image search, are based on textual annotation of images. In these tools, images are manually annotated with keywords and then retrieved using text-based search methods. The performances of these systems are not satisfactory. The goal of CBIR is to extract visual content of an image automatically, like color, texture, or shape. The SBIR technology can be used in several applications such as digital libraries, crime prevention, and photo sharing sites. Such a system has great value in apprehending suspects and identifying victims in forensics and law enforcement. A possible application is matching a forensic sketch to a gallery of mug shot images. The area of retrieve images based on the visual content of the query picture intensified recently, which Demands on the quite wide methodology spectrum on the area of the image processing.

Keywords— SBIR, CBIR, EHD, HOG.

I. INTRODUCTION

Image retrieval from distributed image servers using a sketched image was confirmed to be superior to those using keywords. In accordance with experimental and analytical studies of electronic encyclopedias, the total processing time of the image retrieval using a sketched image was much shorter than that of the image retrieval using keywords, and the volume of data required for the image retrieval using a sketched image was much smaller than that for the image retrieval using keywords. Even if not familiar with English, the user can easily access the desired image databases using the sketched image at high speed. It is very important that image retrieval using a sketched image is not restricted by the user ages, knowledge, and languages since the user can easily access the image databases from terminals without keyboards. The concept of image retrieval using a sketched image will provide new criteria for designing a new type of TV set. This new type of TV set, containing multimedia user terminal functions as well as the conventional TV receiver functions, is proposed based on the results of the image retrieval using a sketched image 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.

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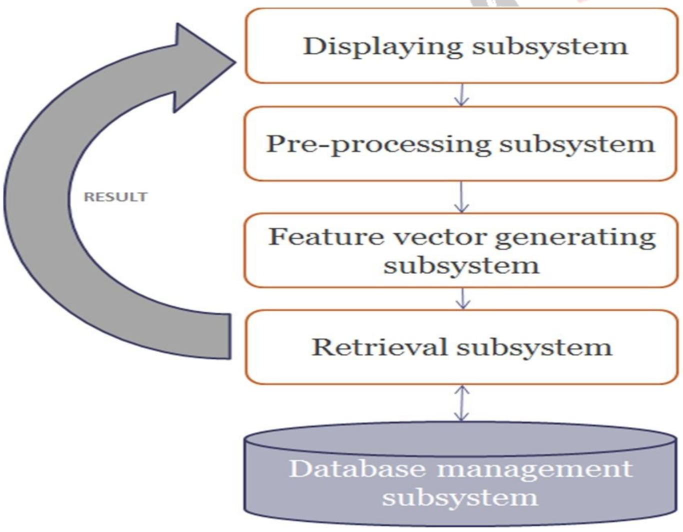
At the images the huge number of data and the management of those cause the problem. The processing space is enormous.

Our purpose is to develop a content based image retrieval system, which can retrieve using sketches in frequently used databases. The user has a drawing area where he can draw those sketches, which are the base of the retrieval method.
Using a sketch based system can be very important and efficient in many areas of the life.

II. User Sketch Pre-Processing

The user will draw free hand sketch on the given canvas area the user sketch can be any basic object which he needs to find in image like a triangle or a circle, user can also select a color of the object e.g. if user draws a brown triangle, it can be a roof of a house or a rig of a bicycle. Next the visual contents of user sketch are converted to mathematical version. In this pre-processing, first the edges of the sketch are detected, for storing the edge information like pixel value, intensity, location etc., a matrix is prepared using morphology techniques, and from matrix, a sketch vector is prepared which is the extracted content from user sketch and which is compared with the database image vectors.



III. Content Based Image Retrieval

Content-based image retrieval also known as query by image content and content-based visual information retrieval problem of searching for digital images in large database. Content-based means that the search will analyze the actual contents of 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.

The earliest use of the term Content Based Image Retrieval in the literature seems to be by Kato, was to describe his experiments in automatic retrieval of images from a database by color and shape features. The term has since been widely used to describe the process of retrieving desired images from a large collection on the basis of features (such as color,Texture and shape) that can be automatically extracted from the images themselves. The features used for retrieval can be either primitive or semantic, but the extraction process must be predominantly automatic.

The ideal approach of querying an image database is using content semantics, which applies the human understanding about image. Unfortunately, extracting the semantic information in an image efficiently and accurately is still a question. Even with the most advanced implementation of computer vision, it is still not easy to identify an image of horses on a road. So, using low level features instead of semantics is still a more practical way. Until semantic extraction can be done automatically and accurately, image retrieval systems cannot be expected to find all correct images. They should select the most similar images to let the user choose the desired images. The number of images of retrieved set can be reduced by applying similarity measure that measures the perceptual similarity.

A typical CBIR system consists of three major components and the variations of them depend on features used.

i. **Feature extraction** – Analyze raw image data to extract feature specific Information.

ii. **Feature storage** – Provide efficient storage for the extracted information, also help to improve searching speed.

iii. **Similarity measure** – Measure the difference between images for determining the relevance between images.

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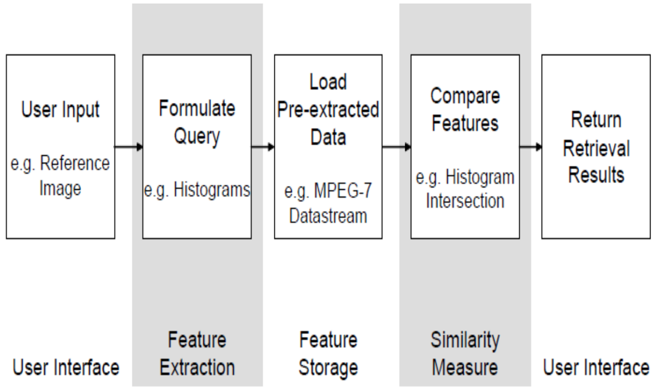

Fig: Flow of a typical CBIR process.

IV. The k-means algorithm

Algorithm: k-means. The k-means algorithm for partitioning based on the mean value of the objects in the cluster.

Input: The number of clusters k and a database containing n objects.

Output: A set of k clusters that minimizes the squared-error criterion.

Method:

- Step 1: arbitrarily choose k objects as the initial cluster centers.
- Step 2: repeat.
- Step 3: (re)assign each object to the cluster to which the object is the most similar, based on the mean value of the objects in the cluster.
- Step 4: Update the cluster means, i.e., calculate the mean value of the objects for each cluster.
- Step 5: Until no change.

V. Biased discriminate Euclidean embedding (BDEE)

In this report, images are represented by low-level visual features. Actually, these can be deemed as samples drawn from a low-dimensional manifold and artificially embedded in a high dimensional ambient space. Here, the high-dimensional ambient space is the low-level visual feature space and the low-dimensional smooth manifold is R^L. Therefore, our objective is

to find a mapping *F* to select the effective subspace from for separating positive samples from negative samples based on a number of observations

$X = [\vec{x_i}]_{1\le i\le n} \in R^{H*n}$ $X = [\vec{x_i}]_{1\le i}$. To reduce the complexity of the problem, we assume that the mapping is linear (i.e., the mapping is defined by a projection matrix ($U \in R^{H*L}$) and then we can find low-dimensional representations as $Y = U^T X \in R^{L*n}$ where each column of Y is $\vec{y_i} = U^T \vec{x_i} \in R^L$.

In recent years, many manifold learning-based dimensionality reduction algorithms have been developed, including locally linear embedding (LLE), ISOMAP, and Laplacian Eigen Maps (LE). LLE uses linear coefficients, which reconstruct a given sample by using its neighbours to represent the local geometry. Subsequently, it seeks a low-dimensional embedding, in which these coefficients are still suitable for reconstruction. ISOMAP, a variant of MDS, preserves global geodesic distances of all pairs of samples.

LE preserves proximity relationships by manipulations on an undirected weighted graph, which indicates neighbour relations of pair wise samples. However, they suffer from the out of sample problem, i.e., we cannot obtain the low-dimensional representation of samples not in the training set. One common response to address this problem is to apply a linearization procedure to construct explicit maps over new samples. Their corresponding linearization algorithms are neighbourhood preserving embedding (NPE), isometric projection, and locality preserving projections (LPP).

However, these algorithms are imperfect for supervised learning tasks, because they only consider the intra class geometry, while ignoring the interactions of samples from different classes. Marginal bias analysis (MBA) is a solution which takes both the intra class geometry and the interclass discrimination into account. However, it extracts discriminative information from only the marginal samples, although no marginal samples also contain the discriminative information. Furthermore, it preserves the local geometry of intra class samples by making them as close as possible, i.e., the local geometry in MBA is described by the sample distribution compactness, but this is not a precise way for local geometry modelling. In addition to the above problems, MBA has the under sampled problem when the number of training samples is insufficient. In this report, we

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present a novel algorithm, which precisely models both the intra class geometry and interclass discrimination and never meets the under sampled problem. That is in the low-dimensional space, distances between positive samples and negative samples should be as large as possible while distances between positive samples should be as small as possible; and the local geometry of positive samples should be preserved as much as possible by keeping linear reconstruction coefficients obtained in R^H.The former part is called the discrimination preservation and the latter is called the local geometry preservation, so we term the proposed algorithm as Biased Discriminant Euclidean Embedding (BDEE).

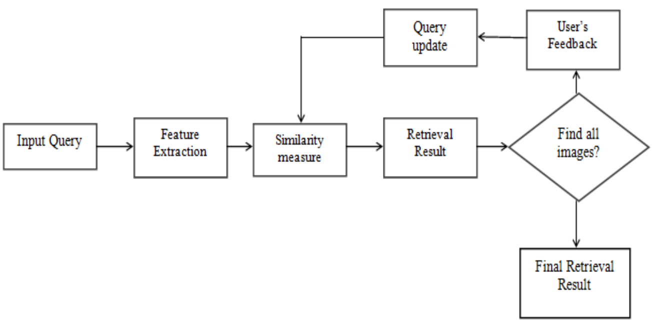

Fig : Flow of image retrieval .

VI. CONCLUSION

Content Based Image Retrieval (CBIR) is an automatic process for searching relevant images based on image features and user inputs. 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 highly interactive. The robustness of the method is essential in some degree of noise, which might also be in case of simple images.

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