Survey on Sketch Based Image Retrieval

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Abstract— Sketch Based Image Retrieval technique is used to retrieve the images from database, Based on Sketch as query image, There are several techniques which are used to retrieve images, Such as content based image retrieval, Text based image retrieval, Sketch Based Image Retrieval. Among Sketch base image retrieval technique is one of the popular and most efficient method used to retrieve the images from the database. It's useful when there is no natural scene query image, to draw the query sketch need not to have high drawing skills, a rough hand written sketch composed of black and white is enough to retrieve relevant images from database. Sketch based image retrieval technique is used in our day to day life, In the fields of Biometric Security, Shapes Identification, Medical diagnosis – Tumors detection, Investigation – helps the police to detect the culprit, Search engines etc. In this survey paper we have summarizes different Sketch based methods used to retrieve the images, and comparison among them.

Key words: CBIR, SBIR, TBIR, SIFT, GCM

I. INTRODUCTION

Every day lots of data is gathering over internet by various means of multimedia such as Facebook, Google, Youtube, Istagram etc. The challenging task is to retrieve the images from large database efficiently. There are different techniques which are used to retrieve the images.

A. CBIR - [8]

Content based image retrieval in this technique the image is retrieve based on the optical features of the image such as color, shape, texture, blob detection, edge detection, and contour detection. Textual descriptors are avoided instead images are retrieve based on their similarities in content. CBIR extracts the features of a query image and extracts the features of a database images compare both the features by using various similarity measure algorithms and display the resultant images from best match to worst match.

B. TBIR

Text based image retrieval in this technique the images are retrieve based on the metadata such as captioning, keywords, description to the images. [13] The images are described by using text descriptors; this approach requires lot of man power and efforts to describe the images. For large database images manual annotation is difficult and the lack of knowledge about the image the user can't shape most appropriate keywords for the database images. The search engines sometimes fail to retrieve the relevant images due to lack of keywords and more than one image may referred with same keyword.

C. SBIR – [4] [5]

Sketch based image retrieval in this technique the images are retrieve based on Sketch as a query image. When the user doesn't have accurate textual information or the input images to retrieve relevant images. In such cases Sketch based image retrieval technique is used. This technique is one of the popular and most efficient methods used to retrieve the images from the database by just giving simple rough sketch as input. [6] The user need not be a skilled artist a rough drawing would be enough to retrieve relevant images from the database. Forensic artist are used to draw the sketch based on eyewitnesses, then those sketches are applied on database images to find out the criminals.

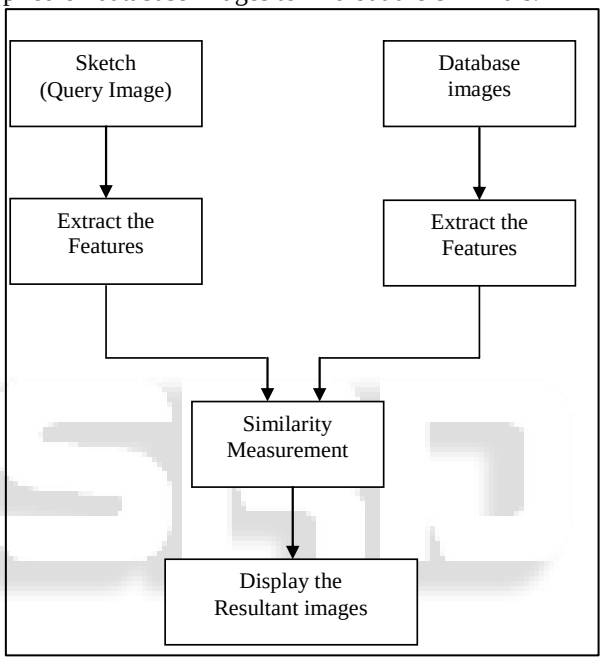


Fig. 1: Architecture of SBIR

II. LITERATURE REVIEW

[1] In this paper the author has proposed three different techniques as feature descriptor and principal component analysis. Local feature based discriminant analysis (LFDA), Multiscale local binary pattern (MLBP) Scale invariant feature transform (SIFT).

The steps which are used to match the sketch and the database images are.

- Use feature extraction methods on every input sketch and database images store the result in database.
- The extracted features result need to be build for every image in a database.
- Compare the extracted features of sketch and database image by using Euclidean distance algorithm, the resultant image would be the minimum distance calculated the matching algorithm.

A. LFDA

The feature vector of each image is divided into slices of smaller dimensions. Discriminant analysis is performed on each slice to get the final feature vector by removing the redundant information among the feature slices [15].

B. SIFT

This algorithm is used to extract the interesting points from the image and provide the feature description of the image. It uses gradient based feature descriptors. This quantizes both the spatial locations and gradient orientation with in small sized image patches and gives histogram of the each value.

[2] In this paper the author is dividing the image contour into two types. Global contour map and Salient contour map which are used to find out the objects in the images. In addition to this the author proposed Angular radial partitioning feature descriptor (AROP) [16] which utilizes the edge pixels fully to detect the spatial relationship.

C. GCM

Global contour map is used to describe the background contour of an image it has impact on main object of the image by adjusting its weight. It decreases the background threshold, so that to get focus on main object [21].

D. SCM

Salient Contour map is used to find the similar objects between the sketch and corresponding images. To extract the salient region, Region based contrast method is used [10]. The largest connected region will be considered as initial candidate region and the remaining region will be considered as a background. If SR(x, y) =1 then the pixels belongs to salient region otherwise it belongs to the background. First obtain the RC saliency mp for each image and use bounding box to get minimum rectangle saliency map. Secondly get the candidate rectangle by refining the saliency map. Filter some small rectangles and get refined saliency map. If there is only one connected region then consider that region as candidate region. If more than one region is there then merge them to get candidate rectangle [18]. Extract the contour map from the candidate rectangle.

[3] In this paper the author focused on the appearance gap between the image and the sketch. To bridge the gap the author has proposed new line based descriptor called Histogram of line relationship (HLR) and Noise impact reduction algorithm called Object boundary selection.

E. HLR

Extracts the edges from both sketch and database images and creates a series of line segments and selects the relationship between them. The object selection boundary algorithm based on HLR line segments reduces the impact of noisy edges by selecting the main object boundaries. The histogram of line relationship shows line segments and their relationship with other neighboring line segments [19].

[4] In this paper the author bridging the appearance gap between hand drawn sketches and database images based on sketch tokens. They are (Sketch tokens) mid level representation of local edge structures. And also proposes a local descriptor to describe shape of the object by collecting the sketch tokens.

There are some advantages if an image is describe with tokens.

1) First if an image is described with tokens extractions of edge can be avoided, thus it removes the errors which will propagate through.
2) The tokens describe local edge shape more accurately.

The author uses (BoVM) Bag of Visual Words model to represents images. For every image of database probabilities of an image patch belongs to which token classes is calculated. Based on this local descriptor will be extracted to explain the shape of the object. The descriptor has four blocks, for each block to describe the probabilities of sketches token a histogram for each block is built.

[17] In this paper the author has proposed re-ranking and relevance feedback schemes to effectively retrieve the sketch based image. Relevance feedback is applied to find best match images.

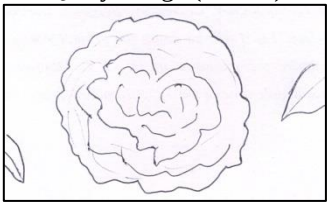
The Proposed SBIR system consists of two parts online part and offline part,

1) In Offline part – by using Berkeley Edge Detector for each image an edge index structure is built. Then extract the SIFT features and record their orientation and location. Finally built an index based on similarity in their contour.
2) In Online part – initialize SBIR System obtain the initial results. Relevant images are grouped and result the top N ranked images. Re-rank to enhance the image matching. Relevance feedback based on contour to find the best match. Re-rank again to improve the performance.

Method	Advantages	Disadvantages
LFDA,MLBP, SIFT	Robust, Inexpensive	Less Accurate
GCM,SCM, AROP	High Performance, Less Searching Time	Gives less performance when (Threshold) th > 0. Gives best match when th = 0.3 - 0.5
HLR,Object Boundary Selection	Reduce the impact of Noise edges	Less flexible when more noisy edges.
Sketch Tokens, BoVM	Extractions of edges can be avoided. Describe local shape edges more accurately.	Gives best result when token class is 100 and database size is 2k
Re-Ranking and Relevance Feedback back	High Performance, Enhancement in Searching	Takes more time, need relevance feedback

Table 1: Comparison of various SBIR Methods

Query Image (Sketch)



Database Images

Fig. 2: Resultant images.

III. CONCLUSION

In this paper we have done a survey on various different image retrieval methods and done a comparison among them. Each method has its own advantages and some limitations. We have presented to improve the knowledge about image retrieval technique and future guidelines.

REFERENCES

[1] Mugdha Joshi et.al, "Face Sketch Recognition Based on SIFT and MLBP", International Journal of Advanced in Engineering and Science, *vol. no. 4, Issue No.08,August 2016.*

[2] Yuting Zhang et.al, "Sketch Based Image Retrieval by Salient Contour Reinforcement", IEEE Transaction on Multimedia , *vol. 18 no. 8, August 2016.*

[3] Shu Wang et.al, "Sketch Based Image Retrieval Through Hypothesis Driven Object Boundary Selection with HLR Descriptor", IEEE Transaction on Multimedia , *vol. 17 no. 7, July 2015.*

[4] Shu Wang et.al, "Sketch Based Image Retrieval using Sketch Tokens", 3rd IAPR Asian Conference on Pattern Recognition, *2015.*

[5] Mathias Eitz et.al, "Sketch Based Image Retrieval : Benchmark and Bag-of-Features Decriptors ", IEEE Transaction on visualization and computer graphics, *vol. 17 no. 11, November 2011.*

[6] Ming-Ming Cheng et.al, "Global Contrast Based Salient Region Detection ", IEEE Transaction on pattern analysis and machine intelligence, *vol. 37 no.3, March 2015.*

[7] M Indu et.al, "Survey on Sketch Based Image Retrieval Methods ",International Comnference on Circuit, Power and Computing Technologies [ICCPCT], *2015.*

[8] Ashutosh Gupta et.al, "Image Retrieval based on Color ,Shape and Texture ",Proceedings of the IEEE 2nd International Conference on Computing for Sustainable Development,P 2097,*2014, 2015.*

[9] Mushtaq Ali et.al, "A Color Image Retrieval System Based on Weighted Average ",Proceedings of the IEEE Conference, *2015.*

[10] Sugandha Agarwal et.al, "Survey on Sketch Based Image Retrieval Using Watershed Transformation ",Second International Comnference on Computational Intelligence and Communication Technology, *2015.*

[11] Pakruddin B. et.al, "A Survey on Content Based Image Retrieval by Various Features", International Journal of Advanced Research in Computer and Communication Engineering [ICRITCSA] , *vol. 5, Speal Issue 2 , October 2016.*

[12] Md. Khalid Imam Rahmani et.al, "A Efficient Indexing Algorithm for CBIR", Proceedings of the IEEE International Conference on Computational Intelligence and Communication Technologies, *2015, pp. 73-77.*

[13] Vrushali A. et.al, "Content based Image Retrieval from Videos using CBIR and ABIR algorithms", Proceedings of 2015 Global Conference on Communication Technologies (GCCT 2015), *2015, p 767-771.*

[14] Pakruddin B. et.al, "Content based Image Retrieval Using Color and Texture Features ", Proceedings of International Journal for Scientific Research and Development, *Vol. 4, Issue 03,2016.S.*

[15] H.B. Kekre. et.al, "Comparative Study of Color Histogram Based Bins Approach in RGB,XYZ,Kekre's LXY Color Spaces", Proceedings of IEEE International Conference on Circuit Systems, Communication and Information Technology applications(SCCITA) *P 364-36,2014.*

[16] Tu Bui. et.al, "Scalable Sketch Based Image Retreival using Color Gradient Features", IEEE International Conference on Computer Vision Workshop, *2015.*

[17] Xueming Qian et.al, "Enhancing Sketch Based Image Retrieval by Re-Ranking and relevance Feedback", IEEE transactions on Image Processing, *vol. 25, no. 1, Issue No.08,January 2016.*

[18] R. Aarthi et.al, "Saliency Based Modified Chamfers Matching Method for Sketch Based Image Retrieval", IEEE Sponsored 2nd International Conference on Innovation Embedded and Communication Systems ICIIECS'15.

[19] Noorah M Asiri et.al, "Combination of Histogram of Oriented Gradients and Hierarchial Centroid for Sketch Based Image Retrieval", IEEE.*2015*

[20] Carlos A.F. Pimentel Filho et.al, "Sketch Finder: efficient and effective sketch based retrieval for large image collections", XXVI Conference on Graphics, Patterns and Images.*2013.*

[21] Da Pan et.al, "Sketch Based Image Retrieval by Using Saliency", 11th International Conference on Fuzzy Systems and Knowledge Discovery.*2014.*

