CONTENT BASED IMAGE RETRIEVAL WITH RELEVANCE FEEDBACK AND COMPOSITE FEATURE

Sweety Maniar[1], Dr. Kajal Patel[2] and Dr. J. S. Shah[3]

[2,3]Co-Guide & Guide, Department of Computer/It Engineering, Gujarat Technological University, Ahmedabad.

[3]Assistant Professor, Department of Computer Engineering, NSIT-Jetalpur, Ahmedabad.

Abstract: The paper gives, a new method relevance feedback was compared with (texture and shape) the Composite feature based method. The results were taken using medical database with the heart image as a query image. Based on implementation of this research, we have proved that more features given for input in search than retrieval result are always better.

Keywords and Phrases: Content Based Image Retrieval (CBIR), Composite (texture and shape) feature, Relevance Feedback.

1. Introduction

The large number of images was to be maintain, searched, retrieved, stored produces constantly in lot many areas of engineering and research. The search for images in general used search engine like Bingo, Yahoo, and Google, the search for image we give text which retrieves similar images that give as input image but not on text. CBIR system find the content of image and retrieval images from database. In the terms of low level features like color, texture, shape uses to retrieve contents of images and with their positions to present the number of images from databases.

In various hospitals as well as in various medical centers are produced different types of medical images such as endoscopy, MRI, X-ray, Computer Tomography scan, Position Emission Tomography scan are produced [3]. The use of Medical image retrieval has many useful area of research fields, education and medical diagnosis. Medical Content-based image retrieval (MCBIR) was image search for medical database in the application of image processing techniques. MCBIR search from the database to retrieve similar images [4]. So there is a need for classification of images and feature extraction for cool and best retrieval. MCBIR was calculated feature such as shape and texture and automatic retrieve the images from database.

2. Relevance Feedback

The main reason of CBIR created for relevance feedback is on re-retrieval of query image, permitting operators to evaluate and select the retrieval outcomes using content based image retrieval, check that which images are not relevant in results and which are releted to the query image, again feedback the related info to the operators select to the system as training samples for instruct next image retrieval and learning, So made retrieval results good as per the requirements of operators [2]. A wider use of relevance feedback technique changes the query vector with selected query image, relevance feedback query image also change the calculated feature of each feature vector for the database images, find out the more useful feature vector for the selected query image.

In CBIR based systems use the low level image features as color, shape and texture are extracted for matching. Extracted feature was characterized by feature vectors in place of lot many of keywords. Though, big issue in

CBIR was the semantic gap between the low level features and high level concepts. To decrease the gap in between the low level features and high level concepts.

The Research gap was the low-level feature calculation with texture and shape and understand the human requirement for finding the similarity of image [1]. This semantic gap, one should incorporate of human knowledge into the image retrieval system. One another method, generally used for this purpose of retrieval better was relevance feedback (RF) [5]-[8]. In RF, a user mark the relevant image as per the user requirement on the first retrieval results of the CBIR system can find more relevant images as per the user requirement. RF is also used for medical image retrieval [10].

The other issue of MCBIR systems was multi-dimensional indexing. In MCBIR systems, the image features has more numeric data so it has the high dimensional data. So to manage these type of data with general type of database systems was more difficult, the reason behind these was systems planned for text data and small dimensional numerical data. Due to this reason investigators with high dimensional data in CBIR systems for indexing purpose [11].

3. Composite (Texture & Shape) Feature

Dimensionality reduces can be done with Feature extraction. When the input to the various methods are too big to be give and it is believed to be disreputably needed, then the input data will be changed into a compact version with different number of features (known as features vector). Storing the various data with the other format of features was called features extraction. The composite feature was nothing but combination of texture and shape feature. The numbers of techniques for texture and shape feature extraction are given below.

3.1. Texture

Texture representation can be of two types: structural and statistical. Statistical features can be extracted by co-occurrence matrices, principal component analysis. [13]The features like mean variance standard deviation, energy, entropy, correlation, inertia are extracted using co-occurrence matrix. Contrast is the measure of the local variation in the gray level co-occurrence matrix [9].

$$Mean = \sum_{i=1}^{n}\sum_{j=1}^{m} x_y/mn \quad (1)$$

$$Variance = \frac{1}{mn}\sum_{i=1}^{n}\sum_{j=1}^{m} x_y - Mean \quad (2)$$

$$\sigma = \sqrt{Variance} \quad (3)$$

$$Correlation = \sum_{i,j}\frac{(i-\mu i)(j-\mu j)P_u}{\sigma_i\sigma_j} \quad (4)$$

$$Entropy = -\sum_i\sum_j P_d(i,j)\log P_d(i,j) \quad (5)$$

$$Contrast = \sum_i\sum_j (i-j)^2 P_d(i,j) \quad (6)$$

In Equation 1. m and n are size of image ,$X_{ij.}$ In Equation 5 and Equation 6 is the pixel at i and j position, $P_d(i,j)$ is the probability distribution function.

3.2. Shape

Shape features have an important role in primary categorization of medical images based on their content [2]. Features such Area, Edge, Fourier Descriptor, Circularity, are used to retrieve medical images [14, 8].
Area: Area of selection in square pixels or in calibrated square units.

Edge: Using canny edge detector, gradient, and other operators.

Fourier Descriptor: Fourier Descriptors (FDs) is a powerful feature for boundaries and objects representation.

$$a(k) = \sum_{n=0}^{N-1} z(n) \exp[\frac{-j2\pi kn}{N}] \ , 0 \leq k \ \leq N-1 \qquad (7)$$

Discrete Fourier Transform of z(n)(boundary point) gives value of Fourier Descriptor.

$$Circularity = 4\pi \ (\frac{Area}{Perimeter^2}) \qquad (8)$$

Equivalence diameter (circle with same area as the region)

$$Equivalence\ Diameter = \sqrt{\frac{4*Area}{\pi}} \qquad (9)$$

4. Proposed system

MCBIR systems retrieve images from that database which was similar to the query image. Primarily research in Medical Content Based Image Retrieval has always focused on systems utilizing shape and texture features. The step for proposed medical content based image retrieval system are:

1: A Database created with medical images out of that user can select any image as search Query image.
2: Input or select the query image.
3: Extract the texture and shape feature for database images and query image.
4: Create Feature Vector for query image and database image, Calculated the Euclidian and Manhattan distances between the both feature vectors.
5: Apply Sorting in distance and retrieve the matching for database.
6: The precision and recall calculated with category of image for algorithm performance measure.

5. IMPLEMENTATION

The proposed MCBIR system was testing with a test based of 650 different types of images with 5 categories and with different scan of human organ of image in database. The distribution and category for medical images are shown with figure 1. The proposed system implementation done on MATLAB 7.0. The hardware requirement for system implementation are Intel Core i3 Processor, 4 GB RAM with higher graphics. The proposed MCBIR system develop as per below. As per the proposed system the first step to create the database of medical image with different category. Database for medical images give in figure 1. To input query image we need some interface so create Graphical User Interface (GUI) for MCBIR that give in figure 2. As per the second step of proposed system select any query image. In figure give the selected query image of heart. The feature for texture and shape are calculated. In the texture feature calculate the mean, variance, standard deviation, correlation, energy, entropy, and contrast. For the shape feature area, edge, fourier descriptor, circularity, equivalence diameter are calculated. For selected query image of brain the texture and shape feature was calculated that give in figure 3 and figure 4. As per the different category of images was stored in database. So for the different category of image texture and shape feature are calculated that texture and shape features was stored in database. After feature calculate retrieve the result with relevance feedback and proposed system that give in figure 5 and figure 6. In all the figure give step by step implementation of proposed system.

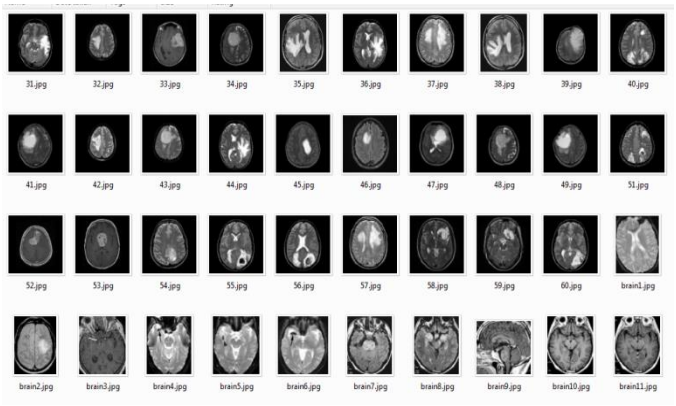

Figure 1. Database Image

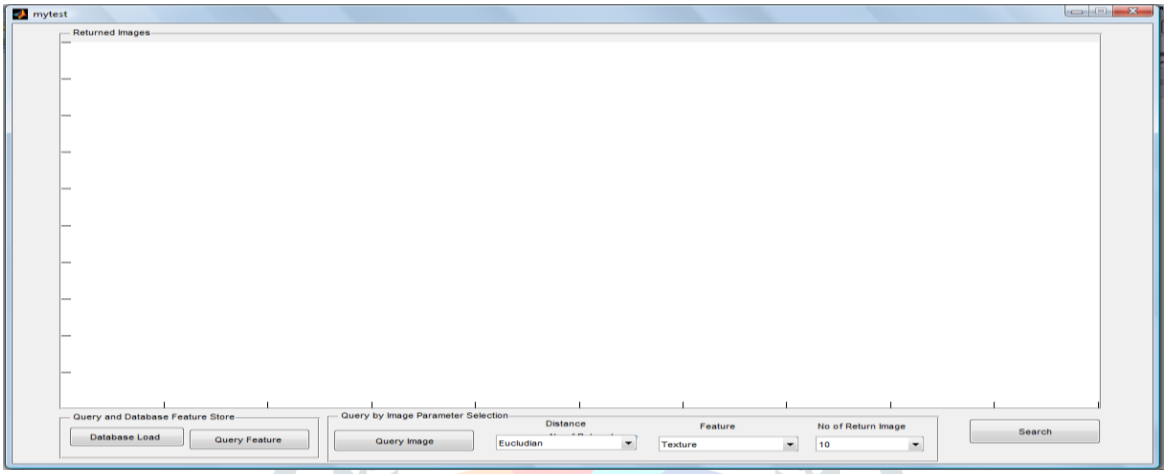

Figure 2. GUI of MCBIR

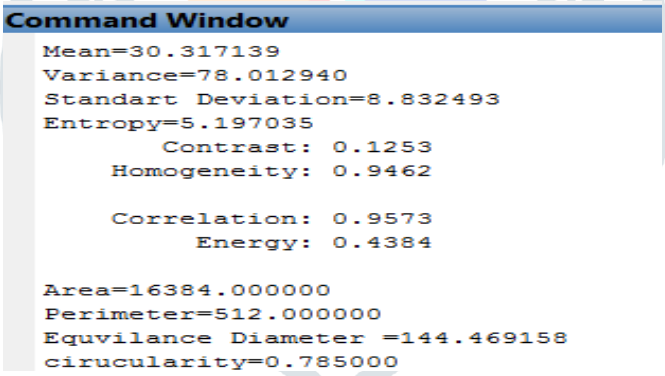

Figure 3. Feature Extraction

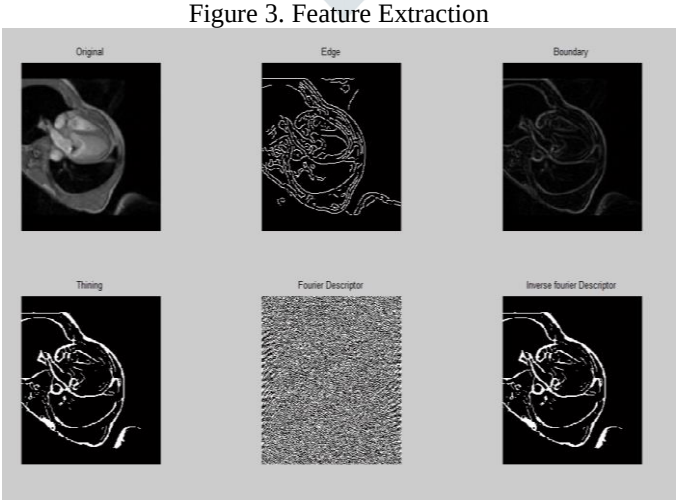

Figure 4. Feature Extraction with Heart Image

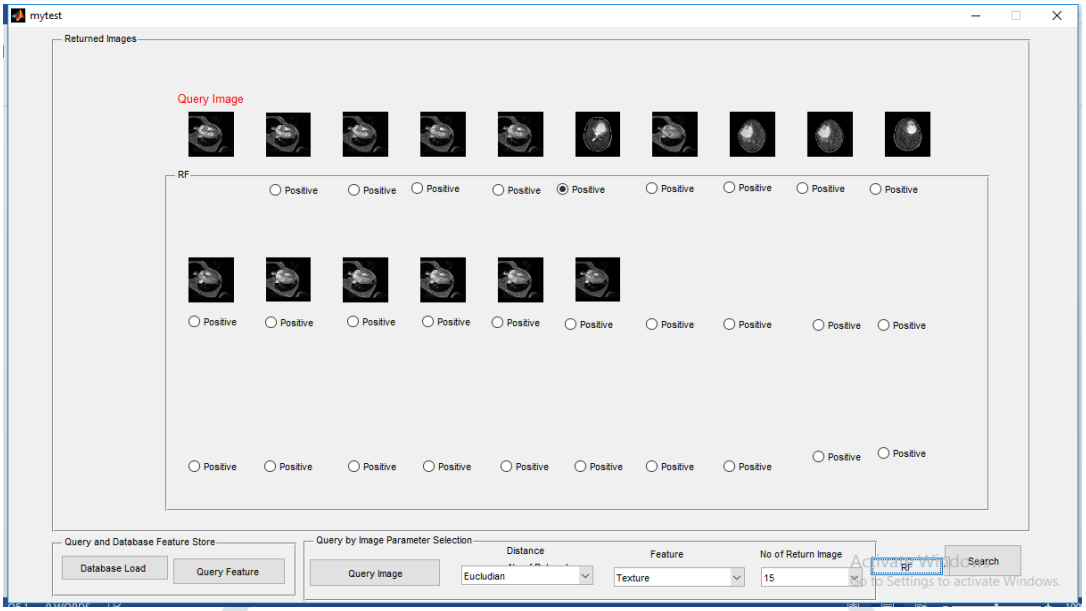

Figure 5. Retrieval result(11) with Texture features with RF for heart query image of MCBIR

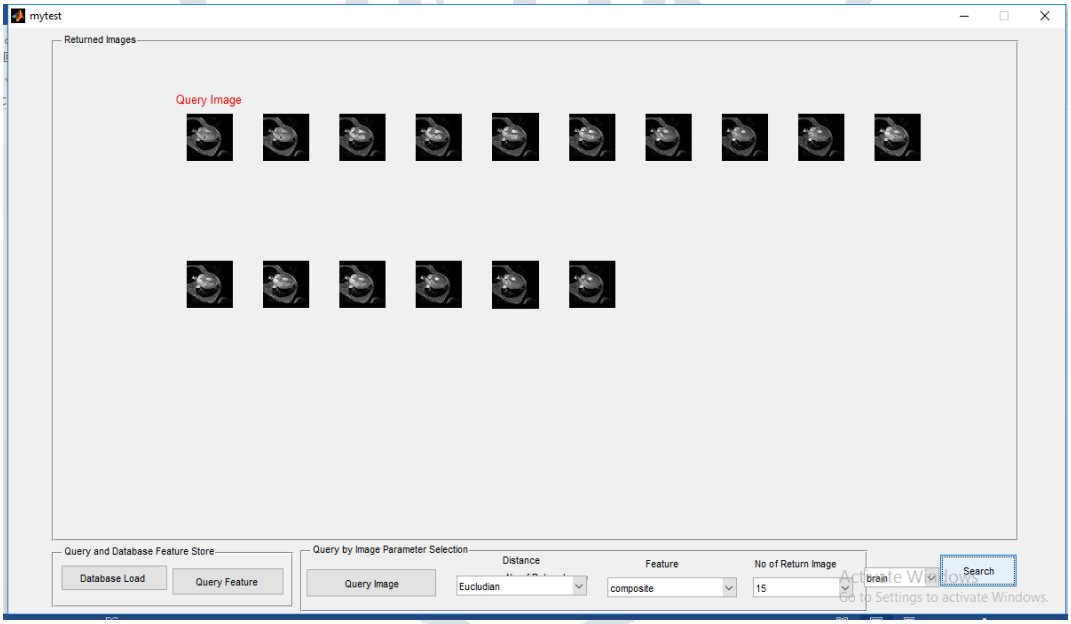

Figure 6. Retrieval result(15) with composite features for heart query image of MCBIR

6. Conclusion

This paper has given content on the CBIR applications in medical domain, the majority of the MCBIR systems have emerged as adaptations of the CBIR systems. The purpose of medical image databases was to provide an effectual means for organizing, searching, and indexing large collections of medical images. Medical content based retrieval is a promising approach to achieve retrieval and has developed a number of techniques using texture and shape feature. CBIR approach provides semantic retrieval and effective feature extraction with composite techniques of shape and texture compare to relevance feedback.

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