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Content Based Image Retrival with Surf and Colour Histogram Using Cross Validation and Graph Matching On Medical Images

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ABSTRACT: The paper construe a technique for medical images annotation based on the SURF descriptor, cross validation and color histogram. The CBIR is a substantial research field for maneuver a large extent of image databases. This paper concentrates on a decisive algorithm which is based on Speeded up Robust Features, Cross Validation and Color Histogram. Firstly in this method the SURF feature detector is applied for the extraction of reference images and then performs matching of feature points present in the image, respectively. Finally, the estimation of the space geometric transformation parameters between two images is performed according to the rest of the match point and this will conclude the process of matching. The interest points are used for the extraction of the similar images but with different pose and certainty. Here, the same thing is done to retrieve this but with the help of SURF, Color Histogram and the obtained data is fed to the Cross Validation for performing further classification. The implementation of this proposed work is done with the help of the Image Processing Toolbox under Mat lab.

KEYWORDS: Cross Validation, CBIR, SURF, Color Histogram

I. INTRODUCTION

There are different applications of computer vision available related to image retrieval problem, Content-based image retrieval is one of them. The problem occurs in image retrieval is the problem of seeking for digital images in enormous databases. The word 'content' in this context refers to colors, shapes, textures, or any other data which can be derived from the image itself and the word “Content-based" means that the search will analyze the actual contents of the image. CBIR is also called as the QBIC (Query by Image Content) and CBVIR (Content-Based Visual Information Retrieval). Among all CBIR is enticing because most of the web-based image search engines depend purely on meta data and due to this a lot of litter in the results is produced and also by manually entering the keywords by humans for images in a large database can be feeble, ineffectual and expensive and sometimes it may not apprehends every keyword which depicts the image. Therefore a system which can filter images on the basis of their content and contribute better indexing and rebound more factual and authentic results is preferred. CBIR work starts when a query image along with a large dataset of images is available. Then the role of CBIR is to extract the visual features of the query image and after extraction of features to compares these with the visual features of each image present in the dataset. Those images present in the dataset, whose visual features are intently matched with those of the query image, are then fetched. These fetched or retrieved images are those images which are supposed to be looking similar to the query image. In practical, there are only a few retrieved images will look similar. This is because the visual features which are extracted from any image will not fully describe or represent that image. But the images which seem close in feature space are not close semantically in general.

II. RELATED WORK

A literature review goes beyond the search for information and includes the identification and articulation of relationships between the literature and our field of research. While the form of the literature review may vary with different types of studies, the basic purposes remain constant: Anna Wojnar *et.al* (IEEE, 2012), this paper described a method for medical images annotation based on the SURF descriptor and the SVM classifier. For the features

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extraction a Fast-Hessian detector was used. The feature matching was performed with a SVM and the testing of the developed system was performed using a subset of the IRMA radiographic images. The results provided with the SURF descriptor are compared with the ones obtained using the SIFT descriptor with SVM classification. Applying the SURF descriptor resulted in improved classification of lung images with accuracy over 96%. There search has shown that the SURF is a potentially strong tool with a huge potential in applications in the field of annotation of medical images.. To summarize, the SURF descriptor was potentially strong tool applied in the field of medical image annotation, together with a SVM classifier it might be constructed an efficient and reliable system for automatic medical image annotation and retrieval.

Lei Yang *et.al* (IEEE, 2011) due to the stitching precision and speed of existing image mosaicing technique, this paper summarized three image registration methods based on feature matching and the correlation experiment contrast has been processed. Harris method was good at its simple calculation and evenly reasonable angular point feature extraction, but was ineffective at matching effect of image rotation scale variation. The advantage of SURF method lies in its fastest, and was able to realize real-time requirements, at the same time its matching effect was basically equal to SIFT method, but it was bad to colors and illumination change

Jianlin Zhang *et.al* (IEEE, 2010) proposed a novel technique that employed both the colors and edge direction features for Content-Based Image Retrieval. In this method, a given image was first divided into sub-block which has the same size and then the colors and edge direction features of each sub-block can be extracted. The effectiveness of this technique was demonstrated with the experiments. The experimental results showed that the proposed algorithm was effective to image retrieval. This image retrieval method introduced new ideas and has a good perspective in real world applications.

Jingin Hong *et.al* (ICISE, 2009) proposed an image mosaic algorithm based on SURF feature matching. For an image mosaic method based on feature matching, feature detection required to perform in each image. The extracted features were matched by a fast matching strategy. Then, a RANSAC algorithm was applied to eliminate outliers to ensure the effectiveness of the matching's. Finally images are stitched by a multi-band blending algorithm. Experimental results showed that this method was fast and effective.

III. PROPOSED ALGORITHM

The methodology used in this paper involves various phases. In the Pre-processing of images involves removing low-frequency background noise, normalizing the intensity of the individual particles images. Several filter operations which intensify or reduce certain image details enable an easier or faster evaluation. After performing the pre-processing phase, features are extracted. The feature extraction phase is performed on both i.e. the input image and on all the images stored in the database. Then the extracted features of the input image are compared with the extracted features of the dataset. The flowchart of methodology is shown below:

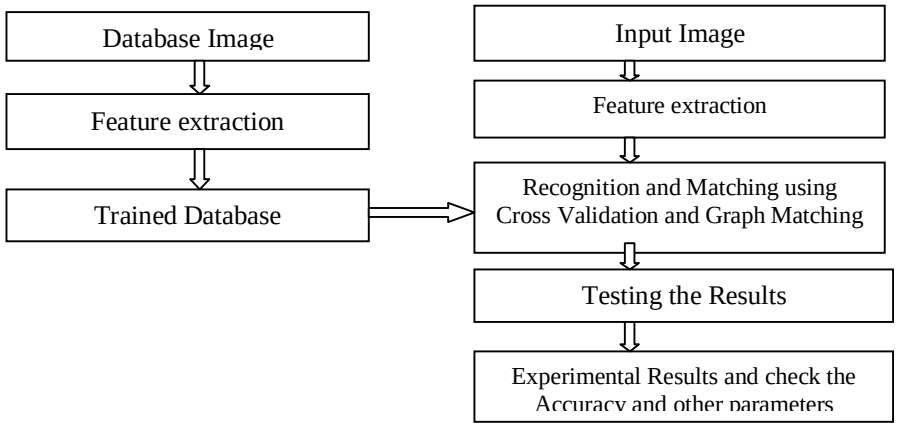

Fig 1 Proposed Work Process (Flow Chart)

Feature Extraction

In content based image retrieval the phase of extracting feature is the basis step. The feature may include both the visual based feature and text based features. On the extraction of text based features there exists an ample literature, therefore we constrain ourselves to the techniques based on the extraction of visual feature. The visual feature scope

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can be extent and further classified as domain specific features and general features. The old involves texture, colour, and shape feature while the later is application dependant and involve human faces, finger prints and many more. *Colour Feature:* Colour feature is the mostly used visual feature among other features in Image Retrieval. It is comparatively potent to the background complication and it is independent of image orientations and image size. *Colour Histogram:* It is the most frequently used colour feature representations. It exemplifies the joint probabilities of three colour channels. The Color Histogram technique is that which is based on the intensity of three channels and it depicts the no. of pixels that have colours in each of a fixed list of colour ranges. *Colour Moment:* It is used to overcome the effect of quantization in colour histogram. Color Moment serve to calculate the colors similarity by using weighted Euclidean distance. The colour set is used for fast search over the substantial collection of image. This is based on the excerption of colors from the quantized colors space

IV. TECHNIQUES USED

Content-based image retrieval (CBIR): In the general image retrieval system, there are usually three main modules, namely, input module, query module, and retrieval module. In the fig 1 shown below, the retrieval process is shown.

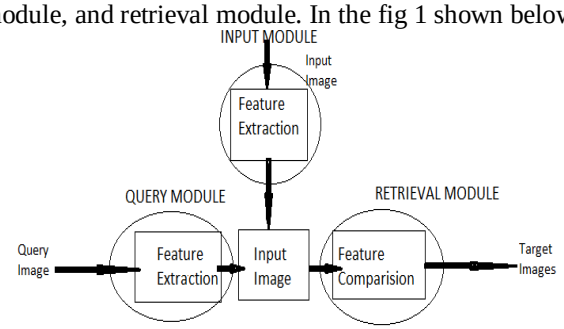

Fig 2 Block diagram of Content Based Image Retrieval System

In the input module, the feature vector from the input image is extracted and that input image is stored in the image dataset. The feature vector of each image in the dataset is also stored in the dataset whereas in the second module i.e. query module, a query image is inputted. After that the extraction of its feature vector is done. During the third module i.e. in the process of retrieval, comparison is performed. The feature vector of the query image is compared with the each vector stored in the dataset. After comparison the similar images are outputted. There are many Content Based Image Retrieval systems now days, which supports the feedback parts and because of this the retrieval performance can be enhanced. The features which are widely used involve: texture, color, local shape and spatial information. There is very high demand for searching image datasets of ever-growing size, this is reason why CBIR is becoming very popular. As the speed and accuracy are important, therefore there is need for developing a scheme for retrieving the images efficiently.

SURF: SURF stands for Speeded Up Robust Features. It is a robust local feature detection algorithm. It is partially stimulated by the SIFT (Scale Invariant Feature Transform) descriptor. The basic version of SURF is three times faster than SIFT and it is alleged by the authors that it is more potent when compared with the different image transformations than SIFT. SURF is based on the sums of responses obtained from 2-Dimensional HAAR wavelet and it makes a decisive use of integral images. It performs an integer approximation on the determinant retrieved from Hessian blob detector and this can be estimated quickly with an integral image. For features, SURF uses the sum of the HAAR wavelet response around the interest point. Here, SURF is used in this scheme for extraction of the relevant features and the extraction of descriptors from images. In SURF, a descriptor vector is constructed of length 64 by using a histogram of gradient orientations in the local neighbourhood around each interest point. This scheme is ratified over the previous schemes because of its concise descriptor length of 64 floating point values. This is the reason SURF algorithm is preferred over other algorithms for matching.

Cross-Validation: They are a useful technique used for the classification of data. A Cross Validation scheme segregates or classifies the data by finding the best hyper-plane which separates all the data points of one class from the data points of the other class.

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The algorithm of cross validation and graph matching learning is imposed to design the classification parameters according to the features calculated. The calculated classification parameters are utilised for classifying the images. The content present in image can be segregated into the different categories on the basis of the support vector classifier which is designed.

Color Moments: There are two types of features namely; text and visual features. Color is one of the most widely used visual features in Image Retrieval. It is comparatively potent to the background complication and it is independent of image orientations and image size. Color Moments are steps that describe the color distribution in an image in the same way that the central moments characterize a probability distribution. The main purpose for which they are mainly utilized is colors indexing as features in image retrieval system so as to perform comparison that how similar the two images are on the basis of colour. The one image which is inputted is compared with the images stored in the dataset so as to identify and retrieve a similar image. The comparison performed between each images results in a similarity score. The decision is made on the basis of this score only. The lower the score is the more identical or similar are the two images supposed to be. The result i.e. similarity score should be lower so that more advanced approach can be proposed.

V.RESULTS AND DISSCUSSION

In this section, we perform experiments to prove the adequacy of the proposed approach. The comparison of the accuracy, PSNR, MSE is done with the given values to the proposed work Fig 3 shows the MSE comparison graph between the previous and the proposed approach and Fig 4 shows the reading of MSE in the cases of previous and proposed approaches.

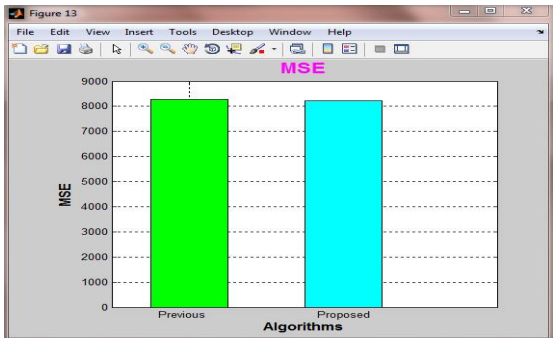

Fig 3 Comparison graph of MSE

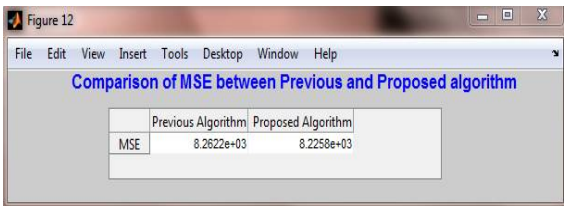

Fig 4 Comparison of MSE

Fig 4 shows the comparison between the MSE of both previous and proposed approaches. This shows that the approach which is proposed in this paper is a better approach than that of previous.

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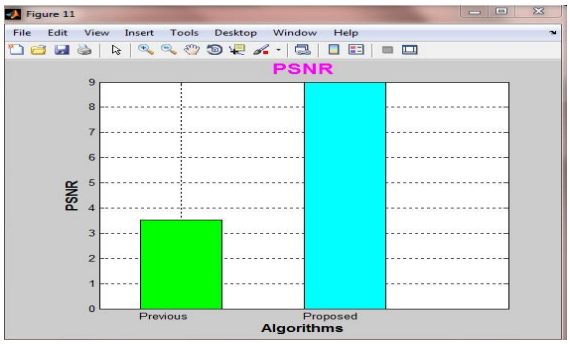

Fig 5 graph for PSNR of previous and proposed approach

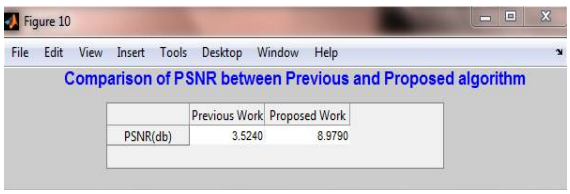

Fig 6 Comparison of PSNR for previous and proposed approach

Fig 5 and Fig 6 shows the PSNR graph and reading of previous and proposed approach. The value of PSNR obtained by the proposed approach is more than that of the previous approach. This makes the proposed approach better.

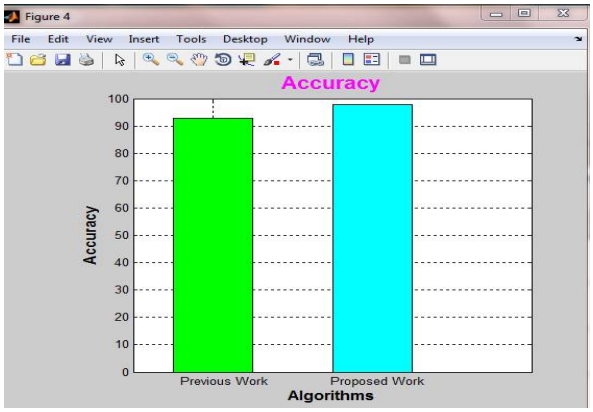

Fig 7 Accuracy comparison of previous and proposed approach

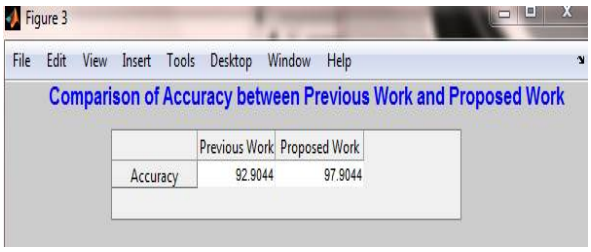

Fig 8 Accuracy comparison

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Fig 7 and fig 8 shown above shows the comparison of accuracy between the previous method and the proposed method. The accuracy achieved by the proposed approach is approx 98 percent which is high when compared with the previous approach.

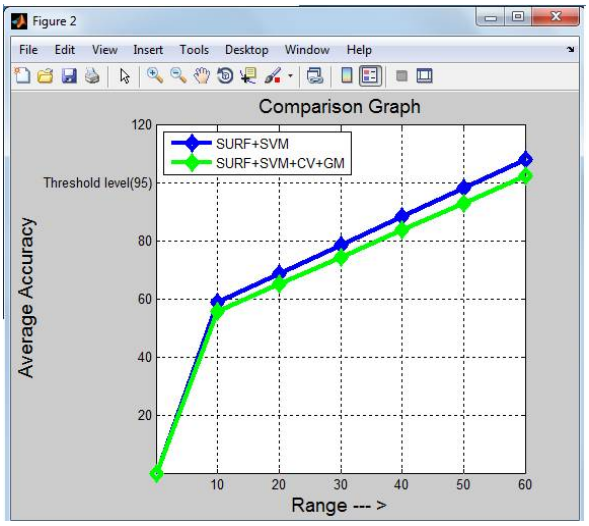

Fig 9 Comparison Graph of proposed and previous approach

Fig 10 and fig 11 shown above shows the comparison of feature point between the previous method and the proposed method. The value of feature point achieved by the proposed approach is higher when compared with the previous approach.

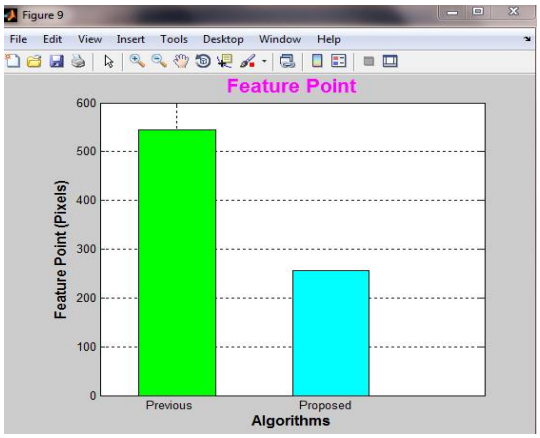

Fig 10 graph for Feature Point of previous and proposed approach

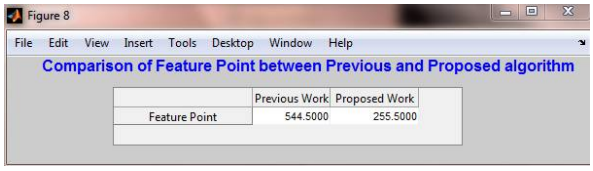

Fig 11 Comparison of Feature Point for previous and proposed approach

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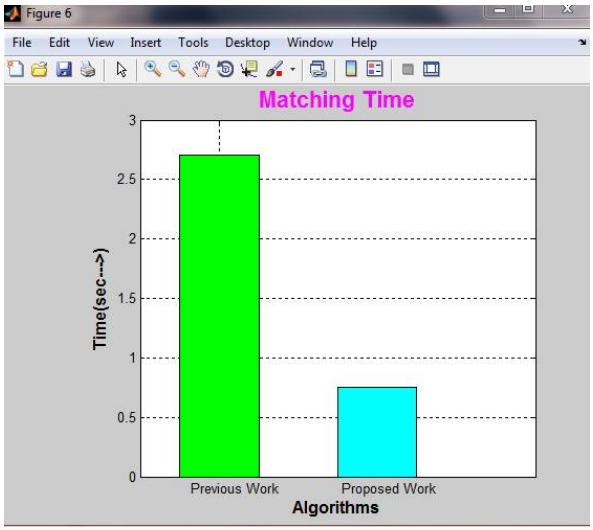

Fig 12 Graph for Matching Time of previous and proposed approach

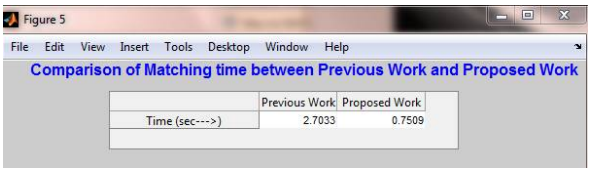

Fig 13 Comparison of Matching Time for previous and proposed approach

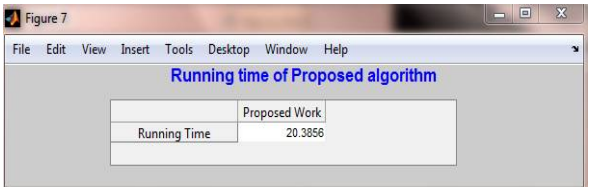

Fig 14 Graph for Running Time of previous and proposed approach

All the experiments performed shows that the approach which is proposed in this paper is more decisive and potent when compared with the all previous techniques used. This shows that the proposed system is much efficient as compared with the previous system. All the parameters are calculated just to verify the efficacy of the system.

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VI. Conclusion and Future Work

The explosive growth of image data leads to the need of research and development of Image Retrieval. Content-based image retrieval is currently a very important area of research in the area of multimedia databases. In this paper we have presented an efficient algorithm based on SURF, Cross validation and Color Histogram. In this paper, the same is tried to retrieve with the use of SURF, Color Histogram and fed into Cross Validation for further classification. The results obtained above on the basis on PSNR, MSE and ACCURACY makes the proposed approach, a better approach as compared with the previous approach.

This approach is restricted to acquiring single image from the group of images stored in database. Our research work can be extended on the different images and on more than single image simultaneously. In the future work, more parameters can be considered like enhancing the number of pixels quality. The work can also extend for the infinite no. of subjects. Different algorithms can be used for enhancing accuracy in the retrieval of images and for reducing the time for execution.

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