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A Survey on Content Based Image Retrieval by Using Various Features

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Abstract: This paper proposes a survey on Content Based Image Retrieval via various features. Related work is the foundation for understanding and improving more knowledge regarding precise field. Content Based Image Retrieval is a technique for extracting features of images like color, shape, texture, blob detection, edge detection, contour detection and etc. Once features are extracted from a query image then same procedure will be used for extracting features of database images. For comparing features of both images Euclidian distance can be used to produce the best result. The key part of retrieval system is feature extraction. Until now, the only way of penetrating these collections was based on keyword indexing, text, or just by browsing. In this paper we survey some practical aspect of current CBIR and color histogram, texture, and shape for exact and efficient CBIR after doing the study of related works.

Keywords: CBIR, ABIR, Precision, Recall.

I. INTRODUCTION

Content based image retrieval is the retrieval of images based on their optical features such as color, texture, edge detection, blob detection, contour detection and shape. Content based image retrieval is a dedicated tool for many image database applications. An average CBIR utilizes the substance of a picture to speak to represent and access. CBIR frameworks extricate highlights (color, surface, and shape) from pictures in the database in light of the estimation of the picture pixels. These elements are littler than the picture size also, put away in a database called highlight database. Hence the highlight database contains a reflection (minimal structure) of the pictures in the picture database; every picture is spoken to by a minimized representation of its substance (color, surface, shape and spacial information) [1].
The principle preferred standpoint of utilizing CBIR framework is that the framework utilizes picture highlights as opposed to utilizing the picture itself. In this way, CBIR is cheap, quick, and productive over picture look strategies.

There are different types of techniques are used for retrieval like text based, color based, index based etc. In the text-based methods, images are represented actually by text descriptors and then used in the retrieval procedure. However, this approach requires a major effort for physical footnote, and the keywords lack in recitation the image contents in the considered domain properly. In addition this, users should know modest about the field, and therefore can't shape the most appropriate keywords for image retrieval. In this case for indexing the images, color, shapes and texture types of visual contents are used [14].

II. LITERATURE REVIEW

In [2] the creators presented one image feature, for example, weighted average of colourful image. This feature portrays the probability of the sum of the color values of any of the relating pixels of the three planes in the given RGB image. There are four steps to find this feature, First include comparing pixel of the three planes of shading picture, Second figure the sum of the occurrences of all different values in the result array, Third find the probability distribution function of the occurrences of each different value in the result array, Finally calculate the weighted average using different values and their related probabilities. Major goal of this paper is to compare the average retrieval time of proposed system with color averaging technique. Hence, the proposed system retrieves the desired images very quickly. The average precision, recall and F_measure of the results are generated.

In [3] the authors proposed color histogram based bins approach in RGB, XYZ, Kekre's LXY and L'X'Y' color spaces. The proposed technique contains seven steps as follows: First take the input as RGB image, Second convert the input RGB image to XYZ, LXY and L'X'Y' color spaces, Third divide the image into three planes of individual color spaces, Forth calculate the histograms for each of the three planes of the image from each color space, Fifth dividing each histogram into two parts by computing the Centre of gravity and perform the "8 bins formation" procedure, Sixth bins formation: Seventh eight bins obtained after execution of step sixth. There are three similarity measures are used Euclidean distance, Cosine correlation distance, Absolute distance for accurate image retrieval.

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In [4] the authors proposed Kekre Transform and HSV Color adaptive Segmentation for image retrieval. According to Kekre transform features vectors are calculated by using a combination of row mean and column mean of input image and database images. Similarly HSV color space quantifies the color space into different regions, by calculating the precision and recall parameters of choosy images from the database, contrast among the two algorithms and the efficiency of the mixture of both the algorithms can be calculated.

In [5] Ahmed J.Afifi and wesam M.Ashour proposed a content-based image retrieval method using color and texture feature. To extract the color feature from the image the colour moments has calculated where the image will be in the HSV colour space. To extract the texture feature the image to be in gray –scale and ranklet transform is performed on it [6]. From the ranklet images generated from the original images, the texture feature is extracted by calculating the texture moments.
In [7] the author proposed three image indexing technique for retrieval of images. The query procedure algorithm is used to find the features of the query image. The Indexing procedure is used to find the features of the database images and Finally Semantic Indexing algorithm is used to find the features of the collected images. In this approach medical images are used as a database which is available in google search engine.

In [8] the author proposed three image retrieval techniques for Biometric Security System to retrieve images from the database. First colour feature algorithm based on two methods i.e. colour image histogram and an intensity image histogram. For the colour image RGB colour model is used. Second texture feature algorithm based on the Gabor wavelet algorithm. Third is shape feature algorithm based on Hu moment invariant algorithm for extracting image features for object recognition application. In order to evaluate the effectiveness of proposed method, the two standard parameters are used i.e. Precision and Recall to show better result compare to previous system.

In [9] the author proposed two image retrieval techniques such as CBIR (query by example) and ABIR (query by text). CBIR or content based image retrieval algorithm is a retrieval of images based on color, texture and shape, these is the visual features. In CBIR all images are stored in the databases and features are extracted from database images and compared with the features of the query image. There are two main steps of CBIR: a) Feature extraction: Extracting the image features. b) Matching: Matching features of query image and database images for similarity. CBIR Algorithm works like: - A. Creates image files in a directory B. Runs technique for all images in database C. Compares query image to all the images in the database D. Displays the image results sorted best match to worst match.

In the ABIR algorithm set of frames or set of images will be taken, and then give the labelling of one image from every video. The information store in the XML file information contains their path, images assign with the word or text. Annotation means what is in the image, what is it about, what does it invoke? Give the detail description to that image. Prepare annotated data. Take any one word or text as an input from the annotated data. Find the keyword from pre-processed data if match take that image as an output image. Display the result means retrieves the image by using the text query search. With the help of labelling it's possible to get the image from the particular path.

In the ABIR calculation set of frames or set of pictures will be taken, and afterward give the marking of one picture from each video. The data store in the XML document data contains their way, pictures allocate with the word or content. Annotation implies what is in the picture, what is it about, what does it invoke? Give the subtle element depiction to that picture. Plan annotated on information. Take any single word or content as a contribution from the annotated on information. Display the watchword from pre-prepared information if match take that picture as a yield picture.

III. ARCHITECTURE OF CBIR SYSTEM

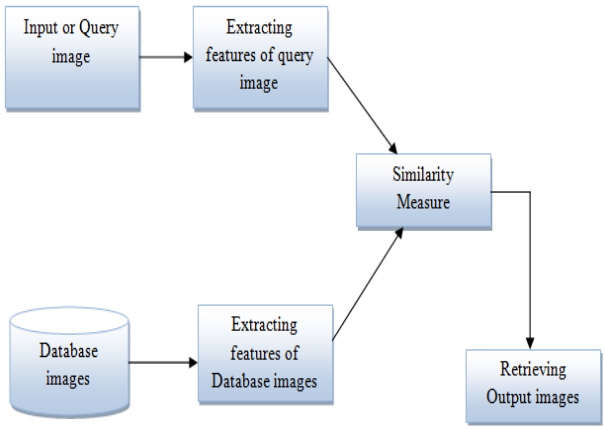

Fig. III.1 Architecture of CBIR system

IV. PARAMETERS USED FOR EXPERIMENTAL EVALUATION

There are many parameters are used to measure the performance of every image, but there are two commonly used precision and recall of the system. Many authors have used these two parameters for retrieval. The precision and recall are calculated as:

$$\text{Precision} = \frac{\text{Number of relevant images retrieved}}{\text{Total number of images retrieved}} \quad (1)$$

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$$\text{Recall} = \frac{\text{Number of relevant images retrieved}}{\text{Total number of relevant images}} \quad (2)$$

V. SIMILARITY MEASUREMENT

Comparison is one of the most important factors in image processing for content based image retrieval. It is used to compare the features of database images with query image and same procedure will be used for both sides. Distance of similar images should be small and for different images distance should be large. This similarity measure gives high-quality result if the retrieval is precise. There are many similarity measures can be used for comparison such as Euclidean distance, Cosine correlation distance, Absolute distance and etc.

VI. APPLICATIONS

There are varieties of applications for content based image retrieval it can be used for architectural and engineering, digital libraries, art collections(museums,..), crime prevention(security filtering,..), intellectual property, medical diagnosis(X-ray, CT, MRI,..), commerce(fashion, catalogue,..), entertainment(personal album,..), military(radar, aerial,..) and etc.

VII. EXPERIMENTAL RESULTS

In [6] the recovery precision is exhibited in term of Precision and Recall curve [7]. All pictures will be chosen from every class or classification in the database to utilize them as questions to ascertain the Precision and Recall esteem. For every picture, the accuracy of the recovery result is acquired by expanding the quantity of recovered pictures. Fig VII.1 demonstrates the Precision and Recall diagram for the proposed method, this chart has accuracy comes about over distinctive estimations of review. For the proposed strategy, the most extreme normal accuracy or precision of 100% at recall worth is 5% and the exactness quality reductions to 47.57% at 50% recall [8][9].

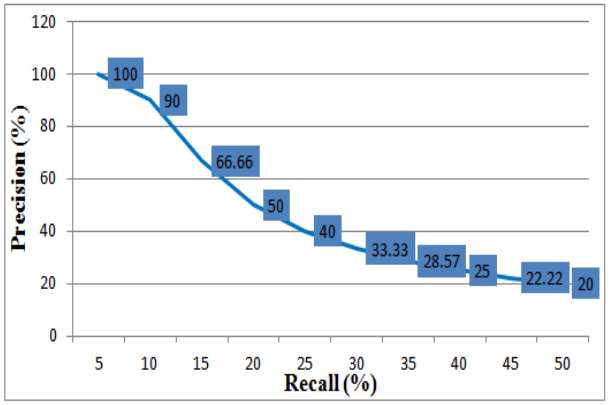

Figure VII.1: A graph of Precision versus recall.

Table VII.1: Proposed system Precision and Recall value.

Recall (%)	Precision (%) for the proposed method
5	100
10	90.00
15	66.66
20	50.00
25	40.00
30	33.33
35	28.57
40	25.00
45	22.22
50	20.00
AR = 27.50 %	**AP = 47.57 %**

Using equation (1) and (2) the Table VII.1 demonstrates the Precision and Recall values. Content Based Image Retrieval (CBIR) is a method utilized for extricating comparative pictures from a database, the real downside of this system is a great deal of time utilization in CPU. Thus, it exhibits that great execution can be accomplished by utilizing new algorithms. The Table VII.1 demonstrates that examination of serial usage. Table VII.2 additionally demonstrates that execution time in view of the picture determination, with the enhanced code. This table reports the pace up[15].

Table VII.2: Execution time for combining both methods for serial implementation

Resolution	Images in Database	CPU Runtime in Seconds
384 X 256	500	316.11
384 X 256	1000	720.05

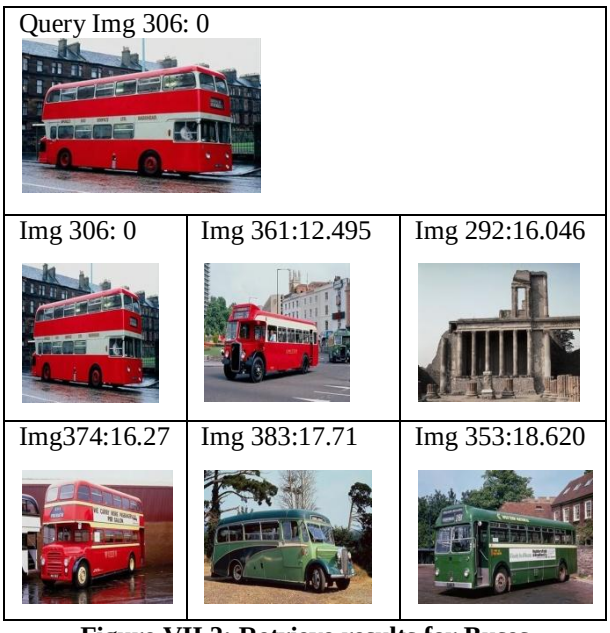

Figure VII.2: Retrieve results for Buses

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Figure VII.3 Retrieve results for Flowers

VIII. CONCLUSION

This paper focus on a survey on Content Based Image Retrieval by using various features. We compared many image database algorithms based on category. We have presented to improve the image classification for the future guidelines of the present content based image retrieval systems [13].

TABLE1. ANALYSIS OF CBIR

SlNo	Year	Author	Proposed Method	Dataset Used	Parameter Used For Evaluation	Results
1	2015	Ashutosh Gupta, M.Gangadharappa		WANG Database contains 1000 JPEG images.	Euclidean Distance, ColorCorrelogram, Image Retrieval, Inverse Probabilities, Local Correlation, Prewitt Operator, Robert Operator.	
2	2014	Mushtaq Ali, Le Dong, Yan Liang, Zongyi Xu, Ling He and Ning Feng	Weighted average of colorful image	Testing & Pascal Dataset. These 2 datasets contain 600 & 9197 images of resolution 256*256	CBIR, Precision, Recall, F_measure.	The overall average precision i.e., 64%.
3	2014	H. B. Kekre, Kavita Sonawane	Texture content(statistical moments) & color contents(RGB, XYZ, LXY, and L'X'Y')	WANG Database contains 2000 JPEG images.	Precision Recall Cross over Point, Longest String, and Length of String to Retrieve all Relevant images	Color & Texture features in bins approach with dimensionality reduction achieve better performance in the CBIR field.
4	2011	Venu Shah, Pavan Bhat, Mahesh Dasarath, Shipra Gupta and Jackie Bhavsar	Kekre Transform and HSV Color adaptive Segmentation	Penn State University	CBIR, HSV, Precision, Recall,	Combination of Kekre Transform and HSV Color adaptive Segmentation gives better result
5	2012	Ahmed J. Afifi, Wesam M. Ashour	combination of HSV color moment feature and Ranklet texture moment feature	WANG Database contains 2000 JPEG images.	CBIR, Precision, Recall	Proposed method has higher retrieval accuracy than those based on color and texture features respectively
6	2016	Pakruddin.B, Ravi G.H	Color and Texture Features	WANG Database contains 1000 JPEG images.	CBIR, Precision, Recall	Precision of 100% at recall worth is 5% and the exactness quality reductions to 47.57% at 50% recall
7	2015	Md. Khalid Imam Rahmani, M. A. Ansari, Amit Kumar Goel	Image Indexing; Algorithm;Image Retrieval Indexing	medical images	Image Indexing; Algorithm; Image Retrieval Indexing	10 relevant images are displayed as query
8	2015	Aravind G, Andan H M, Tripty Singh and Glence Joseph	Using fuzzy heuristics method	WANG Database contains 1000 JPEG images.	CBIR, Precision, Recall	Better result compare to previous system.
9	2015	Vrushali A. Wankhede, Prakash S. Mohod	CBIR (query by example) and ABIR (query by text)	Database	-	Better result compare to previous system.

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