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A New Approach for Effective Medical Image Retrieval

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Abstract:
The dominant rotated local binary pattern and histogram of oriented gradients are combined together which is useful to search the features of a medical image from a huge database. Similarity search has been done using hierarchical extreme learning machine of multi-layer perceptron and is merged with evolutionary algorithm to retrieve a medical image. This searching process is very easy, fast responsive nature and efficient for a new doctor or a doctor in a remote place to diagnose the patient. The dominant direction and histogram oriented gradients help the retrieving process to come with remarkable results. The quality of the retrieving process is tested for database and compared with state of medical image retrieval models. Content-based image retrieval is the application of computer vision techniques to the problem of digital image search in large databases. In this work, an image retrieval system based on curvature coding is focused.

Keywords: *Quality parameters, curvature, retrieval, texture.*

I. INTRODUCTION

Different categories of users are precisely using Image retrieval [1-2]. The retrieval is referring to identified objects. The text metadata and the use of image content information are the two ways of retrieving a required image from the data base of massive images [3-4].

To describe the same image, different textual representations are used by different users which lead a tedious process. In the image retrieval process utilization of textual metadata is not preferable towards performance wise. The word is a text content, even though text represents the image content it is not enough to describe the image content connected with various knowledge layers and also is not applicable when it is not straight forward and literal. Image wrong retrieval takes place with inaccurate annotation. Therefore an accurate system is essential which is allowing image retrieval by content not with text description and should free from manual annotation task by performing the image retrieval [5] task automatically.

Content Based Image Retrieval (CBIR) method addresses the shortcomings of the textual metadata based image retrieval. The image characteristics like colour, texture and query image shape and retrieve images having similar attributes from the image database are extracted with CBIR method which uses the algorithms of image processing. The advantage of CBIR method is that, the image retrieval process is very efficient as there is no need to follow any specific annotation methodology to manually annotate the images in image data bases and also concentrates for describing the digital images complex object information by non-textual features, which are applicable for efficient query processing [6-7]. Content based image retrieval system applicable in different areas like defence organizations, engineering based applications, healthcare, journalism and advertising, education and training, geographical information and remote

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sensing etc. Medical imaging [8-9] is one field which would immensely benefit from CBIR. Medical imaging procedures are very popular as that facilitates accurate diagnosis, monitoring drug responses and have almost negligible side effects.

The medical images include X-rays, computed tomography scans, magnetic resonance images, ultrasound, mammograms etc. For diagnosis of health hazards thousands of medical images are produced on daily basis, as medical imaging is an indispensable tool for the medical practitioners. These images include X-rays, magnetic resonance images, computed tomography scans, ultrasound, mammograms etc. Physicians used to rely upon these images in hardcopy image formats to diagnose health hazards. It becomes impractical to store and retrieve the images in hardcopy image formats [10], as the volume generated by medical images on daily basis is enormous. The problem of retrieving and storing of medical images in hardcopy format is circumvented [11] with the advancement of data storage technology. The medical image data stored in softcopy form paves way for their usage in various cases [12-13]. The stored digital images and their efficient retrieval are used to aid in diagnostics, as physicians can compare the image under investigation to that of healthy organs, or search for similar cases for prognosis [14-16]. The feature content of images is a powerful and direct query which can be used to search for other images containing similar content [17].

II. Proposed Method

In this proposed method as shown in figure 1, all the features like statistical, area and textural features have been evaluated for query medical image. The features are included in statistical area are mean, standard deviation and variance. The texture features included are entropy, energy, skewness, correlation, root mean square value, contrast and kurtosis. The area features that are included are area, perimeter, circularity, centroid and centroid mid-point. Dominant rotated local binary patterns and rotated local binary patterns are performed. From the inverse difference, curvature image has been evaluated. Features have been evaluated using histogram of oriented gradients. The features calculated in above steps are fused for better version of features. Local linear embedding based dimensionality reduction has been done. Similarity search has been done using hierarchical extreme learning machine of multi-layer perceptron and is merged with evolutionary algorithm. Then the searching output is nothing but the retrieving process from the database. The statistical parameters like accuracy of producer, user and overall and other parameters like specificity, kappa, sensitivity, etc. can be measured for the method. Error parameter and ranking parameters are can be evaluated. If the new image is asked for searching it has to that the image is not in the database and it will be added to the available database. The medical image details like patient name, doctor name, address and contact details of patient date of diagnosis, age of the patient, disease details, etc. information can be displaced for easy analysis for a new doctor and it is shown in figure 4. A general method is explained in figure 1.

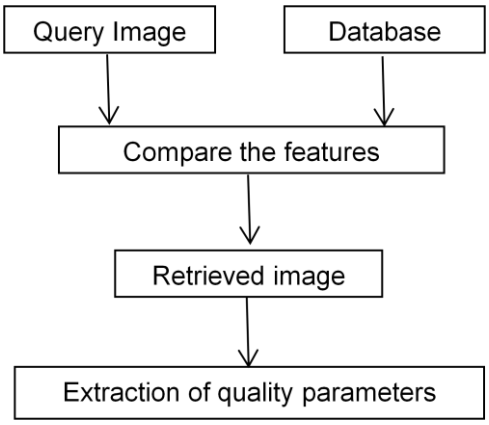

Figure 1: General procedure to retrieve an image from a database

III. Results and Discussion

The proposed method has been tested on a big database to retrieve the images. If new image is given to retrieve, it has given the information that it

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is not there in given database and it has asked to add. Figure 2 shows that the retrieving of an image with different similarity images. Figure 3 shows that retrieving of different images and their five similarity images from the database. Figure 4 shows the retrieved image details of a patient. The quality parameters like accuracy, precision, recall, specificity, etc. are compared with state of art medical image retrieving techniques. Table 1 shows the confusion matrix for different classes of images by considering 300 images in the database. Table 2 shows the accuracy measurements. Table 3 shows other quality parameters of proposed method. From the retrieved images and their rankings, the confusion matrix is constructed. From the confusion matrix, TP, FP, FN and TN are evaluated based on multi-class classification model. Then all other parameters are evaluated. This process of statistical evaluation is common for all the retrieving methods. The proposed method is Extreme Learning Machine based Evolutionary Algorithm.

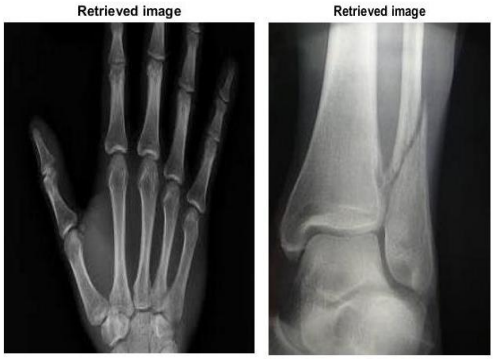

Figure 2: Retrieving of one image with different number similar outputs.

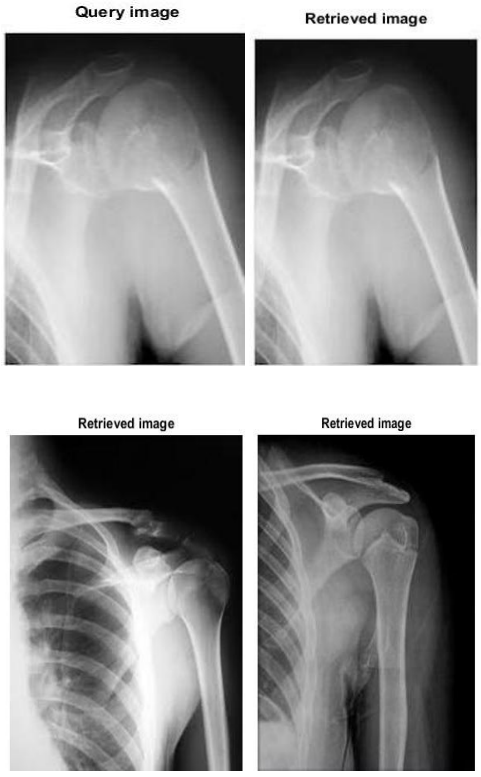

Figure 3: Retrieving of some images from database

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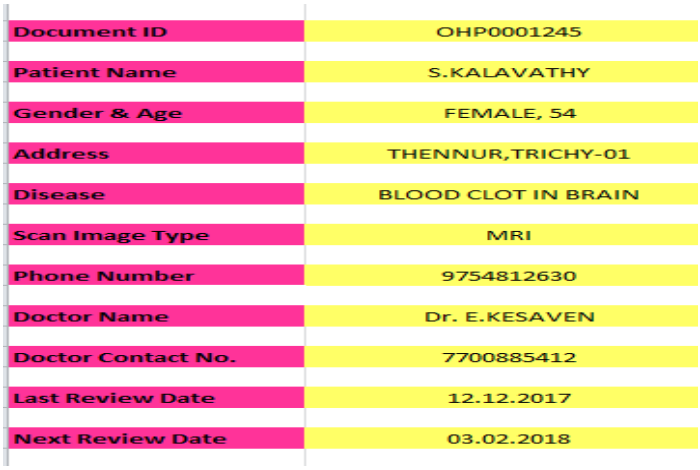

Figure 4: Retrieved image details

TABLE I Confusion matrix for different classes of images

	PREDICTED				
ACTUAL	CLASS	A	B	C	Total
	A	97	2	1	100
	B	2	97	1	100
	C	0	1	99	100
	Total	99	100	101	300

TABLE II Different accuracy evaluations

	Reference Pixels	Classified Pixels	Matching	Accuracy type	
				Procedures	Users
A	99	100	97	97.98%	97.00%
B	100	100	97	97.00%	97.00%
C	101	100	99	98.02%	99.00%
Total	300	300	293		
Overall Classification Accuracy				97.66666667	

TABLE III Different quality parameters of proposed method

	Accuracy	Precision	Recall	Specificity	F1 score
A	0.976667	0.979798	0.97	0.99	0.974874
B		0.97	0.97	0.985	0.97
C		0.980198	0.99	0.99	0.985075
Over all		0.976665	0.976667	0.988333	0.97665

IV. CONCLUSIONS

The proposed has given remarkable results in the area of medical image retrieving process. The accuracy of 97.6% is achieved for a database of 300 images. The medical images classes A, B & C in the above tables are X-ray image, magnetic resonance image, and computed tomography scan images respectively. The quality parameters are compared with different existing models also. If new image is asked to retrieve which is not there in the database, it has asked to add it or not. In this way the database can be expanded. The image details are displayed for easy diagnosis by a new doctor or a doctor in a remote area.

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VI. REFERENCES

[1]. P. Korn, N. Sidiropoulos, C. Faloutsos, E. Siegel and Z. Protopapas "Fast and effective retrieval of medical tumor shapes", IEEE Trans KDE, 10, 6, 889-904. (1998).

[2]. C.R. Shyu, C.E. Brodley, A.C. Kak, A. Kosaka, A.M. Aisen and L.S. Broderick "ASSERT - A physician-in-the-loop content based retrieval system for HRCT image databases", Computer Vision and Image Understanding, 75, 1, 111-132. (1999).

[3]. W.W. Chu, C.C. Hsu, A.F. Cardenas and R.K. Tiara "Knowledge based image retrieval with spatial and temporal constructs", IEEE Trans KDE, 10, 6, 872-888. (1998).

[4]. Y. FanidFathabad and M.A. Balafar, "Content Based Image Retrieval in Medical", International Journal on Technical and Physical Problems of Engineering (IJTPE), 12, 4, 177-182. (2012).

[5]. W. Yang, Q. Feng, M. Yu, Z. Lu, Y. Gao, Y. Xu and W. Chen, "Content Based Retrieval of Brain Tumor in Contrast Enhanced MRI Images Using Tumor Margin Information and Learned Distance Metric", Medical Physics, 39, 11, 6929-6943. (2012).

[6]. A. Varghese, R.R. Varghese, K. Balakrishnan and J.S. Paul, "Brain Slice Retrieval from a Feature Reduced MR Images Using Moments", IJCST, 3, 1, 87-92. (2012).

[7]. M.A. Balafar, "Gaussian Mixture Model Based Segmentation Methods for Brain MRI Images", Artificial Intelligence Review, 6, 2, 1-11. (2012).

[8]. H.B. Kekre, T.K. Sarode and S. Gharge, "Detection and Demarcation of Tumor Using Vector Quantization in MRI Images", International Journal of Engineering Science and Technology (IJEST), 2, 2, 59- 66. (2009).

[9]. K.H. Hwang, H. Lee and D. Choi, "Medical Image Retrieval: Past and Present", Healthcare Informatics Research, 18, 1, 3-9. (2012).

[10]. R. Adams and L. Bischof, "Seeded Region Growing", IEEE Transactions on Pattern Analysis and Machine Intelligence, 16, 6, 641-647. (1994).

[11]. Y. Liu, D. Zhang, G. Lu and W.Y. Ma, "A Survey of Content Based Image Retrieval with High Level Semantics", Pattern Recognition, 40, 262-282. (2007).

[12]. A.C. Bovik, M. Clark and W. Geisler, "Multichannel Texture Analysis Using Localized Spatial Filters", IEEE Transactions on Pattern Analysis and Machine Intelligence, 12, 55-73. (1990).

[13]. V.N. Gudivada and V.V. Raghavan, "Content-based image retrieval system", IEEE Comput. 28, 9, 18-22. (1995).

[14]. H.D. Tagare, C.C. Jaffe and J. Duncan, "Medical Image Databases a Content Based Retrieval Approach", Journal of the American Medical Informatics Association, 4, 3, 184-198. (1997).

[15]. S.Vyshali, M.V.Subramanyam and K.SoundaraRajan, "Divergence Coding For Medical Image Coding", International Journal of Pure and Applied Mathematics, 117, 10, 87-90. (2017).

[16]. K.Radhika and S.Varadarajan, "Satellite Image Classification based on Ensemble Subspace Discriminant method using Random Subspace Algorithm", Helix, 8, 1, 2714- 2718. (2018).

[17]. A.U. Jawadekar, G.M. Dhole, S.R. Paraskar and M.A.Beg, "Novel Wavelet ANN Technique to Classify Bearing Faults in Three Phase Induction Motor", International Journal on Technical and Physical Problems of Engineering, 3, 8, 48-54. (2011).