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Image Retrieval by Matching Sketches and Images

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Abstract*—the proposed system provides a unique scheme for Content based image retrieval (CBIR) using sketches. CBIR is the application of computer vision to the image retrieval problem that is the problem of searching for digital images in the large database. Content based means the search will analyze the contents of the images. The main aim of CBIR is to extract visual content of an image automatically like color, texture, shape or any combination of them. The goal is to retrieve all the images whose content is similar to those of query image. Even a query sketch which is given as input will display related images from the frequently used database (SBIR). Sketch will be drawn in a provided drawing area in the proposed system. After the preprocessing on the input sketch, descriptors are formed using HOG, EHG, SIFT algorithms. This Paper will focus on implementation of SBIR system, in which descriptors will reduce the gap between the sketch and the image.

***Index Terms*—CBIR, SBIR**

I. INTRODUCTION

Content-based image retrieval (CBIR) is a technique for retrieving images on the basis of automatically-derived features such as color, texture and shape. In a particular CBIR, features related to visual content such as shapes, colors, and textures are extracted from a query image, the similarity between the set of features of the query image and that of each target image in a database is then computed, and target images are next retrieved which are most similar to the query image. CBIR is also known as query by content (QBIC) and content based information retrieval. Extraction of good features which compactly represent a query image is one of the important tasks in CBIR. Shape is a visual feature that describes the contours of objects in an image, which are usually extracted from segmenting the image into meaningful regions or objects. The problems of image retrieval are becoming extensively recognized, and the search for solutions an increasingly active area for research and development. Problems with conventional methods of image indexing have led to the rise of interest in techniques for retrieving images on the basis of automatically derived features such as color, texture and shape images at each iteration.

1. Architecture:

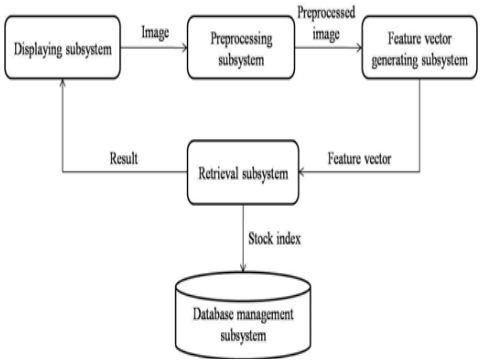

Fig.1 General Architecture

2. Modules:

The modules in this sketch based image retrieval system:

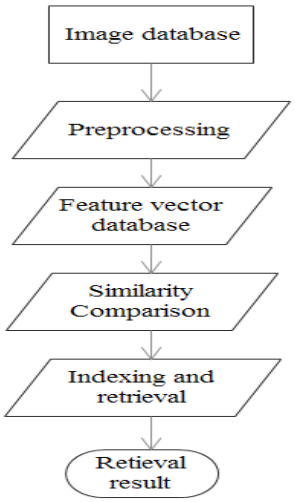

Fig 2. Modules the architecture consists of four modules

1] Image database:

The system is designed for databases containing relatively simple images, but even in such cases large differences can occur among images in file size and resolution. In some cases some images may be noisier and so the feature vectors cannot ne effectively compared. In order to avoid it, a multistep preprocessing mechanism precedes the generation of descriptors.

2] Preprocessing:

Here the Preprocessing of image has been done. Preprocessing includes blurring, histogram equalization, Edge detection. Then we get the preprocessed image and this image is given input to calculate feature vectors. And then we calculate features of an input image and input feature vector is generated. Same thing is done for

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database images and another feature vector is generated for database.

3] Similarity Comparison:

The images and their descriptor are stored and the necessary mechanism for subsequent processing sequence is provided. In these step similar images related to input image from database image are found through the feature vector comparison.

4] Indexing and Retrieval:

Feature vectors are generated after preprocessing. Threshold values for the images present in the database are calculated. According to the threshold value clusters of the images which are close to each other are stored. When an input image is processed then indexing is done. Threshold value of that image is compared with threshold value of the images in cluster; those images are to be retrieved. The retrieval results are obtained from the feature set comparison. The output of the system is all the images which contains the sketch present in input image. I.e. Sketch from the input image is matched with all database images.

3. Algorithms Used:

Preprocessing:

Preprocessing is carried out in three steps as shown in the following diagram:

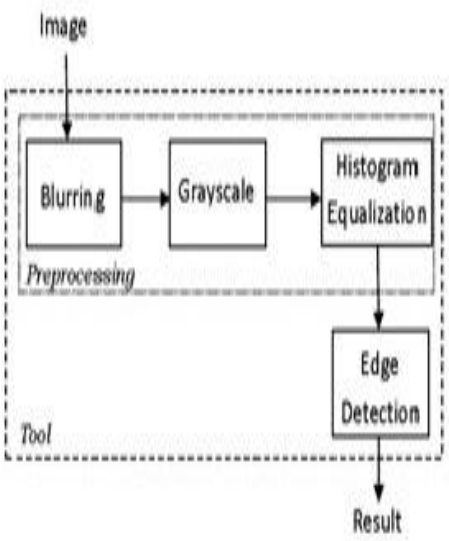

Fig 3.Preprocessing

1. Blurring:

To reduce high frequency noise component in the image, low pass filter has been used for blurring i.e. Gaussian Blur. In most of the similar types of images Gaussian Filter is used

$$A^* = \frac{1}{159}\begin{bmatrix} 2 & 4 & 5 & 4 & 2 \\ 4 & 9 & 12 & 9 & 4 \\ 5 & 12 & 15 & 12 & 5 \\ 4 & 9 & 12 & 9 & 5 \\ 2 & 4 & 5 & 4 & 2 \end{bmatrix} \text{x A}$$

Where A: input image,

A*: image formed by use of filter

2. Grayscale:

Pixel carries intensity information about image. Intensity of a pixel can be expressed within a range. Grayscale is a range of shadows between black and white. It forms a scale for images which calculates intensity of image .Between 0 to 255(pixel range) or 0-100%

3. Histogram Equalization:

When image is converted to its gray scale equivalent, histogram equalization is calculated as follows:

- Cumulative histogram is formed.
- Frequency of each intensity level is computed.
- Calculate the cumulative values using cumulative distributive function (cdf).
- Normalize (cdf) to [0,255].
- Compute the equalized value as h (v).

$$h(v) = round\left(\frac{cdf(v) - cdfmin}{(M\ X\ N) - cdfmin} X(L-1)\right)$$

- Map the original value to the result by a one-to-one correspondence.

4. Edge Detection:

- **Canny Edge Detection Algorithm:**

1. **Smoothing**: Blurring of the image to remove noise.
2. **Finding gradients**: edges marked where the curve of the image has large magnitudes.
3. **Non-maximum suppression**: Only local actual path should be marked as edges.
4. **Double thresholding:** Potential edges are determined.
5. **Edge tracking by hysteresis**: Only Seen the actual boundary.

Gradient based method has been used for the edge detection which is a search based method. We have used 3x3 kernel, which as shown in the algorithm. This method detect edges by first computing a measure of edge strength such as the gradient magnitude, then searching for local directional maxima of the gradient magnitude using a computed local orientation of the edges(gradient direction).

- Begin with the upper threshold to find the start of an edge.
- Mark the edges whenever value lies between upper and lower threshold.
- Compare the edge strength of the current pixel with the edge strength of the pixel in the positive and negative gradient direction.

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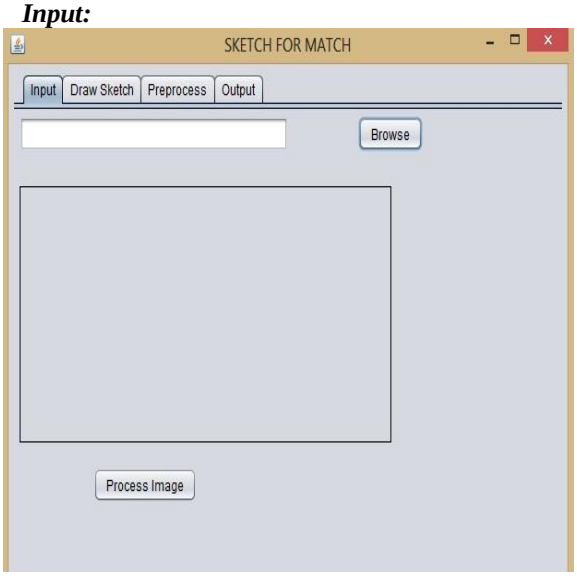
- If the edge strength of the current pixel is largest; preserve the value of the edge strength. If not, suppress the value.
- Stop marking edges when the edge strength falls below lower threshold

II. RESULTS

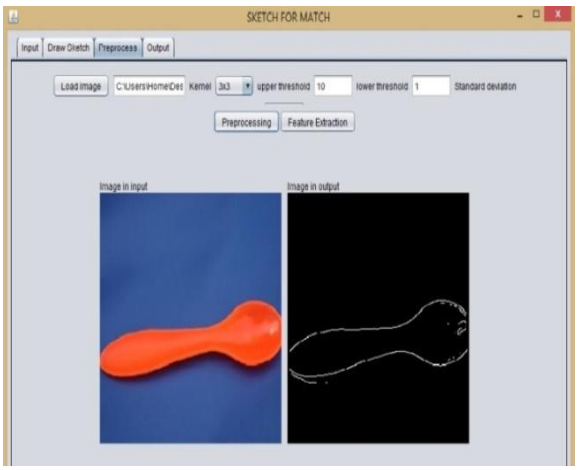
Proposed system consists two parts as follows:
1. Search by image
2. Search by sketch

In the search by image, an image is to be browsed from any folder present in the hard disc. That will be an input image. Then it will be loaded and preprocessed when key is pressed. Further its features should be extracted using feature extraction key. Then related output will be displayed i.e. images which are most similar to the input image. In the Search by sketch, a drawing area is provided. Free hand sketch can be drawn using it. Sketch will be stored in image format (.jpg). Similarly it is then loaded and processed as per the 'search by image'.

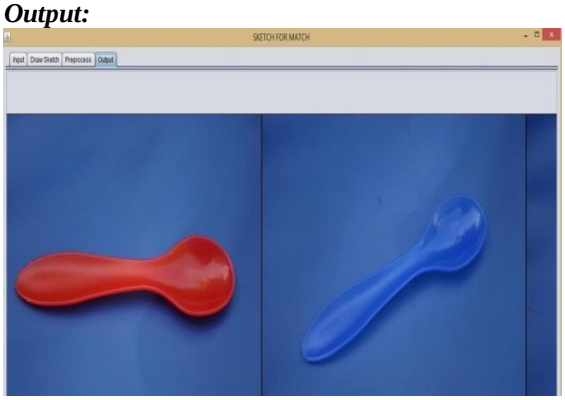
1. Input:



2. Image Preprocessing:



3. Output:



III. COMPARATIVE STUDY

Researchers have presented several works on this area. A general technique for the recovery of significant image features is presented in one of the paper using Mean shift algorithm [1].The paper proposes the feature sets for robust visual object recognition, adopting linear SVM primarily based human detection as test cases [2]. The paper proposes a large number of different image descriptors for content-based image retrieval [3]. One paper by D.G. Lowe describes the method for extracting distinctive invariant features from images that can be used to perform reliable matching between different views of an object or scene [8]. A highly functional prototype system for searching by visual features in an image database called visual seeks [10]. A paper by Brandon Klare, Anil k Jain sketch to match a feature based approach that a concept of the retrieval of the images based on the effective approach takes place in a well efficient manner [16]. Content-based image retrieval has become a topic of interest in recent years, and there has been some substantial research in the area. Learning over a single query is called short term learning. As the CBIR system returns more images and the user labels them, the CBIR system learns what the user is searching for and it returns more relevant images at each iteration. Grid approaches have also been used to locate photos using sketched depiction of object shape (via EHD or structure tensor). Contour description techniques have also been used to match sketched shapes to images. Edge segments are organized into a string representation, encoding length, curvature and relative spatial relationship, Edge orientation and angular partitioning have also used to describe contours. Model fitting approaches such as deform the sketch to fit to edges of objects in the images, calculate similarity via the deformation energy spent.

IV. CONCLUSION

In this paper we have presented implementation of a unique approach called Sketch for match. The retrieval process has to be unconventional and highly interactive. The robustness of the method is essential in some degree of noise, which may also be in case of simple images.

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Initially, the image database for sketch image is taken as input and then preprocessing is done and then stored features of images are using stored in feature vector feature extraction. The features are compared using similarity comparison. The indexing of similar features is done and the output images are presented at the list. Our evaluation results shows that HOG in more cases is better than the EHD based retrieval. This is due to the sliding window solution of HOG. Using the SIFT based multi-level solution the search result list is refined. With the categorization of retrieval response a bigger decision possibility was given to the user on that way, he can choose from more groups of results.

V. FUTURE SCOPE

This system can be extended for use over a LOCAL AREA NETWORK (LAN) i.e. distributed in nature. It also can be used to develop a Video based Face recognition system in Bank ATM. Tattoo detection and morphological comparison can be added to it, which will increase its usability in crime investigation. Fingerprint scanning is also a future scope for proposed sketch based image search system.

REFERENCES

[1] D. Comaniciu, and P. Meer, "Robust analysis of feature spaces: color image segmentation," IEEE Conference on Computer Vision and Pattern Recognition, pp. 750–755, June 1997.

[2] N. Dalal, and B. Triggs, "Histograms of oriented gradients for human detection," IEEE Conference on Computer Vision and Pattern Recognition, pp. 886–893, July 2005.

[3] T. Deselaers, D. Keysers, and H. Ney, "Features for image retrieval: an experimental comparison," Information Retrieval, vol. 11, pp. 77–107, December 2007.

[4] M. Eitz, K. Hildebrand, T. Boubekeur, and M. Alexa, "An evaluation of descriptors for large-scale image retrieval from sketched feature lines," Computers and Graphics, vol. 34, pp. 482–498, October 2010.

[5] R. Hu, M. Barnard, and J. Collomosse, "Gradient field descriptor for sketch based image retrieval and localization," International Conference on Image Processing, pp. 1–4, 2010.

[6] T. Hashimoto, A. R¨ovid, G. Ohashi, Y. Ogura, H. Nakahara, and A.R. V´arkonyi-K´oczy, "Edge detection based image retrieval method by sketches," Proc. of the International Symposium on Flexible Automation, pp. 1–4, 2006.

[7] J.B. Kruskal, "Nonmetric multidimensional scaling: a numerical method," Psychometrika, vol. 29, pp. 115–129, 1964.

[8] D.G. Lowe, "Distinctive image features from scale-invariant key points," International Journal of Computer Vision, vol. 60, pp. 91–110, 2004.

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