CBIR System for Medical Images in Color and Texture Domain Using Distance Profile

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Abstract- Content based image retrieval system in color and texture domain using distance profile maps the images based on image analysis in GLCM matrix for texture feature computation and color features using RGB color format. The existing base paper work is focused on image retrieval using color auto-correlogram and edge orientation based features followed by support vector machine as classifier. The work suffers from the draw back of texture related features as the medical images contain lot of informative texture in order to classify or distinguish a radio graph. Besides texture feature extracted out of the grey level co-occurrence matrix (GLCM) as in base paper work, does not completely portray the medical image as there may be two different images with approximately same texture features. This may be improved if the distance profile along with texture feature is attributed in order to retrieve a medical image from the data base. The distance profile may be computed in all three color channels of the RGB query as well as data base images.

Keywords- Image Segmentation, SVM Classifier, Texture Features, Statistical Features

I. INTRODUCTION

The term CBIR has been widely used to describe the process of retrieving desired images from a large collection on the basis of features (such as colour, texture and shape) that can be automatically extracted from the images themselves. The features used for retrieval can be either primitive or semantic, but the extraction process must be predominantly automatic. Retrieval of images by manually-assigned keywords is definitely not CBIR as the term is generally understood – even if the keywords describe image content. CBIR differs from classical information retrieval in that image databases are essentially unstructured, since digitized images consist purely of arrays of pixel intensities, with no inherent meaning. One of the key issues with any kind of image processing is the need to extract useful information from the raw data (such as recognizing the presence of particular shapes or textures) before any kind of reasoning about the image's contents is possible. Image databases thus differ fundamentally from text databases, where the raw material (words stored as ASCII character strings) has already been logically. Content based image retrieval system for medical images is primarily the texture profile extraction and mapping. The degree of texture profile can be estimated by extracting gray level co-occurrence matrix and then computing the features like contrast, energy, correlation and homogeneity supported by entropy and color moments. The texture features, color moments and entropy all together make the feature vector. The feature vector is generated for the entire data base image using the presented algorithm. The query image is exposed to same algorithm and similarity index is computed using the mean square error method and error margin criterion. The similar images are retrieved using the score index or minimum mean square error between query image feature vector and the data base image feature vector.

II. RELATED WORKS

This paper presents a fast and robust color indexing techniques, namely auto color correlation (ACC) based on a color correlogram (CC), for extracting and indexing low-level features of images. The proposed technique can reduce computational time of color correlogram technique from O(m2d) to O(md). Additionally, an extended technique of ACC based on the autocorrelogram, namely Auto Color Correlogram and Correlation (ACCC) is proposed. It is the integration of Autocorrelogram and Auto Color Correlation techniques that the computational time of ACCC is still O(md). The experimental result show, the ACCC algorithm has the bester efficiency than the AC algorithms for retrieving images. Moreover, the proposed method consumes less processing time than the CC algorithm so that the proosed method is applicable in practice for real-time processing.[1]
The global features of color, texture and shape are usually designated as the key index when content-based image retrieval (CBIR) is used in the medical field. Sometimes good result appears when these features are applied to color pathology or dermatosis images retrieval, however the topological relationships of the organs are generally ignored for most of the medical images. These disadvantages could be diminished by local features. In this paper, a new retrieval algorithm based on the fuzzy feature of medical images is proposed. Firstly, the medical images are segmented by the improved Chan-Vese(CV) method with complex models. Secondly, in order to describe the uncertainty of the segmentation results, the features are mapped to the fuzzy feature region, and then the features of gray level, texture and shape are extracted from the segmented regions as the vision features. Finally, the comparability of the fuzzy features is calculated. The experimental results indicate that the focus distribution information of the medical images can be labelled exactly by using the proposed algorithm, which has a good robustness, high efficiency, and comparatively good recall ratio and precision ratio. [2] CBIR technique is becoming increasingly important in medical field in order to store, manage, and retrieve image data based on user query. Searching is done by means of matching the image features such as texture, shape or different combinations of them. Texture features play an important role in computer vision, image processing and pattern recognition. In this paper we

introduce a novel method of using SVM (Support Vector machine) classifier followed by KNN (K-nearest neighbor) for CBIR using texture and shape feature. [3] In this paper, we propose a Content Based Medical Images Indexing System Based on Spatial Distribution of Vector Descriptors. The query image can be a portion of images, or entire ones. Our system is based on retrieving and classifying images by extracting local image features using descriptors and statistical distance measurements to compute similarity. For pattern recognition, we applied the approach of Scale Invariant Feature Transform (SIFT) descriptor which extracts the local features vector for the key-point in order to obtain a cloud of points indicating the locations of the key-feature. Then, we used the Quick Hull algorithm to delimit this cloud of points into a vector forming a pattern. The medical image dataset we used is provided by EL KASSAB hospital, Tunis, Tunisia. Our system was successfully tested on brain tumor MRI, and we are in the process to extend it to bone images. [4]

Digital images have many applications in different fields like medical imaging and diagnostics, weather forecasting, space research, military etc. The number of images available and their wide variety increases with the ease of acquiring, storing and sharing digital images due to the advances in technology. As a result, the significance of image retrieval algorithms and systems has been considerably increased. Many researches on content-based image retrieval (CBIR) are being carried out. In this paper, a fast image retrieval algorithm called feature levels is proposed. Feature levels algorithm works with the classification of image features to different categories or levels, feature extraction in terms of levels and feature similarity comparison of the query image with database images. The system retrieves images from the associated database. The database is re-written after each level according to Database Revision (DR) algorithm. [5]Application of content-based image retrieval (CBIR) to medical image analysis has recently become an active research field. While many previous studies have focused on the feature design, the metric design, another key CBIR component, has not been well investigated in this application context. This paper presents a medical CBIR that adapts its similarity metric from data by using information theoretic metric learning. Also we systematically compare our SIFT bag-of-words-based system with various plug-in similarity measures available in literature. The proposed systems are evaluated with the ImageCLEF-2011 benchmarking dataset. Our experimental results demonstrate the advantage of the proposed metric learning approach and L1 distance-based measures. [6] This paper proposes a novel method, based on Full Range Autoregressive (FRAR) model with Bayesian approach for color image retrieval. The color image is segmented into various regions according to its structure and nature. The segmented image is modeled to RGB color space. On each region, the model parameters are computed. The model parameters are formed as a feature vector of the image. The Hotlling T2 Statistic distance is applied to measure the distance between the query and target images. Moreover, the obtained results are compared to that of the existing methods, which reveals that the proposed method outperforms the existing methods.[7]

In medical field, digital images are produced in ever increasing quantities and used for diagnostics and therapy. The swift expansion of digital medical images has enforced the requirement of efficient Content-based image retrieval system for retrieving medical images that are visually similar to query image. Such systems provide great assistance to doctors in clinical care and research. In this paper, we have designed a Content Based Image Retrieval System for Medical Databases (CBIR-MD) based on various techniques like Fourier descriptor, Euclidean distance, Haar Wavelet transformation, Canberra distance and analyzed its performance on Endoscopy, Dental and Skull images. [8] This paper describes the results after using an automatic classification method to help improve the retrieval of medical images. Using a large dataset of medical images, we established links between low-level features from medical images and high-level features from textual codes of Image Retrieval for Medical Application (IRMA). This paper also explains the process and methods used to automatically classify these medical images, and the results from the classification process. Our best classification results were on image modality with an error-rate of 1%. [9, 10] Image pattern features are discussed in texture, color and radial domain for pattern identification and classification. The feature base can be used in BIR system for object extraction. [11, 12]

III.ALGORITHM

The proposed CBIR system consist of following blocks

- Feature extraction using Color Auto-correlogram
- Feature Extraction using Edge Orientation Auto-correlogram (EOAC)
- Texture Features
- Color Moments, and
- Distance –intensity profile

Feature extraction using Color Auto-correlogram

In the proposed system, the color medical images are in RGB color space and they are converted into HSV color space (Karkanis et al., 2003) then the images are segregated into IH (Hue), IS (Saturation) and IV (Intensity) component images, where IH and IS component images have chromatic information and IV component image contains achromatic information. Then, the color autocorrelogram is computed from the uniformly quantized IH and IS images respectively, and is formed as color feature vector .

Feature Extraction using Edge Orientation Auto-correlogram (EOAC)

the EOAC is constructed as a matrix, which consists of 72 rows and 2 columns. Each element of the matrix is computed by comparing each edge pixel with its neighborhood edge pixels (k pixel distance apart) to determine their similarity based on their magnitude and orientations.

Texture Features

Texture features are computed by extracting the grey level co-occurrence matrix (GLCM) from input image. The texture features consist of contrast, energy, homogeneity and correlation. Besides texture features, entropy is also computed from grey version of the input image.

Color Moments

Color moments consists of mean of red, green and blue color pixel intensities. The standard deviation of red, green and blue color pixels also make the parameters in feature vector set.

Distance-Intensity Profile

Distance –Intensity profile is the plot between image one dimension and count of non-zero pixels in other direction. The distance-intensity profile is different form histogram in the sense that histogram is the plot of pixels with their respective intensity.

IV. RESULTS AND DISCUSSION

Exp. No.	Query Image No.	Total Image Retrieved	Relevant Images	Retrieval Time in secs.	% Accuracy
1		4	4	3.6	100
2		10	8	3.5	80
3		9	8	3.6	88
4		5	4	3.7	80
5		9	7	3.5	77
6		22	20	3.5	90


Figure 2
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Image ID #20.jpg
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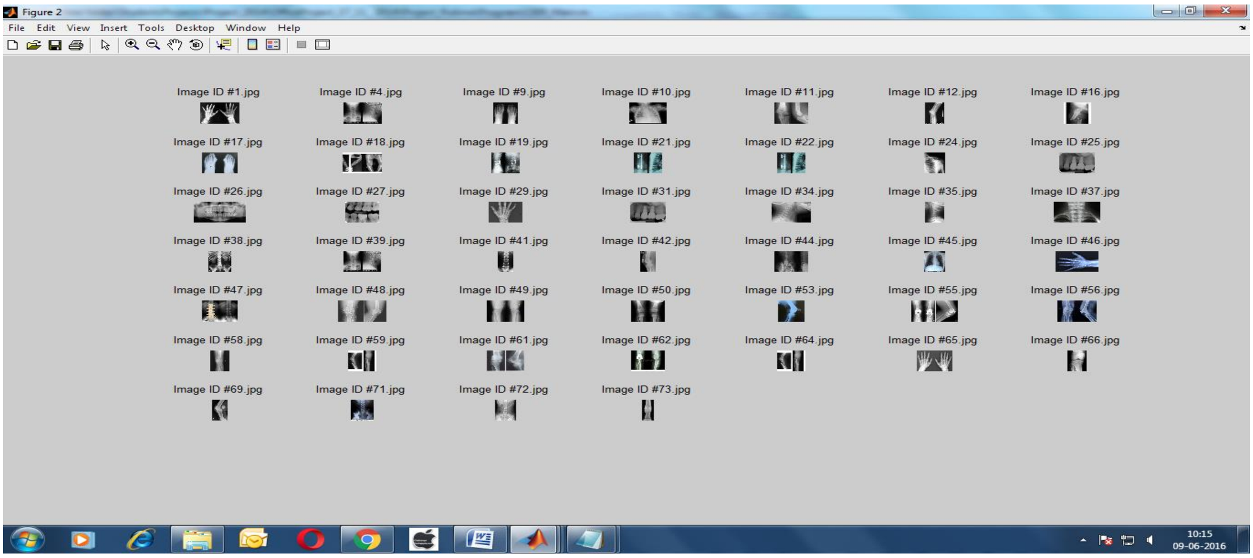
Figure 2
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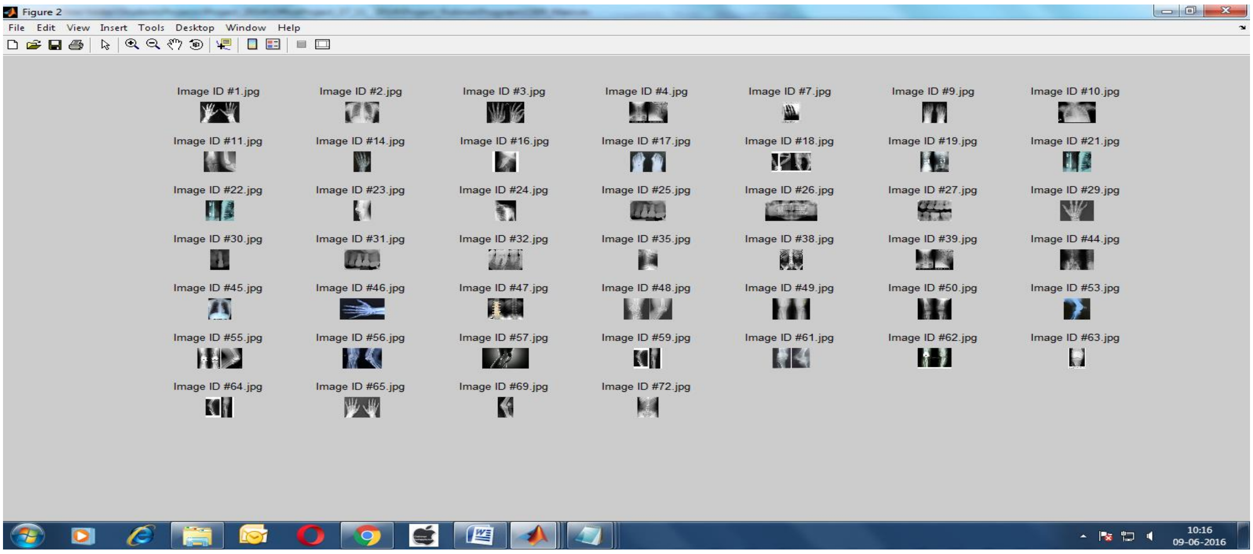
Figure 2
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VI. CONCLUSION

The presented work has been tested on no. of data base images collected on line. The precision, recall and accuracy are computed using the total no. of data images and correctly and incorrect images retrieved. The texture features plays important role in correctly retrieving images as the medical radio graphs primarily vary over the gray image intensity. The retrieval accuracy is above 80%.

VII. REFERENCES

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