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CBIR SYSTEM USING COLOR HISTOGRAM AND WAVELET TRANSFORM FOR BLOOD CELLS IMAGES

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***Abstract*— The research in Content-based image retrieval is developing rapidly. It benefits many other fields, in particular the medical field as the need of having a better way of managing andretrieving digital images has increased.The aim of the thesis is to investigate performance of descriptors of blood cell image retrieval. In this process traditional wavelet based and global color histogram is investigated. The prototype system allows user to search by providing a query image and selecting one of four implemented methods. Research goal is enhancing current content-based image retrieval techniques. Results were obtained by experimenting to this proposed method is able to perform clinically relevant queries on image databases without user supervision.**

Keywords-component: content based image retrieval, color histogram, blood cells images, wavelet form.

I. . INTRODUCTION

Retrieval of digital images in the past has been based on textual annotation for indexing andsearching. Images stored in the database are associated with keywords, which are manually annotated to the images. This method is time consuming especially for database with a large number of images. Recently a new method of image retrieval has been introduced.Images are now retrieved based on the content such as the colour, texture, shape, and spatial information.

Content-based image retrieval (CBIR) involves retrieval of images similar to an example query image in terms of some features extracted from the images. It uses visual content such as colour, shape,texture and spatial layout to represent and index the image[1]. CBIR has been an active and challenging research area due to thegrowth of digital images. The amount of medical images has experienced exponential growth and significance of CBIR is more tangible than before.

In this research,color is the most used feature in the content-based image retrieval systems.Here, we developed a content-based image retrieval(CBIR) system for scanned blood cells in order to investigate the effectiveness of wavelet-based texture descriptors.

A.Color Histogram:

Color histogram is the traditional method of describing color properties. It is also invariant to translation and rotation of objects. The color histogram for an image is constructed by countingthe number of pixels of each color. A histogram is a probability density function of the image intensities. A color histogram can be defined by this formula

$$h_{P,Q,R}(p,q,r)=M.Prob(P=p,Q=q,R=r)$$

where P,Q and R represent the three color channels(R,G,B or H,S,v) and m is the number of pixels in the image[4].

B.Wavelet Transform:

The wavelet transform has become a useful computational tool for a variety of signal and image processing applications. It is used in this work because of its excellent characteristics of localization in time and frequency[2].For implementing wavelet transform; firstly, three dimensional nature of queried image has to convert into two dimensions.Here, in this process Daubechies wavelet method is executed onto the image.

C.Color:

Color is the most extensively used visual content for image retrieval. In medical image processing, color is a very important feature. It is invariant to orientation and scaling . The first step to extract color features is to select an appropriate color space. Several color spaces are available, such as RGB, CMYK, HSV and CIE L*u*v,Munsell, CIE L*a*b* [1].The RGB color model is composed of the primary colors Red,Green and Blue.These colors are consider as "additive primaries" but it is rarely used for indexing and querying because it does not correspond well for human color perception[3].So here in this work Hue ,Saturation and Value(HSV) model is used.HSV is interchangeable with HSL(Hue,Saturation ,Lightness).Hue describes the actual wavelength of color percept,Saturation indicates the amount of presented white in the color and brightness(value) represents intensity of color.

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D.Texture:

Texture of an image is referred as the presence of a spatial pattern that has some properties of homogeneity. There are three principal approaches to describe texture. They are statistical, structural, spectral.Statistical techniques characterize textures using gray levels statistical properties of points/pixels in a comprised surface image. Structural techniques are also know as “texels”.Spectral techniques are based on properties of the fourier spectrum and describe global periodicity of the grey levels for a surface. The most common method for capturing texture of an image is Wavelets and Gabor filters. This method is useful for images with homogenous texture. Fourier power spectra, co-occurrence matrices, shift-invariant principal component analysis (SPCA), Tamura feature, Wold decomposition, Markov random field, fractal model are statistical methods and characterize texture by statistical distribution of the image intensity[1]. Texture can be useful to differentiate images, which contain areas of similar colourssuch as images of sky, leaves or grass. Wavelet transform method transforms an image into a multi-scale representation with both spatial and frequency characteristics. This reveals an effective multiscale image analysis with lower computational cost [5].According to this transformation, a function, which can represent an image, a curve, signal etc., can be described interms of a coarse level description in addition to others withdetails that range from broad to narrow scales.

II. IMAGE RETRIEVAL METHOD

The main aim of CBIR is to finding nearest images to the input image. In this research, system retrieves nearest images to the input image and then shows list of disease classes,which are sorted by the retieval. The CBIR system is shown in fig.1.By this process user can choose one of the mentioned classes for retrieving number of nearest images to the input image from the selected disease class.This operation is done again for finding nearest images from selected disease class. Here, input image’s signature must be determined. First selecting a similarity measuring and then selects a 280x220 pixels color image,which is in RGB space for using a search reference. Signature of input image and data base image must match. Then, the system computes a signature depending which feature the user selects. Once the signature of the input image is obtained and then it is compared with all the data base images signatures by using a metric selected by user. This comparision process shows the best result. Output includes nine topmost ranked images that earn highest level of similarity in comparision of input image.

Figure 1.CBIR System

A.Feature extraction:

Transforming the input data into the set of features is called feature extraction. In this work it is discussed in two ways i.e., color and texture.Here a JPEG images which contains in RGB format are readily stored in a matlab software.This color features represents intensity value in the image matrix. Counting the number pixels in each bin is done by color histogram.A wavelet transform is implemented by a three dimensional input image is converted into two dimensions.in this work a Daubechies wavelet method is used.

B.Formulas for Similarity Distance Metrics :

Mahalanobis distance
Mahalanobis distance dtermines similarity of an umknown sample set to a known one.
Formula for mahalanobis distance is

$$D_M(x) = \sqrt{(x-\mu)^T S^{-1} (x-\mu)}.$$

Where $x = (x_1, x_2, x_3, \ldots, x_N)^T$ is a multivariate vector $\mu = (\mu_1, \mu_2, \mu_3, \ldots, \mu_N)^T$ is a mean and S is a covariance matrix .

Swain and Ballard [6] proposed a color histogram intersection. The intersection of histograms p and q is given

$$D(p,q)=\frac{\sum_A\sum_B\sum_C \min((p(m,n,o),(m,n,o))}{\min(|p|,|o|)}$$

where |p| and |q| present magnitude of each histogram,which is equal to the number of samples[4].

Correlation is a statistical technique,which can show whether and how strongly pair of variables are related[7]. Given two vectors **m** and **n** where **m** = (m1, m2, m3,..., mn) and **n**= (n1,n2,n3,…,nn). Correlation can be defined by

$$m.n=\sum_{i=1}^{n} mini=m1n1+m2n2+..._mnnn$$

The result of correlation is correlation coefficient("r"). Its range is between -1.0 and +1.0. The closer r is to +1 to-1 means results are related. Uf r is near to 0,it means there is no relationship between the variable.

III. EXPERIMENTAL RESULTS

The proposed method has been implemented in matlab software and run on a desktop computer.The modified CBIR work obtains the good result than the proposed method.Twenty-one images from class "blood cells" were used in this work.all images are retrived by using all four retrieval methods.The ten retrived images displaying in GUI.Here caluculating Precision , Recall and Retrieval Time.Table 1 shows the result of Recall.It measures how well the CBIR system finds all relevant images in a search for a input images[8].

TABLE 1 RECALL

Retrieval Methods	Recall Rate
Histogram Mahalanobis Distance	15.26%
Color Histogram Intersection	6.22%
Wavelet- Correlation	8.93%
Wavelet Mahalanobis Distance	7.02%

Tabel 2 shows the result of Precision . It can be use for describing the accuracy of CBIR systems in finding relevant image to input image[8].

TABLE 2 PRECISION

Retrieval Methods	Precision
Histogram Mahalanobis Distance	34.32%
Color Histogram Intersection	14.32%
Wavelet-Correlation	21.33%
Wavelet Mahalanobis Distance	71.02%

TABLE 3 RETRIEVAL TIME

Retrieval Methods	Average Time(seconds)
Histogram Mahalanobis Distance	2.355
Color Histogram Intersection	2.52361
Wavelet-Correlation	26.98832
Wavelet Mahalanobis Distance	28.11235

Results shows that Histogram Mahalanobis Distance performed the best precision 34.32% and recall rate 15.26%.Color Histogram Intersection shows the worst.Histogram Mahalanobis Distance had better performancein this experiment. A wavelet based methods are slower than color based method.Histogram mahalanobis distance provides very good result in human perception point.

IV. CONCLUSION

Our investigations provided an insight to performance and efficiency of color and wavelet-based texture descriptor in blood cells domain.from this paper number of novel methods are implement for wavelet analysis. Moreover, feature of searching by nearest disease class is propounded. In this work a mahalanobis distance is calculated which shows the best result.Capability of this system can be extended by introducing usage of different distances can be calculated at a time like canberra,manhattan distances.

REFERENCES

[1] F. H. Long, H. J. Zhang and D. D. Feng, "Fundamentals of content-based image retrieval," in *Multimedia Information Retrieval and Management – Technological Fundamentals and Applications*, 2003, pp. 1-26.
[2] A. Irfan, P.S., Hailiza Kamarulhaili, Automated Contentbased Image Retrieval using Wavelets, in International Conference on Computational Intelligence 2004. p. 290 –293.
[3] Sheikh H., B.Z., Micheli-Tzanakou E. . Blood cell identification using neural networks. in Bioengineering Conference. 1996: IEEE Twenty-Second Annual Northeast.
[4] Jeong, S. Histogram Based Image Retrieval,. 2001[cited 10 paril 2007]; Available from: http://scien.stanford.edu/class/psych221/projects/02/sojeong/Last.
[5] Siddique, S., A Wavelet Based Technique for Analysis and Classification of Texture Images. 2002, Carleton University:ottawa.
[6] M. J. Swain, D.H.B., Color indexing. InternationalJournal of Computer Vision, 1991. **7**(1): p. 22.
[7] Rong Zhao , W.I.G., Bridging the semanitic gap in imageretrieval. Distributed multimedia databases: techniques & applications T. K. Shih (Ed.), Idea Group Publishing, Hershey , Pennsylvania, 2001: p. 23.
[8] H. Wei, C.-T.L., R. Wilson, A content-based approach tomedical image database retrieval. Database Modeling for Industrial data Management: Emerging Technologies and Applications, Idea Group Publishing: Hershey, PA, USA, 2006: p. 34.