I J C T A, 9(40) 2016, pp. 353-358

Content Based Medical Image Retrieval System Using DWT and LBP for Ear Images

Manoj Kumar* **and Kh. Manglem Singh****

ABSTRACT

This paper aims to develop visual-content based medical image retrieval technique to search and retrieve ear images from the medical image database. Content based medical image retrieval system search and retrieve images which are perceptually similar to query images from the image database. In this paper, features are extracted using discrete wavelet transform (DWT) and LBP (Local Binary Pattern) algorithm. Then these features are combined to from the s single feature vector of the image by using fusion method. Euclidean Distance method is used to retrieve similar image from the database.

Keywords: CBMIR, DWT, LBP, Euclidean Distance Method, Precision, Recall, Texture Feature Extraction

I. INTRODUCTION

In the current scenario, the medical image database is huge. It is containing many images related to our diseases. Handling these databases is not easy. We need an automatic search and retrieval system for managing medical image database. Content based medical image retrieval system (CBMIR) is very efficient; it retrieves images based on visual content. Content based medical image retrieval system is not text based, so it requires less time to retrieve the images from the database. It uses visual contents (color, shape, texture, and spatial layout) of the image for retrieval. Content based medical image retrieval is automatic. It is independent of human being for finding images from the database. Content based medical image retrieval system is very useful in medical applications [1, 2, 3]. Our objective is to retrieve ear images from the medical image database. There are two major steps for CBIR system, 1.Feature extraction, and 2.Similarity comparison [4]. The first one is the feature extraction, where a set of the feature is generated to represent the content of each image. Features which are extracted from the images are stored in the database. The second one is the similarity comparison where a distance between the query image and each image in the database is computed using their feature vectors. For similarity comparison, Euclidean distance is calculated between query and database images. A general CBMIR system architecture is shown in Figure1.

II. PROPOSED WORK

In this work for image retrieval feature extracted by discrete wavelet transform (DWT) and LBP algorithm are used. Figure2 shows the proposed system flow diagram. The proposed algorithm is explained below.

Algorithm

STEP 1: Create a database containing various ear images.

STEP 2: Extract the visual feature of each image in the database by using discrete wavelet transform and LBP.

* Department of Electronics and Communication Engineering, NIT Manipur, Imphal, Manipur, India, *E-mail: manojara400@gmail.com*

** Department of Computer science and Engineering, NIT Manipur, Imphal, Manipur, India, *E-mail: manglem@gmail.com*

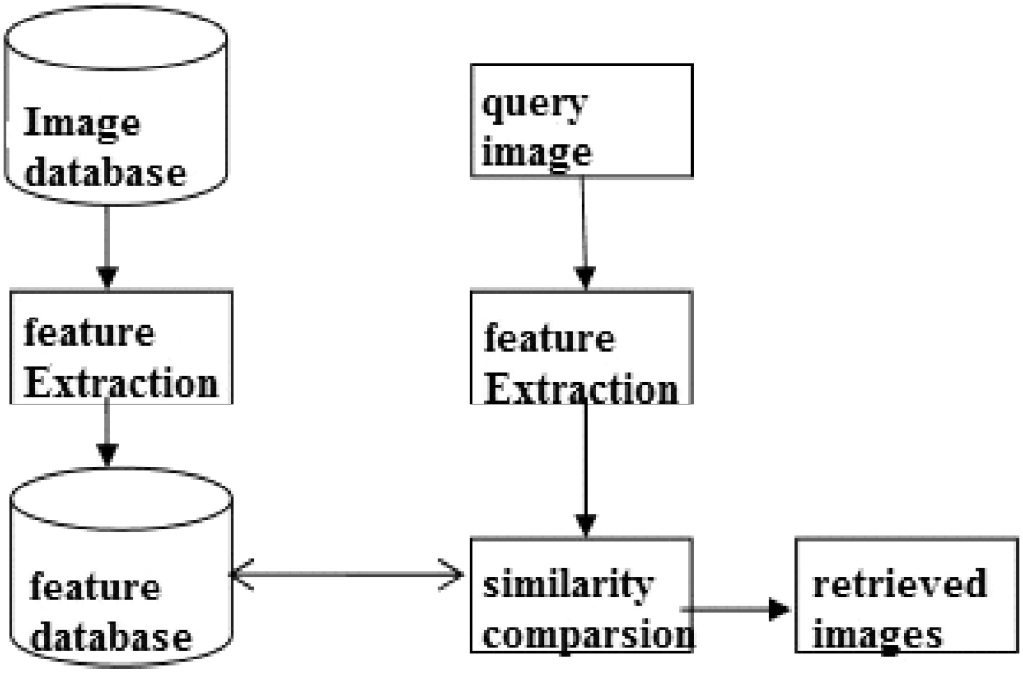


Figure 1: General CBIR System Architecture

STEP 3: Construct a combined feature vector for the features extracted by discrete wavelet transform and LBP.

STEP 4: Featured Databases contains all new images which are formed.

STEP 5: Find the distance between feature vectors of query images and that of Featured database images.

STEP 6: Top most similar images retrieved.

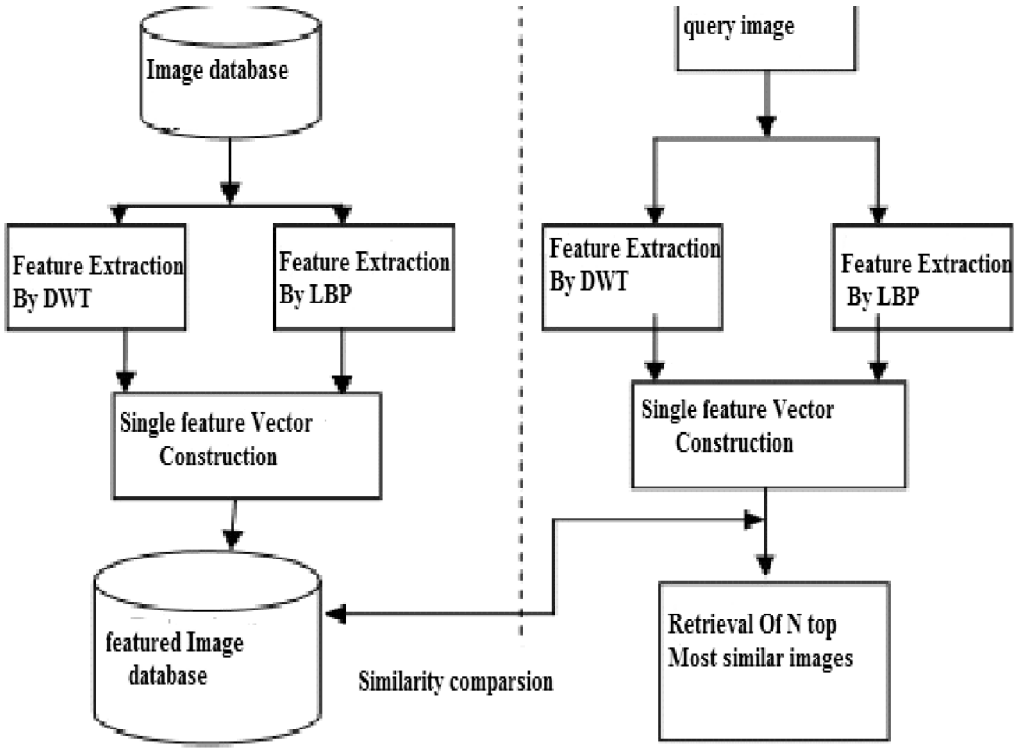


Figure 2: System Flow Diagram

2.1. Feature Extraction by DWT –

Discrete wavelet transform (DWT) decompose the image into a mutually orthogonal set of wavelets [5].After decomposition image is divided into four sub- images, as low-low, low-high, high-low and high-high sub-bands [6].Figure.3 represents wavelet transform for level3.

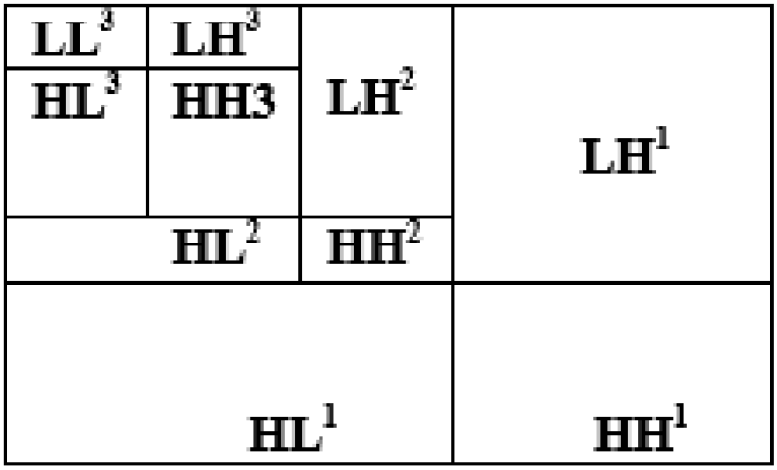


Figure 3: Wavelet Transform (Level 3)

The first step is to resize the image size into 256*256 in a matrix format. Then apply DWT to get the sub-bands of the image. Resized image is decomposed up to 6 levels. After decomposition, we will get the 4*4-sized images. For feature computation energy is calculated for each sub-band, resulting 24 features for each image. Features are stored in feature vector f.

f = [μ1,1, μ1,2, μ1,3, μ1,4, μ2,2, μ2,3 … μ6,1, μ6,2, μ6,3, μ6,4]

Where mean μ is the energy measure to compute the features [7].

Figure.5 shows sub-bands for a sample image.

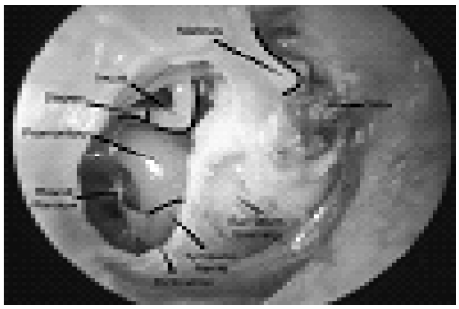
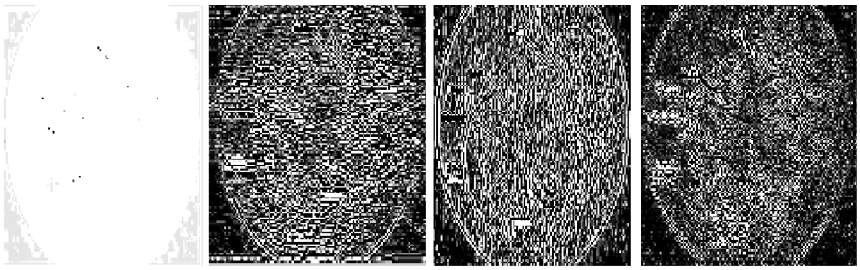


Figure 4: Sample Image



LL Band LH band HL band HH band

Figure 5: Sub-bands for Sample Image

2.2. Feature Extraction by LBP

Local binary pattern algorithm is used to extract texture feature of the image [8].Figure.7 represents the texture extracted image of figure.6 .LBP algorithm is given below

- **Local Binary Pattern (LBP) Algorithm for Feature Extraction**
- **Steps**

  Examined Window is partitioned into cells. (e.g. 16*16 pixels for each cell).

  Pixels of 8 neighbour's are compared with each pixel in a cell. (on its left-top, left-middle, left-bottom, right-top etc.) Pixels follow a circular path.

  If the neighbour pixel's value is less than center pixel's value than write "1".If the neighbour pixel's value is greater than center pixel's value than write "0". By doing this 8-digit binary number are formed.

  Then Histogram of each cell is computed. Histograms are normalized. Histogram (normalized) of cell are Concatenated. This gives the feature vector for the window.

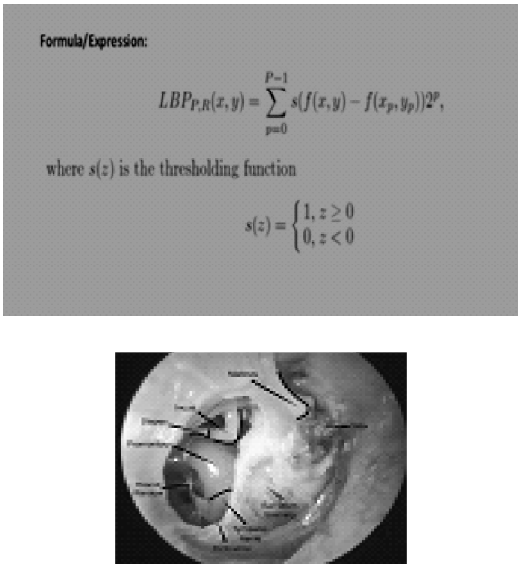


Figure 6: Sample Image

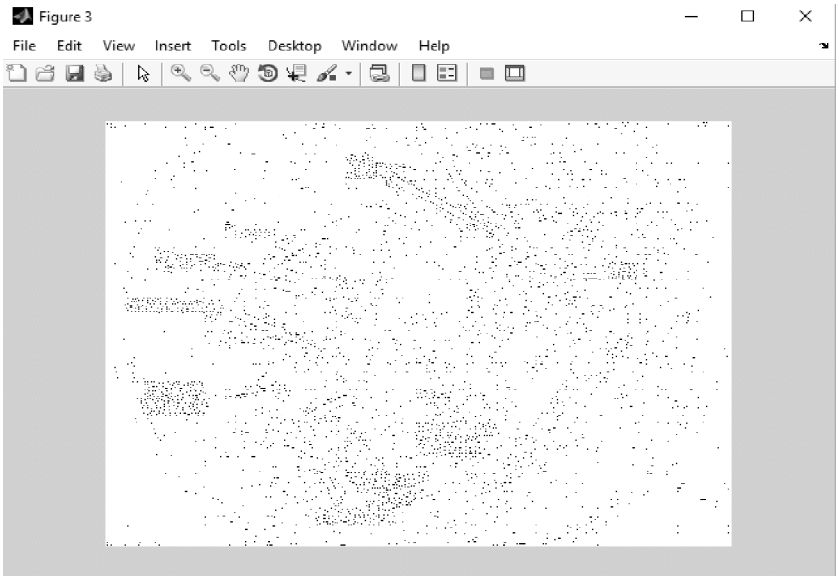


Figure 7: Texture Extracted Image

III. IMPLEMENTATION AND RESULT ANALYSIS

Features obtained by DWT and LBP are combined to form a single feature vector [9].By using fusion method features are combined. s Combined feature vector is used for similarity comparison with query image [10]. For comparison, more than one query is used.

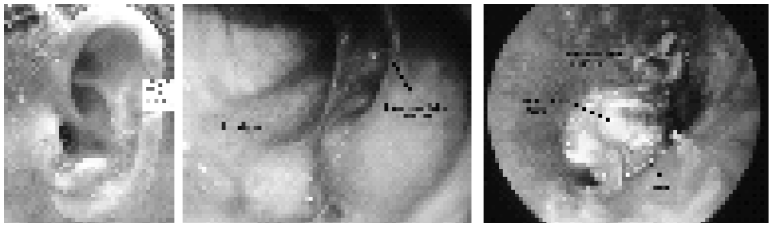


Figure 8: Query Image

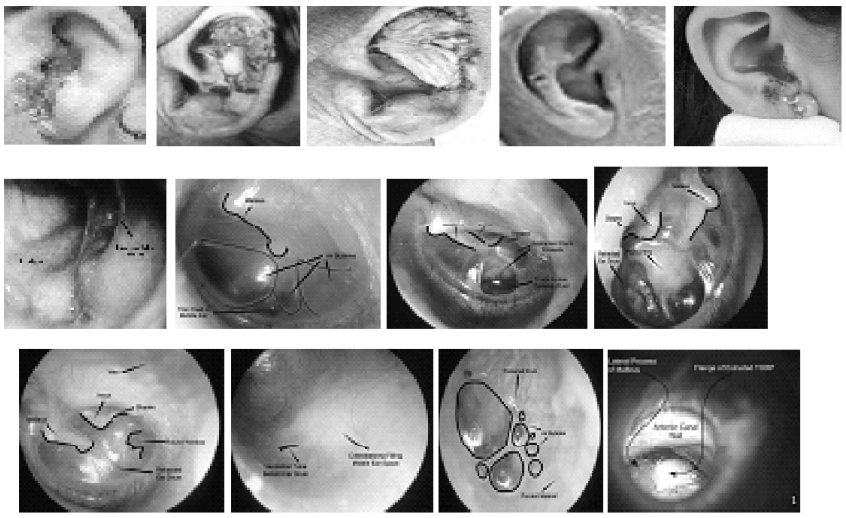


Figure 9: Images in the Database

3.1. Image Retrieval Using Euclidean Method

By using Euclidean method distance between the query image and database image is calculated. For getting matched images query image is compared with database images. Formula for Euclidean distance method is given below

$$d\left(A^{I}, A^{Q}\right)=\sqrt{\sum_{i=1}^{n}\left(A_i^{I}-A_i^{Q}\right)^2}$$

Where,

AI-is the Images in the database
AQ-is the query image for retrieval

Images are retrieved based upon minimum Euclidean distance [11].

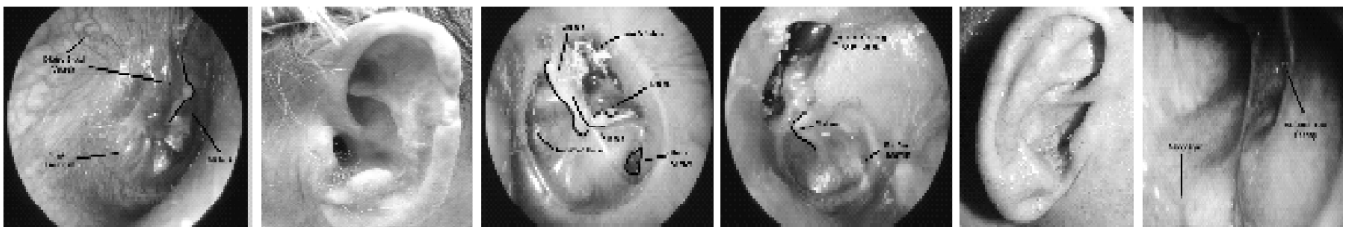


Figure 10: Retrieved Images from Database

3.2. Retrieval Efficiency

For retrieval efficiency, Precision and recall are calculated. The experiment is conducted for more than two hundred real-time medical images from MATLAB workspace database. Precision and recall results are shown in Table.1. Precision and recall formulas are given below.

PRECISION = NO.OF RELEVENT IMAGES RETRIEVED/
TOTAL NO. OF IMAGES RETRIEVED
RECALL=NO.OF RELEVENT IMAGES RETRIEVED/
TOTAL NO.OF RELEVENT IMAGES IN THE DATABASE

Table 1
Precision and Recall Values in %

Query Image	*Precision*	*Recall*
1	98.13%	52.23%
2	97.54%	59.20%
3	**96.49%**	**54.72%**

IV. CONCLUSION

This paper presents an effective ear image retrieval system based on DWT and LBP. Features extracted by LBP and DWT are combined. In this paper 6-level, DWT is applied on the sample datasets of medical images.LBP is used to extract the texture feature by comparing each pixel by pixel. Results are more accurate and robust. For retrieval efficiency precision and recall, methods are used.

REFERENCES

[1] H.D. Tagare, C. Jaffe, J. Duncan, Medical image databasess a content-based retrieval approach, Journal of Am. Med. Informatics Association 4(3), 184198, 1997.

[2] S. Beretti, A. Del Bimbo, P.Pala, Content-based retrieval of 3D cellular structures, Proceedings of 2nd International Conf. on Multimedia and Exposition, IEEE Computer Society, pp. 621-624, 2001.

[3] D. Keysers, J. Dahmen, H. Ney, B.B. Wein, T.M. Lehmann, A statistical framework for model-based image retrieval in medical applications, Journal of Electronic Imaging 12(1), 59-68, 2003.

[4] A. Grace Selvarani, Dr. S. Annadurai; Content Based Image Retrieval For Medical Images Using Generic Fourier Descriptor, Journal of Computational Intelligence in Bioinformatics. ISSN: 0973-385X Volume 1, Number 1 (2008), pp. 65–72.

[5] Gagandeep Bhatia; Extraction of Unique Feature Sets (Bio-metric Identifier) For Human Ear's Image using DWT Analysis, International Journal of Scientific Research Engineering & Technology (IJSRET) Volume 2 ,Issue2, pp 066-071 ,May2013.

[6] Ch.Sravani, D. Hari Krishna, M.C.Chinnaiah; Implementation of Texture Feature Based Medical Image Retrieval Using 2-Level Dwt and Harris Detector, International Journal of Engineering Research and Development e-ISSN: 2278-067X, p-ISSN: 2278-800X, VOLUME 4, Issue 4 (October 2012), PP. 40-46.

[7] A. S. JADHAV, RASHMI V. PAWAR; COLOR HISTOGRAM BASED MEDICAL IMAGE RETRIEVAL SYSTEM, International Journal of Image Processing and Vision Sciences (IJIPVS) ISSN (Print): 2278 – 1110, Vol-1 Iss-3, 4, 2012.

[8] B. Ramamurthy, K.R. Chandran, V.R. Meenakshi, V. Shilpa; CBMIR: Content Based Medical Image Retrieval System Using Texture and Intensity for Dental Images, J. Mathew et al. (Eds.): ICECCS 2012, CCIS 305, pp. 125–134, 2012. © Springer-Verlag Berlin Heidelberg 2012.

[9] Ch.Kavitha,Dr.B.Prabhakara Rao;Image Retrieval Based on Color and Texture Features of the Image Sub-blocks, International Journal of Computer applications (0975-8887), volume 15-No.7, February 2011.

[10] Kong, W.K., Zhang, D., Li, W.: Palmprint feature extraction using 2-D Gabor Filters, Department of Computing,Biometrics Research Centre,The Hong Kong Polytechnic University, HungHom, Kowloon, Hong Kong Received May 15, 2002; received in revised from January 14, 2003; accepted February 14, 2003.

[11] Veni, S., Narayanankutty, K.A.: Image Enhancement of Medical Images using Gabor Filter Bank on Hexagonal Sampled Grids. World Academy of Science, Engineering and Technology 65 (2010).