CBMIR: Content Based M ıge Retrieval System Using Texture ity for Eye Imag

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Abstract— This paper aims to develop an efficient visual -content based te ages from the medical image database. Various features such as texture, color, intensity, shape, resolution, global anc cal images for the retrieval. In this work; we concentrate on the retrieval of eye images. Intensity and texture feature a hese features are combined to form the single feature vector of the image by using fusion method. Query images ar from the database. Euclidean Distance method gives top images matching to our query images.

Index Terms— CBMIR , LBP, Euclidean Distance Method, Precision, Recall, ıre Feature Extraction.

1 INTRODUCTION

Nowdays handling medical image database is very challenging task. There must be automatic search and retrieval system for handling medical image databases. Content based medical images retrieval (CBMIR) is a technique for image retrieval based on visual content.

1.1 Content Based Image Retrieval

Mainly there are two methods exist for image retrieval. One is text-based and other is content based .Text-based method has some limitations. For handling large database, text-based is extremely time consuming. Content based method is more accurate and fast compare to other methods. Content based automatically extract low level features such as texture, intensity, shape and color in order to find similar images compare to query image. In this method query and database features are compared.

1.2 Medical CBIR

We must need an image database for medical field. So, we are developing an efficient technique for searching and retrieving images .CBIR is an important method for searching and retrieving images .CBIR uses most of information from the image .CBIR is independent of human being for finding the images from the database. This method is useful for diagnostic study, treatment planning and research.

1.3 Objectives

Our objective is to retrieve similar images compare to query image by using different visual feature. Stored feature are compared to query feature. Euclidean distance is calculated between query image and database image to retrieve similar images .Fig.1 shows general CBIR system architecture.

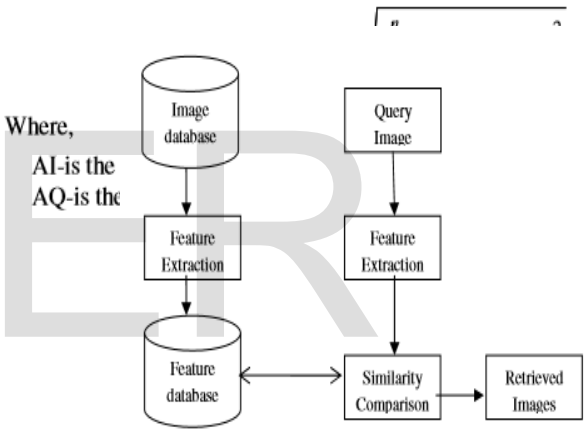

Fig.1. General CBIR System Architecture.

2 RELATED WORK

CBMIR: shape-based image Retrieval using canny edge Detection and k-means Clustering algorithms for Medical images: In this work, the authors have proposed a shape based image retrieval system for medical images. To implement this, preprocessing, image segmentation, feature extraction, and classification steps were carried out. To retrieval, Euclidian distance calculated between query image and database images. Since the system used shape feature alone, it gives about 50% retrieval performance only [1].

Image Retrieval Based on Color and Texture Features of the Image Sub-blocks: In this method the author proposed the image retrieval system based on color and texture feature. An image is partitioned into sub blocks; color of each sub block is taking out by measuring the HSV color space into

non-equal interval. The drawback of the system is the HSV color space. This method will concentrate only on the color images it does not favor for the specific medical domain. Because in specialized fields, namely in medical domain the absolute color and grey level features are very limited [2].

Content Based Medical Image Retrieval Using Lifting Scheme Based Discrete Wavelet Transform: In this paper, lifting scheme is proposed for content based retrieval method for diagnosis aid in medical field. Lifting scheme is simplest and efficient algorithm to calculate wavelet transform. Lifting scheme used as feature in CBIR which has intriguing properties as faster implementation, low computation, easier to understand and can also be used for irregular sampling [3].

Content Based Image Retrieval Based on Pyramid Structure Wavelet: In this method the author proposed the result of image retrieval by using color, shape and texture and combination between them by using Receiver-operating characteristic curve (ROC).The hybrid technique is used with ROC technique to give best results. In hybrid technique it compares HSV query with HSV database images and it provides sorted list with sorted images and their differences. The major drawback is that it takes the longer time for calculation and comparison with other technique [4].

A Content-Based-Image-Retrieval Approach for Medical Image Repositories: This paper describes an approach to assessing image similarity using simple statistical measures computed over blocks of adjacent pixels. The approach can be applied as an initial step in construction of a content-based-image-retrieval system for large collections of medical images, to rank candidate images according to their similarity to a given query image [5].

Content Based Medical Image Retrieval Using Fuzzy C-Means Clustering With RF: Content-based image retrieval with relevance feedback (RF) schemes based on Fuzzy C-Means Clustering is used to retrieve the medical image effectively and efficiently. Fuzzy C-Means Clustering (FCM) is useful to mine complex and multi-dimensional data sets. This technique allows users to retrieve a similar query image from a database, thus a higher retrieval performance can be achieved [6].

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3 Proposed Method

We have used texture and intensity feature for the image retrieval. Our algorithm for proposed method is explained below:

Algorithm
STEP 1: Create a database containing various eye images.
STEP 2: Extract the Texture and Intensity feature of each image in the database.
STEP 3: Construct a combined feature vector for Texture and Intensity.
STEP 4: The new images formed are stored in another database called the Featured Databases.
STEP 5: Find the distance between feature vectors of query images and that of Featured database images.
STEP 6: Sort the distance and Retrieve the N-top most similar images.

Proposed system is more efficient because it extracts both texture and intensity features. Euclidean distance is calculated between query image and database image to retrieve similar images. Fig.2 shows system flow diagram of the proposed system.

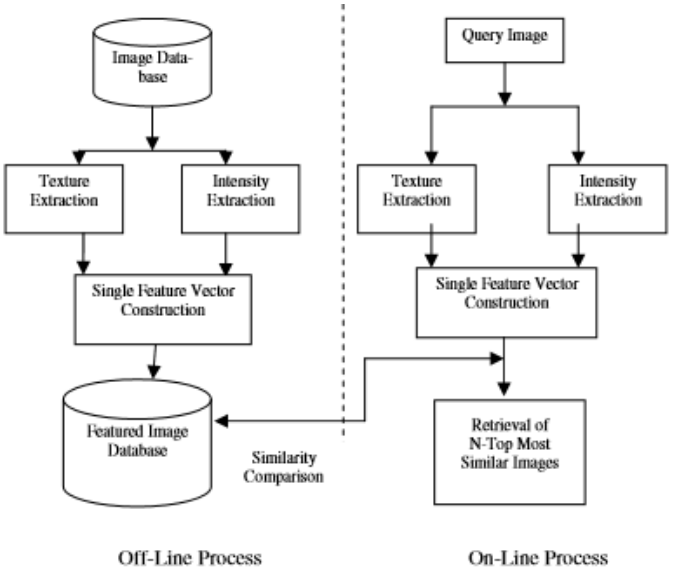


Fig.2. System Flow Diagram.

3.1 Texture Feature Extraction

Texture is natural property of all surfaces that describes visual

$$s(z) = \begin{cases} 1, z \geq 0 \\ 0, z < 0 \end{cases}$$

patterns each having properties of homogeneity. It contains the information about the structural arrangement of the surface such as clouds, leaves, bricks; sky etc. It is characterized by the spatial distribution of gray level in the neighbourhood .Local binary pattern operator is a powerful means of texture description. The original version of the operator labels the image pixels by Thresholding the 3*3 –neighborhood of each pixel with the centre value and summing the threshold values weighted by powers of two. The operator can also be extended to use Neighborhood of different sizes [7].

3.2 Intensity Feature Extraction

Intensity shows the brightness of a pixel. Gray scale image contains most of the image information. In gray scale image black pixel contains minimum intensity and white pixel contains maximum intensity. The intensity information is extracted by determining the pixel values.

3.3 Image Retrieval System

There are two methods for image retrieval 1.text-based 2.content based retrieval. CBIR enhances the accuracy of information being returned .CBIR is based on visual features, such as color , texture and shape. Euclidean distance vector is used to measure similarity between query and database images. Euclidean distance vector provides the top N similar images based on minimum distance between query image and the image in database [8].

4. Implementation and Result Analysis

Our CBIR system implementation and experimental results are explained below.

4.1 Texture Feature Extraction Using Local Binary Pattern (LBP)

Formula/Expression:

Formula/Expression:

$$LBP_{P,R}(x,y) = \sum_{p=0}^{P-1} s(f(x,y) - f(x_p, y_p))2^p,$$

where $s(z)$ is the thresholding function

$$s(z) = \begin{cases} 1, z \geq 0 \\ 0, z < 0 \end{cases}$$

Local Binary Pattern Algorithm for Texture Extraction Steps:

1. Divide the examined window into cells.(e.g. 16*16 pixels for each cell).
2. For each pixel in a cell, compare the pixel to each of its 8 neighbours (on its left-top, left-middle, left-bottom, right-top etc.)Follow the pixels along a circle, i.e. clockwiseor counter-clockwise.
3. Where the center pixel's value is greater than the neighbor's value, write "1".Otherwise, write "0".This gives an 8-digit binary number (which is usually converted to decimal for convenience).
4. Compute the histogram, over the cell, of the frequency of each "number" occurring (i.e. , each combination of which pixels are smaller and which are greater than the centre.).
5. Optimally normalize the histogram.
6. Concatenate (normalized) histograms of all cells .This give the feature vector for the window.

4.2 Intensity Feature Extarction

By using pixel values intensity information are extracted. Data matrix I contains intensity image. Data matrix I contains intensities within some range. In matrix I, each element of the matrix corresponds to one pixel. Imagesc("image scale")function, is use to display intensity image. We have use two –input form of images to display an intensity image.

4.3 Feature Vector Construction

After combining texture and intensity feature vectors we will get common single feature vector. Fusion methods are used to combine one or more features. Texture feature have been fused to intensity features, to generate combined feature vector. Combined feature vector is used for similarity comparison with query image [9].

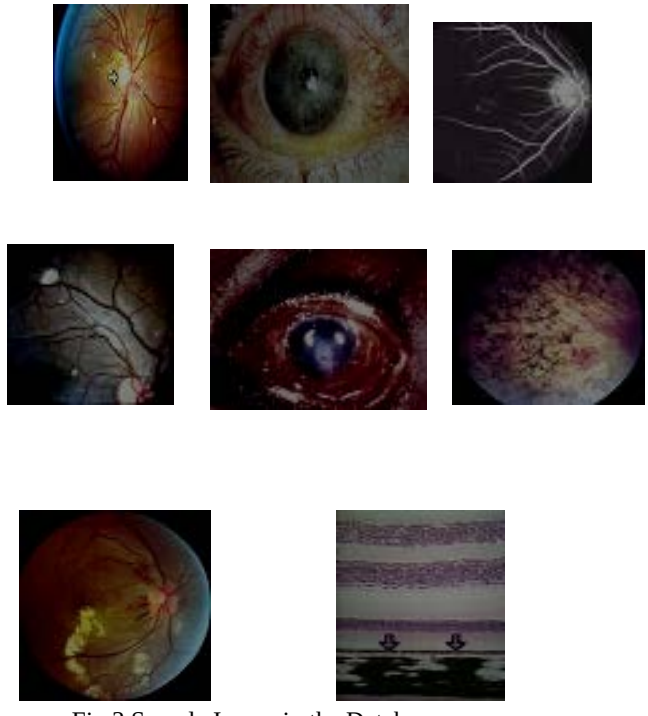
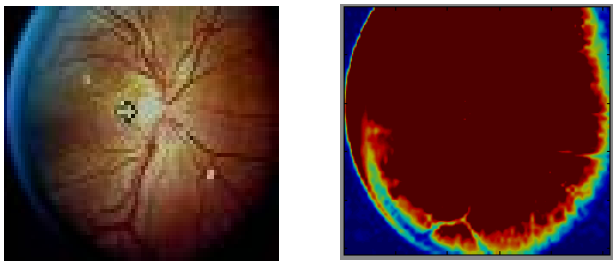
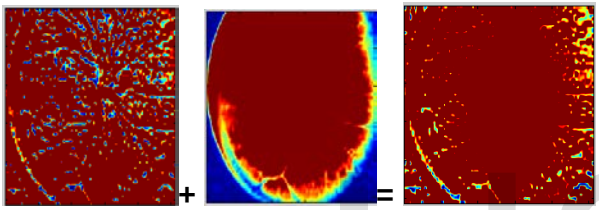


Fig.3 Sample Image in the Database.



(a).Input Image (b).Intensity Extracted Image

Fig.4 Intensity Feature Extraction.



Textured Extracted image + Intensity Extracted Image = Single Featured Image

Fig.5 Single Feature Vector Image.

4.4 Image Retrieval Using Euclidean Method

Euclidean method calculates the distance between query image and database image. Query image are compared with the database images. Formula for Euclidean 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

For image retrieval minimum Euclidean distance image is considered as a most similar image [10].

4.5 Retrieval Efficiency

Precision and recall are calculated for retrieval efficiency calculation. Standard formulas for precision and recall for some sample query images are given below. System was tested for some query images and result is shown in TABLE.1.

PRECISION = NO.OF RELEVENT IMAGES RETRIEVED/ TOTAL NO. OF IMAGES RETRIEVED PRECISION

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	40.86%	34.86%
2	89.18%	60.55%
3	59.52%	78.12%

5. Conclusion and Future Enhancement

Our designed system is more effective after combining intensity and texture feature. We have used local binary pattern to extract the texture feature by comparing each pixel by pixel. Our approach provides more accurate results. Precision and recall method are used for retrieval efficiency. In future, our system can be improved by applying new image content feature .Also; this technique can be applicable for larger database.

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