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# Image Retrieval System Based on Sketch

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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.

## 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 sketch. Query By Image Retrieval (QBIR) is also known as content based image retrieval [2].

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) [2].

This paper presenting 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 user can draw sketch as input. The feature vector of input sketch compare 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.

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

**System Architecture**
In the system architecture an efficient sketch based image retrieval system is proposed.
Figure[1] shows the basic system architecture.It involves blocks like Display subsystem, Feature vector generation, Feature extraction, Retrieval subsystem and Database management subsystem.

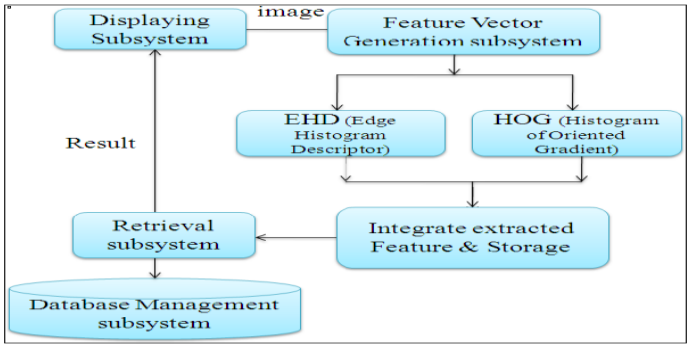


**Figure 1** : System Architecture

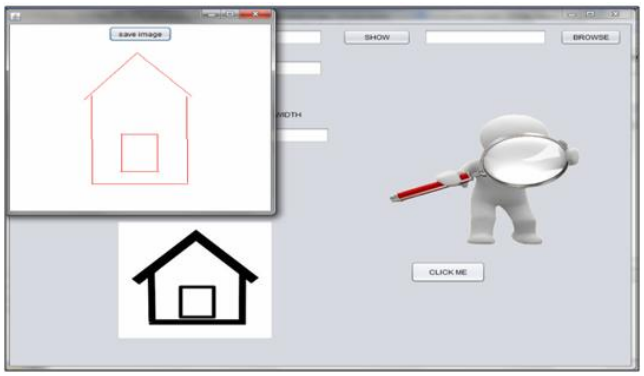


**Figure 2** : Implemented User Interface

***1.Feature Vector Generation Subsystem***

Feature vector is position at which particular value is stored or interesting point of image.

This sub-system consist of descriptor vectors, which signify the content of the image. There are three descriptor vectors that is Edge Histogram descriptor (EHD), Histogram of Oriented Gradients (HOG), Scale invariant feature transform (SIFT).

The function of descriptor is Pre-processing of free hand sketches, Compression of free hand sketch with gallery of images, Retrieval of matched images from the database.

In this system, we get the required image based on sketch image. We discover images via some features of image. This Histogram characteristic is represent the feature composition of an image.

***2.EHD& HOG Descriptor -***

This descriptor extracts the edges and gradients of a image as a feature vector and store.

***3.Integrate Extracted feature & Store -***

This block extracts the feature vector from EHD and HOG descriptor combine this feature vector, store and give it to the retrieval subsystem.

***4.Retrieval Subsystem -***

When the feature vectors are generated, then retrieval process can start. The Retrieval subsystem is used just to retrieve the matched image to the free hand sketch.

***5.Database Management System -***

In Database Subsystem the large set of images and their descriptors are stored and essential mechanism for successive processing is provided. This block consist of the storage of feature vector, the retrieval of image, and the data manipulation of the system.

Feature vectors, information & images provided by the storage module to the database.

***6.Display Subsystem -***

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 Figure 2 and our program has been written in Java.

## Proposed Algorithms

*1.Edge Histogram Descriptor (EHD).*
*2.Histogram of Oriented Gradients Descriptor (HOG).*
*3.Integrated EHD & HOG.*

***1.Edge Histogram Descriptor (EHD) Histogram***

The histogram is the most commonly used structure. To represent any global feature composition of an image. Histogram is useful for indexing and retrieving image [7].

*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 blockswhose 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, 135 diagonal, non-directional, edgeand no-edge.
5. Now a 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 subimage.
7. The normalized bin values are nonlinearly quantized. There are five types of edgeHistogram.

Figure[3] is the window which is used to select the algorithm and graphs of related algorithm.

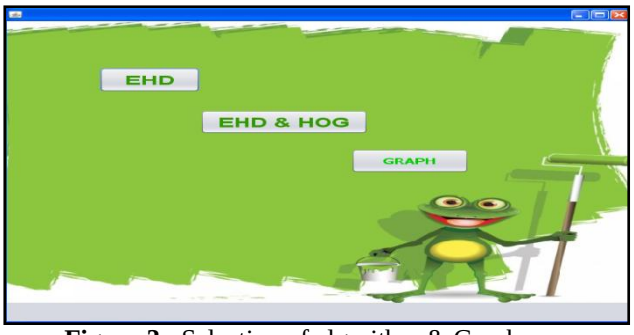


**Figure 3** : Selection of algorithm & Graph

When user select EHD algorithm, SBIR systemfinds the edges of the image. Figure[4] shows the edges of the image using EHD algorithm.

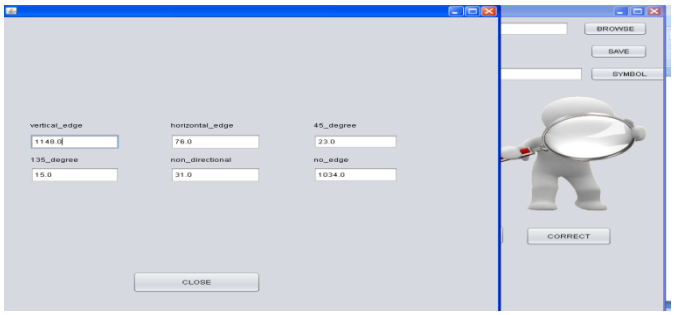


**Figure 4**: Edges of Image Using EHD Algorithm

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.
Figure[5] shows the Sketch based image retrieval by using EHD algorithm.

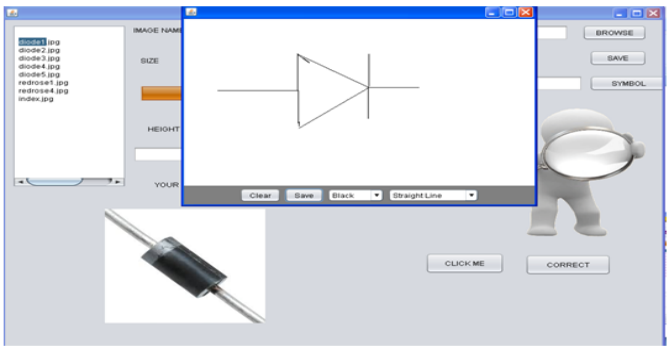


**Figure 5** :Image Retrieval By Using EHD

***2.Histogram of Oriented Gradients (HOG)***

Histogram of Oriented Gradients (HOG) are feature descriptors used in computer vision and image processing for the purpose of object detection. The technique counts occurrences of gradient orientation in localized portions of an image. The Histogram of Oriented Gradient descriptors is that 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 small connected regions, called cells, and for each cell compiling a histogram of gradient directions or edge orientations for the pixels within the cell [5].The combination of these histograms then represents the descriptor. For improved accuracy, the local histograms can be contrast-normalized by calculating a measure of the intensity across a larger region of the image, called a block, and then using this value to normalize all cells within the block. Thisnormalization results 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 test the image.


**Figure 6** : Train and Test Image

HOG algorithm finds the gradients of the image as a feature vector. Figure[7] shows the gradients of the image.

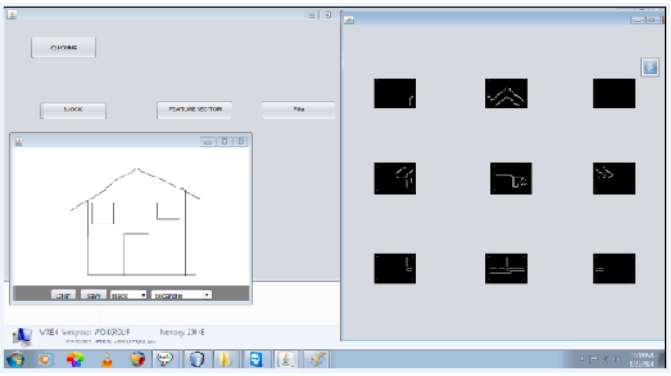

**Figure 7** :Gradients of Image Using HOG

***3.Integrated EHD & HOG***

In this algorithm integrated edge histogram descriptor & histogram of oriented descriptor, which gives better image retrieval than individual EHD & HOG [6].
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.
Figure[8] shows the image retrieval by using integrated EHD & HOG.

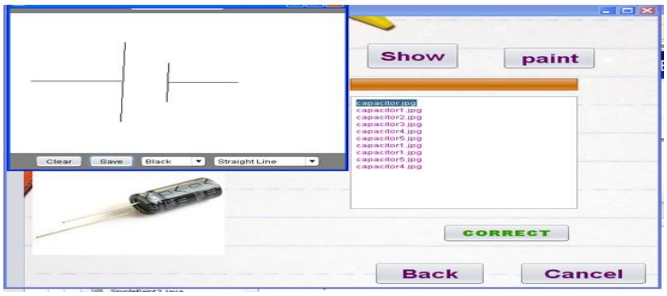


**Figure 8** : Image Retrieval By Integrated EHD & HOG

## TEST AND RESULT

While testing the Sketch Based Image Retrieval System, calculate the Precision & Recall to evaluate the effectiveness & accuracy of the system [5].

where the Precision gives information about the relative effectiveness of the system.

- Precision = Q / P . . . . . .[I]

  Q = No. of images displayed with similar shape.
  P = No. of images displayed.

where the information about the correct accuracy of the system gives the Recall.

- Recall = Q / Z . . . . . [II]

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

Figure 9 shows Precision & Recall graph of integrated System.

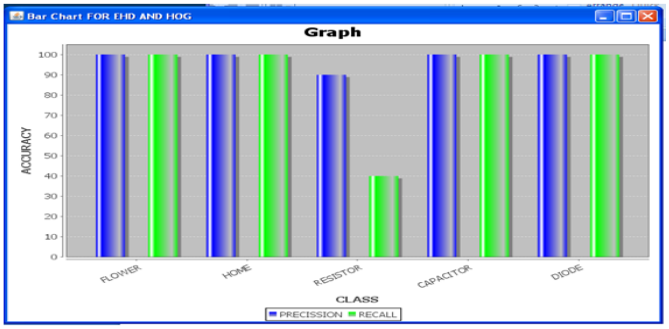


**Figure 9** : Precision & Recall Graph of Integrated System

Figure 10 shows the accuracy of EHD, HOG & Integrated EHD & HOG.


**Figure 10**: 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 1). So the integrated system is more effective than other system.

**Table 1**: Sketch-Based System Effectiveness

| Method | EHD | HOG | Integrated EHD & HOG |
|---|---|---|---|
| Average Precision | 75% | 85% | 92% |

- ***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.

- ***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.

## CONCLUSION

At the tests the effectiveness of EHD and HOG implementation is compared. It examined with more databases. In our research the HOG in more cases was much better than the EHD based retrieval.

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.

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## REFERENCES

[1]B. Szanto. P. Pozsegovics, Z. samossySz. Sergyan,\Sketch4Match { Content-based Image Retrieval System Using Sketches"SAMI 2011 _9th IEEE International Symposium on Applied Machine Intelligence and Informatics January 27-29, 2011 Smolenice, Slovakia.

[2] Prof. BalramPuruswani, Jyoti Jain M.Tech (CTA) Dept. of Computer Science, Gyan Ganga College of Technology Jabalpur (M.P.), \A Preliminary Study on Sketch Based Image Retrieval System", International Journal of Modern Engineering & Management Research, Volume 1, Issue 1, April 2013 ISSN: 2320-9984.

[3] ShadmaParveen, ShwetaYadav ,NeeluChauhan ,Dept(CSE) ,ITM , Gida ITM , Sketch4Match { Content-based Image Retrieval System Using Sketches", International Journal of Advanced Research in Computer Science and Software Engineering , Volume 3, Issue 4, April 2013 ISSN: 2277 128X .

[4] Mr. EshwarErva, Mr. K Chandra Shekar Aurora's Technological Research Institute, Hyderabad, \A System Which Retrieves Images Using a Query Image", International Journal of Engineering Research & Technology (IJERT),Vol. 1 Issue 7, September { 2012 ISSN: 2278-0181.

[5] RuiHua, John Collomossea, A Performance Evaluation of Gradient Field HOG Descriptor for Sketch Based Image Retrieval",Centre for Vision, Speech and Signal Processing, University of Surrey, UK.

[6] J. Jeon, V. Lavrenko, and R. Manmatha, \Automatic Image Annotation and Retrieval Using Cross-Media Relevance Models", Proc. 26th Ann. Int'l ACM SIGIRConf. Research and Development in Information Retrieval (SIGIR '03), pp. 119-126, 2003.

[7] J. Kalervo, K. Jaana, and N. Timo, ExpansionTool: Concept-BasedQuery Expansion and Construction", Information Retrieval, vol. 4, no. 3, pp. 231-255, 2001.

[8] G. Chen, X. Li, L. Shou, J. Dong, and C. Chen, HISA: A Query System Bridging the Semantic Gap for Large Image Databases (Demo)", Proc. 32nd Int'l Conf. Very Large Data Bases (VLDB '06), pp. 1187-1190, 2006.

[9] X.Y. Li, L.D. Shou, G. Chen, and K.-L. Tan, \An Image-Semantic Ontological Framework for Large Image Databases (Poster)", Proc. 12th Int'l Conf. Database Systems for Advanced Applications (DASFAA '07), pp. 1050-1053, 2007.

[10] J.R. Paek and S. Smith, \Detecting Image Purpose in World-Wide Web Documents", Proc. IS&T/SPIE Symp. Electronic Imaging: Science and Technology Document Recognition, vol. 3305, pp. 151- 158, Jan. 1998.

[11] A.W.M. Smeulders, M. Worring, S. Santini, A. Gupta, and R. Jain, \Content-Based Image Retrieval at the End of the Early Years", IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 22, no. 12, pp. 1349-1380, Dec. 2000.

[12] J. H. Choi a *, S. H. Park a, S. J. Park ," Design and Implementation of a Concept-based Image Retrieval System with Edge Description Templates", Electronics and Telecommunications Research Institute, 161 Gajeong-dong, Yuseong-gu, Daejeon, 305-350 KOREA.

[13] A.K. Jain, J.E. Lee, R. Jin, and N. Gregg, \Content based image retrieval: an application to tattoo images", IEEE International Conference on Image Processing,pp. 2745-2748, November 2009.

[14] N. Dalal, and B. Triggs, \Histograms of oriented gradients for human detection", IEEE Conference on Computer Vision and Pattern Recognition, pp. 886-893, July2005.

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