Sketch Based Image Retrieval System

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Abstract— In today's world, technology is enhancing day by day, the most enhanced research area in digital image processing is image retrieval system .The techniques used for retrieving image on the basis of content , the content as text, sketch, color and shape that can be describe the image. Here we present various image retrieval methods which is used as sketch content. So the system is referred to as Sketch Based Image Retrieval System (SBIR). In this paper implement EHD, HOG and Integrated EHD and HOG algorithms and give the comparison of three algorithm based on their accuracy measured. SBIR is advantageous than purely text base image search. The retrieval system using sketches can be essential and effective in our daily life such as Medical diagnosis, digital library, search engines, crime prevention, geographical information, photo sharing sites and remote sensing systems.

Keywords - Database, EHD, HOG, Image, Sketch.

I. INTRODUCTION

With the development of the technology and availability of the image capturing devices such as scanners, digital cameras', the size of the digital image collection increases rapidly. It is important to efficiently store and retrieve images for different applications, for this purpose many image retrieval system have been developed. One of the most popular system is Content Based Image retrieval System (CBIR). Which is based on the content, the content may be color, texture and a sketch. Query By Image Retrieval (QBIR) is also known as content based image retrieval.

In the digital image processing, content based image retrieval is most popular & rising research area. The information extracted from the content of query is used for the content based image retrieval information systems. In these systems the keywords are annotated with images and then using text based search method retrieve images. To extract the visual content of an image like texture, color, shape or sketch is the goal of CBIR. This paper introduces using sketch as a content, so the system becomes Sketch Based Image Retrieval System (SBIR).

This paper is presented the problems and challenges that related to implementing a CBIR system using free hand sketches. The most important task is to bridge the gap between picture and sketch. In sketch based image retrieval system user provided a drawing surface , where the user can draw a sketch as input. The feature vector of input sketch compares with feature vector of database images and retrieve the matched image from the database & display on screen as output of the system. This system retrieves the image better than the previous used systems.

Section 2 gives the literature survey, which gives the information about previously used systems for image retrieval. The proposed system of images retrieval based on a sketch using integrated EHD and HOG descriptor are explained in section 3. Section 4 shows the system result. Finally section 5 provides the conclusion of the system.

II. RELATED WORK

A. Retrieval using Cross Media Relevance Models

For indexing libraries have usually used manual image annotation and then later their image collections are retrieved. However, manual image annotation procedure is an expensive and labor intensive and hence there has been great interest in coming up with retrieving images based on content in an automatic way. Here, to annotating and retrieving images based on a training set of images, we propose an automatic approach [6].

He assumes that a small vocabulary of blobs can be described as regions in an image . Using clustering from image features blobs are generated. Given a training set of images with annotations, we show that to predict the probability of generating a word given the blobs in an image probabilistic models is used. This may be used to automatically annotate and retrieve images given a word as a query. Here shows that relevance models allow us to derive these probabilities in a natural way. Author says his approach shows the usefulness of using formal information retrieval models for the task of image annotation and retrieval.

B. Content Based Image Retrieval

Content Based Image Retrieval (CBIR) is an automatic process based on user input to search relevant images. The input could be sketches, example images or parameters. A typical CBIR process first the image features extracts and efficiently store them. Then it compares with the database images and returns the results [11].

Feature extraction and similarity measure are very dependent on the used features. There would be more than one representation in every feature,. Among these representations, to describe features histogram is the most commonly used technique.

III. PROPOSED SYSTEM DESIGN

In the proposed system for improving the efficiency of an image retrieval system, we integrate the EHD and HOG descriptor. There is trying to overcome the drawback of individual EHD and HOG descriptor algorithm.

A. System Architecture

In the system architecture an efficient sketch based image retrieval system is proposed.

Fig. 1 shows the basic system architecture. It involves blocks like Display subsystem, Feature vector generation, Feature extraction, Retrieval subsystem and Database management subsystem.

In this system the Edge Histogram Descriptor (EHD) & Histogram of Oriented Gradients (HOG) feature vector integrated together. From this feature vector find the similar image.
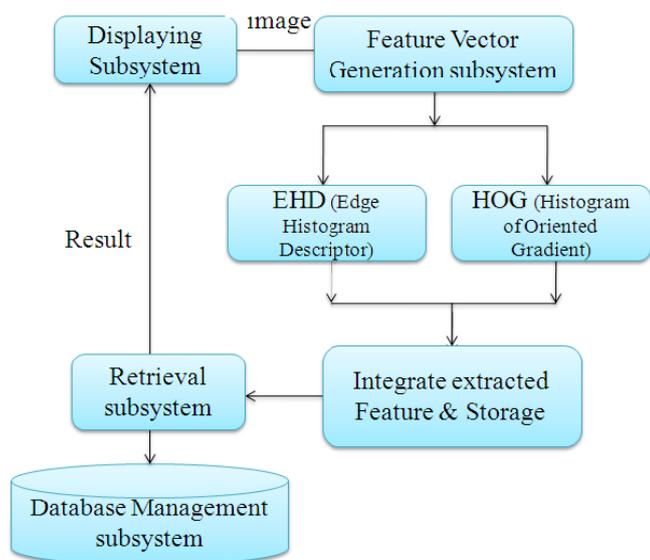

Fig. 1. System Architecture

The displaying subsystem provided the drawing surface for user to draw the sketches. And also provide the screen for

retrieval of matched images [1]. The Display subsystem that is implemented user interface can be seen in Fig. 2 and our program has been written in Java.
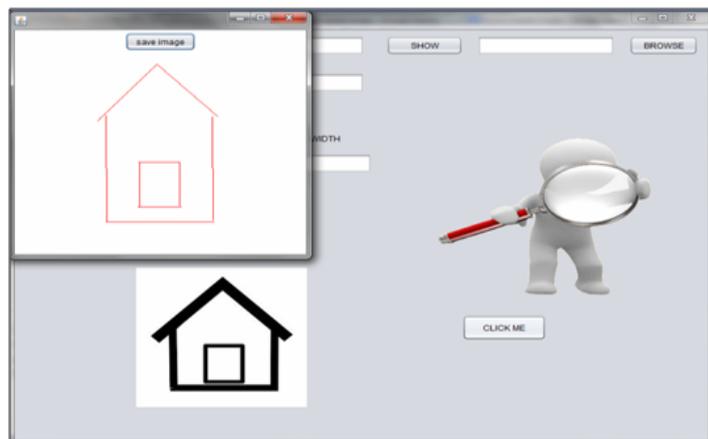

Fig. 2. : Implemented User Interface

B. Proposed Algorithms

1. Edge Histogram Descriptor (EHD)

Histogram - The histogram is the most commonly used configurations. To signify any inclusive feature composition of an image. Histogram is useful for indexing and retrieving image.

Edge - Edge in images constitute an important feature to represent their content. One way of representing an important edge feature is to use a histogram in the image space represents the frequency and directionality of brightness changes in the image hence it is called as Edge Histogram.

The EHD represents the spatial distribution of edges in an image. The extraction process of the EHD consists of the following stages [12].

1) The image array is divided into 4x4 sub images.
2) Each sub image is further partitioned into non-overlapping square image blocks whose size depends on the resolution of the input image.
3) The edges in each image-block is categorized into one of the following
4) Six types- vertical, horizontal, 45 diagonal, non-directional edge , 135 diagonal and no-edge.
5) Now at 5-bin edge histogram of each sub image can be obtained.
6) Each bin value is normalized by the total number of image-blocks in the sub image.
7) The normalized bin values are nonlinearly quantized.

There are five types of edge Histogram
When the user select EHD algorithm, SBIR system finds the edges of the image. Fig. 3 shows the edges of the image using EHD algorithm.
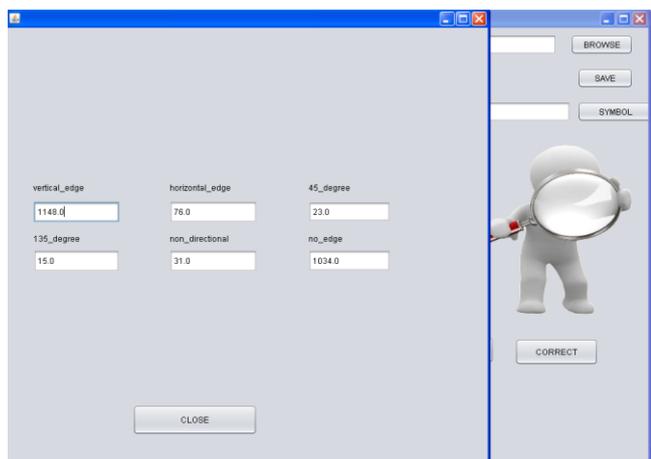
Fig. 3. Edges of Image Using EHD Algorithm

These edges as a feature vector of image & this feature vector compare with the database images feature vector, when matches the feature vector similar image is display on the displaying subsystem as a output image.

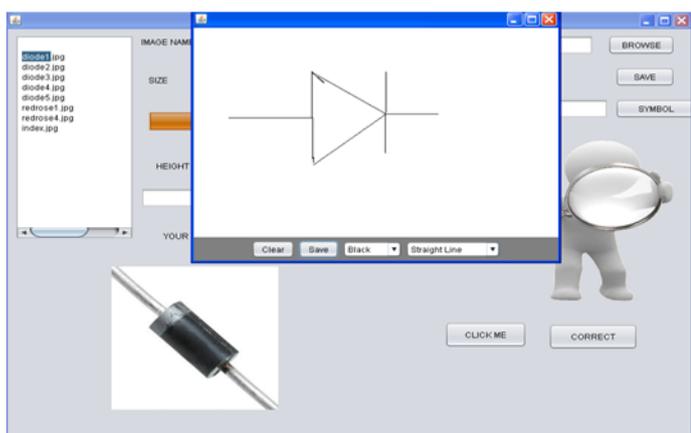Fig. 4 shows the Sketch based image retrieval by using EHD algorithm.

Fig. 4. Image Retrieval By Using EHD

2. Histogram of Oriented Gradients Descriptor (HOG)

Histogram of Oriented Gradients (HOG) are feature descriptors used for the function of object detection in image processing and computer vision. The technique calculates amount of gradient orientation in localized sections of an image. The Histogram of Oriented Gradient descriptors is that the local object appearance and shape within an image can be described by the distribution of intensity gradients or edge directions [5].

The implementation of these descriptors can be achieved by dividing the image into cells. The cell is small coupled sections, and for every cell assemble ling a histogram of gradient directions or edge orientations within the cell for the pixels. The arrangement of these histograms, then represents the descriptor. For enhanced accuracy, the local histograms can be contrast-normalized by calculating a measure of the intensity across a larger region of the image, entitled as block, and then with this value within the block to normalize all cells. This

result of normalization in better invariance to changes in illumination or shadowing.

Compute a Histogram of Oriented Gradients (HOG) by

1) Gradient Computation
2) Orientation Binning
3) Descriptor Blocks
4) Block Normalization
5) SVM Classifier

For implementing the HOG algorithm, first train the image and then the test image.

HOG algorithm finds the gradients of the image as a feature vector. Fig. 5 shows the gradients of the image.
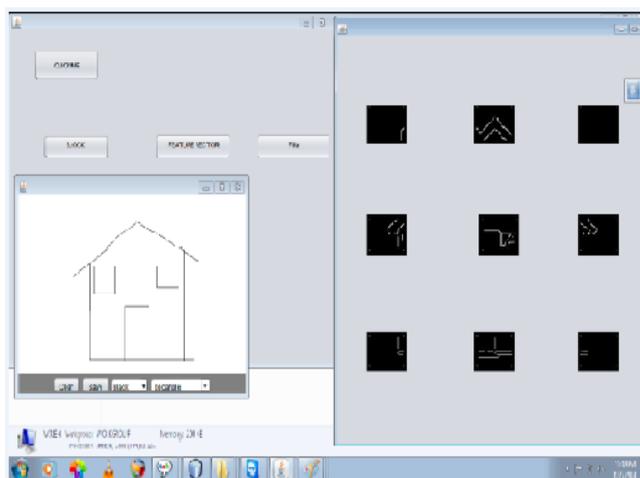

Fig. 5 Gradients of Image Using HOG

3. Integrated EHD & HOG

In this algorithm integrated edge histogram descriptor & histogram of oriented descriptor, which gives better image retrieval than individual EHD & HOG.

In this system first Train image & then Test image. While training the image first find the intensity gradients of the image using HOG descriptor & then find the edges of the image using EHD descriptor. This gradient & edges is the feature vector of the image. In database user which image he is going to train so he can define class & put the feature vector in related class.

In testing user draw sketch on surface area, first find the gradients & edges of the image as a feature vector , after finding the feature vector using SVM model classifier find the feature vector belongs to which class. Once class is find it compare the feature vector with feature vector of selected class images & then shows all images as per similarity match with threshold set by the user & retrieve similar images. This system retrieves images better than the individual EHD & HOG descriptors.

Compute a integrated EHD & HOG by

1) Compute gradient of image using canny.
2) Find gradient at particular edges or angle (horizontal, vertical , 45-degree etc).
3) Save block to database.

4) Use SVM model for classification.

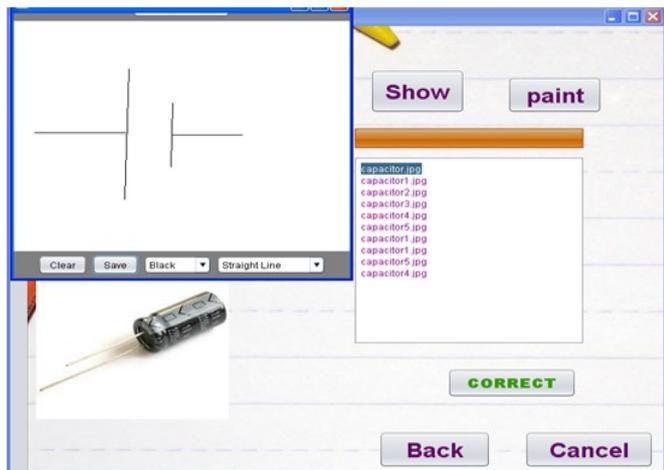Fig. 6 shows the image retrieval by using integrated EHD & HOG.

Fig. 6. : Image Retrieval By Integrated EHD & HOG

IV.   RESULT AND DISSCUSION

While testing the Sketch Based Image Retrieval System, calculate the Precision & Recall to evaluate the effectiveness & accuracy of the system.

Where the Precision provides information related to effectiveness of the system.

- Precision = Q / P . . . .
  Q = No. of images displayed with similar shape.
  P = No. of images displayed.

Where the Recall provides the information regarding exact accuracy of the system .

- Recall = Q / Z . . . .
  Q = No. of images displayed with similar shape.
  Z = No. of images with similar shape in whole database .

Fig. 7 shows Precision & Recall graph of integrated System.
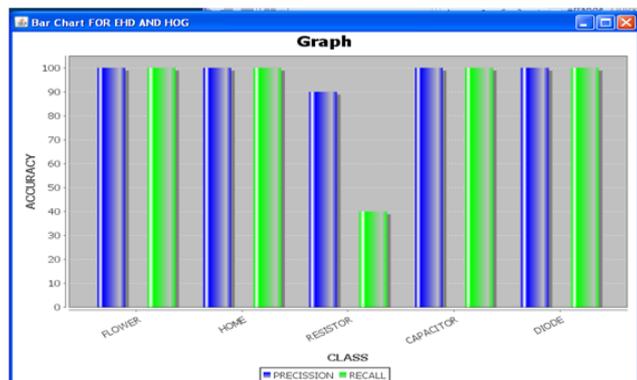

Fig. 7 Precision & Recall Graph of Integrated System

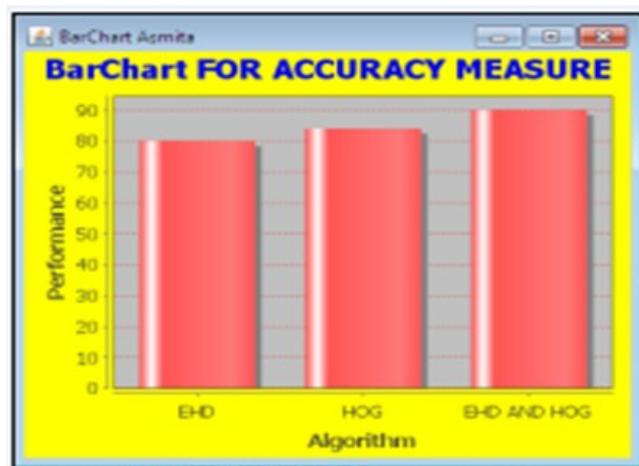Fig. 8 shows the accuracy of EHD, HOG & Integrated EHD & HOG.

Fig. 8. Accuracy of the System

Compare the integrated system, based on standard precision value, system retrieves better image than the individual EHD & HOG system (shown in Table I). So the integrated system is more effective than other system.

TABLE I
EFFECTIVENESS OF SKETCH BASED SYSTEM

Method	EHD	HOG	Integrated EHD & HOG
Average Precision	80%	84%	90%

A.   Advantages of Integrated System

1) It is examine for large database.
2) Integrated EHD & HOG is more better than the individual descriptor.
3) The edge Histogram descriptor not mainly look better for information poor sketch, while other case show better result can be achieve for more detailed this problem can be overcome by the HOG method.
4) Capture edge or gradient structure that is very characteristic of local shape.

B.   Disadvantages of Integrated System

1) Time required to retrieve image is more compared to individual EHD & HOG.
2) In this system complicated images can not draw.

V.   CONCLUSION

In this system describe the individual sketch method and try to integrate this method for reducing the individual methods

drawback. In this system to implement the new searching technique and improving the quality of searching image, in this technique EHD and HOG method work parallel and normalized result is displayed. This system retrieves the image better than the individual EHD & HOG. Integrated system gives the better accuracy.

In future work to make panel which can draw complicated images i.e provide tool, works on color spaces. Also can make more classes in Integrated system to define the images.

VI. ACKNOWLEDGEMENT

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