Retrieval Of Digital Images Using Texture Feature With Advanced Genetic Algorithm

Shafimirza
Head of the dept
Electronics and Communication Engineering
Malineni Lakshmaiah Women's Engg. College
Guntur,Andra pradesh

Dr.J.Apparao
Principal
Malineni Lakshmaiah Women's Engg. College
Guntur,Andra Pradesh

Abstract— This paper proposes an image retrieval method based on multi-feature similarity score fusion using genetic algorithm. In recent years, research and development in the content-based image retrieval has mainly focused n image features, such as color, shape, texture and spatial relationships. In addition, many content-based image retrieval systems and methods have been developed for various applications, such as geographic information systems and medical image databases. The most widely used collection of features is image texture which is used in techniques for texture analysis. describe a texture set approach for indexing in order to extract spatially localized texture information. They are image retrieval based on color feature, texture feature and fusion of color-texture feature similarity score with equal weights. The experimental results show that the proposed method is superior to other methods

Keywords **: image retraival,glcm,ccm, advancedGA.**

I.INTRODUCTION

Image retrieval techniques are useful in many image-processing applications. Content-based image retrieval systems work with whole images and searching is based on comparison of the query. General techniques for image retrieval are color, texture and shape. These techniques are applied to get an image from the image database. They are not concerned with the various resolutions of the images, size and spatial color distribution. Hence all these methods are not appropriate to the art image retrieval. Moreover shape based

retrievals are useful only in the limited domain. The content and metadata based system gives images using an effective image retrieval technique. Many other image retrieval systems use global features like color, shape and texture. But the prior results say there are too many false positives while using those global features to search for similar images. Hence we give the new view of image retrieval system using both content and metadata.

1.1 Image Data Management:

The process of digitization does not in itself make image collections easier to manage. Some form of cataloguing and indexing is still necessary – the only difference being that much of the required information can now potentially be derived automatically from the images themselves. The extent to which this potential is currently being realized is discussed below.

The use of images in human communication is hardly new – our cave-dwelling ancestors painted pictures on the walls of their caves, andthe use of maps and building plans to convey information almost certainly dates back to pre-Roman times. But the twentieth century has witnessed unparalleled growth in the number, availability and importance of images in all walks of life. Images now play a crucial role in fields as diverse as medicine, journalism, advertising, design, education and entertainment

. After examining the issues involved in managing visual information in some depth, the participants concluded that images were indeed likely to play an increasingly important role in electronically- mediated communication. However, significant research advances, involving collaboration between a numbers of disciplines, would be needed before image providers could take full advantage of the opportunities offered. They identified a number of critical areas where research was needed, including data representation, feature extractions and indexing, image query matching and user interfacing. One of the main problems they highlighted was the difficulty of locating a desired image in a large and varied collection. While it is perfectly feasible to identify a desired image from a small collection simply by browsing, more effective techniques are needed with collections containing thousands of items. Journalists requesting photographs of a particular type of event, designers looking for materials with a particular color or texture, and engineers looking for drawings of a particular type of part, all need some form of access by image content. The existence – and continuing use – of detailed classification schemes such as ICONCLASS [Gordon, 1990] for art images, and the Opitz code [Opitz et al, 1969] for machined parts, reinforces this message

1.2 Problem Statement:

The primary goal our project is to reduce the computation time and user interaction. The conventional Content Based Image Retrieval (CBIR) systems also display the large amount of results at the end of the process this will drove the user to spend more time to analyze the output images. In our proposed system we compute texture feature and color feature for compute the similarity between query and database images. This integrated approach will reduce the output results to a certain levels based on the user threshold value. The secondary goal is to reduce semantic gap between high level concepts and low level features. Generally the content based image retrieval systems compute the similarity between the query image and the database images. Hence there might be chances for unexpected results at the end the retrieval process.

The novel clustering technique cluster the output images and select one representative image from each clusters. A third goal is to evaluate their performance with regard to speed and accuracy. These properties were chosen because they have the greatest impact on the implementation effort. A final goal has been to design and implement an algorithm. This should be done in high-level language or Matlab. The source code should be easy to understand so that it can serve as a reference on the standard for designers that need to implement real-time motion detection.

1.3 What is CBIR?

The earliest use of the term *content-based image retrieval* in the literature seems to have been by Kato [1992], to describe his experiments into automatic retrieval of images from a database by colour and shape feature. The term has since 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

II. EXTRACTION OF IMAGE FEATURE

The image content is mainly embodied in colour, texture and shape etc. The colour feature, texture feature and shape feature describe the image content from different angle. More features will provide more information on the image content. This paper focuses on fusion method of multifeature similarity score. For convenience, this paper only discusses the fusion method of two-feature similarity score.

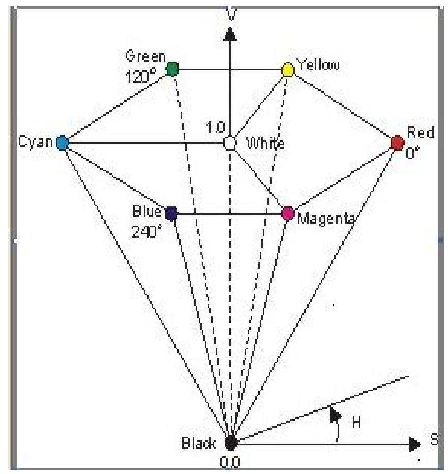

Figure 1. Module wise Block Diagram

HSV color space must first be quantified. According to human cognitive about color, three components of HSV space are quantified in non-uniform manner. Hue is quantized into 16 bins and is among [0, 15]. Saturation is quantized into 4 bins and is among [0, 3]. Value is quantized into 4 bins and is among [0, 3]. Among those three components, human cognitive about color is mainly based on hue, and then saturation, finally value. So, quantized results

2.1 Color feature extraction

HSV color model forms a uniform color space, which uses a linear gauge. The perceived distance between colors is in proportion to Euclidean distance between corresponding pixels in HSV color model, and conforms to eye's feeling about color. So it is very suitable for color based image similarity comparison. In this paper, the color histogram in HSV color space is taken as the color feature describing image content. For calculating color histogram in HSV color space, HSV color space must first be quantified. According to human cognitive about color, three components of HSV space are quantified in non-uniform manner. Hue is quantized into 16 bins and is among [0, 11]. Saturation is quantized into 4 bins and is among [0, 3]. Value is quantized into 4 bins and is among [0, 3]. Among those three components, human cognitive about color is mainly based on hue, and then saturation, finally value. So, quantized results are coded as

F=16H+4S+V

F is a integer between 0 and 255. Thus the color feature can be obtained by calculating histogram of an image in HSV space

III.TEXTURE FEATURE EXTRACTION

3.1 Texture feature extraction based on GLCM

GLCM creates a matrix with the directions and distances between pixels, and then extracts meaningful statistics from the matrix as texture features.[8] GLCM texture features commonly used are shown in the followingGLCM is composed of the probability value, it is defined by $P(i, j\ d, \theta)$ which expresses the probability of the couple pixels atθ direction and d interval. When θ and d is determined, $P(i, j\ d, \theta)$ is showed by $P i, j$. Distinctly GLCM is a symmetry matrix; its level is determined by the image gray-level. Elements in the matrix are computed by the equation showed as follow

$$P(i, j|d, \theta) = \frac{P(i, j|d, \theta)}{\sum_i \sum_j P(i, j|d, \theta)}$$

GLCM expresses the texture feature according the correlation of the couple pixels gray-level at different positions. It quantification ally describes the texture feature. In this paper, four features is selected, include energy, contrast, entropy, inverse difference

Energy E= $p(x, y)$^2

It is a gray-scale image texture measure of homogeneity changing, reflecting the distribution of image gray-scale uniformity of weight and texture

Contrast I = ΣΣ(x − y)2 p(x, y)

Contrast is the main diagonal near the moment of inertia, which measure the value of the matrix is distributed and images of local changes in number, reflecting the image clarity and texture of shadow depth. Contrast is large means texture is deeper.

Entropy S= ΣΣ p(x, y) log p(x, y)

Entropy measures image texture randomness, when the space co-occurrence matrix for all values are equal, it achieved the minimum value; on the other hand, if the value of co-occurrence matrix is very uneven, its value is greater. Therefore, the maximum entropy implied by the image gray distribution is random.[9]

Inverse difference H= ΣΣ (1/(1+(x-y)^2)*P(x,y) It measures local changes in image texture number. Its value in large is illustrated that image texture between the different regions of the lack of change and partial very evenly. Here p(x, y) is the gray-level value at the coordinate (x, y)

3.2 Feature extraction based on CCM

Assuming color image is divided into $N * N$ image sub-block, for anyone image sub-block T(i, j) $(1 \le i \le N, 1 \le j \le N)$, using the main color image extraction algorithm to calculate the main color C(i, j) . For any two 4-connected image sub-block T(i, j) and T(k ,l) (i − k =1 and j = l ; or j − l = 1 and i = k) , if its corresponds to the main color and in the HSV space to meet the following condition.

a. Cj And Ci belong to the same color of magnitude, that is, its HSV components hi = hj , si = s j , vi = v j ;

b. Cj And Ci don't belong to the same color of magnitude, but satisfy si ∗ 3 + vi = s j ∗ 3 + v j , and hi − hj = 1; or satisfy hi = hj , si = s j and vi , v j ∈{0,1} . We can say image sub-block T(i, j) and T(k ,l) are color connected. According to the concept of color-connected regions, we can make each sub-block of the entire image into a unique color of connected set S = {Ri}$(1 \le i \le M)$ in accordance with guidelines 4-connected The set S corresponds to the colour-connected region. For each colour-connected region$\{Ri\}(1 \le i \le M)$, the colour components R, G in RGB colour space and H in HSV colour space are respectively extracted the CCM at the direction δ = 1;θ = 0° ,45° ,90° ,135° . The same operation is done with I (intensity of the image). The statistic features extracted from CCM are as follows

Energy E=Σ Σ m (i,j)^2

Contrast I = $(i - j)$^2 $m(i, j)$

Entropy S = −ΣΣ m(i, j) log[m(i, j)]

if $m(i, j) = 0$, $\log[m(i, j)] = 0$

Inverse difference H = m(i, j)/(1+(i-j)^2)

Through this method, we can get a 16 dimensional texture feature for component R, G, H and I, each component correspond to four statistic values E, I, S and H. F=[FR,FG,FH,FI]=[fRE,fRI,fRS,fRI,…,fIE,fII,fIS,fIH]

IV.FUSION USING ADVANCED GENETIC ALGORITHM

During the course of similarity score fusion, a key problem is how to assign the weights of similarity score. It affects directly the retrieval performance of the system. It can be considered as an optimization problem to assign reasonably the weights of color feature similarity score and texture feature similarity score. That is to find the optimum in weight value space. So, this problem can be resolved by genetic algorithm. This paper proposed a similarity score fusion method using genetic algorithm. With genetic algorithm the weights of color feature similarity score and texture feature similarity score are assigned optimally

4.1 Population Initialization

In genetic algorithm, the number of individuals in population and the initial values of the individuals will influence the solution greatly. In this paper, the number of individuals in population *N* is taken as *I* . *N* is set a bigger value, the aim of which is to gain the optimal solution quickly. The individuals are initialized as follows.[5] The solution space is divided into *N* equal portions, the centers of which are taken as the initial values of the individuals[10]

4.2 Determination of fitness function

The fitness of individuals can be evaluated as follows. According to the weights *C W* and *T W* of *N* individuals, we can get *N* groups of image retrieval results. For every group, the top *M* images are considered. Total number of images is *MN* . By calculating occurrence frequency of images of every group in all images, the fitness of every individual is evaluated. Specific operations are as follows.

Let ikj N denote if kth image ik A of ith group i G is in jth Group j G or not. That can be formulated as

N(i,j)={1 & 0

Where A(i,j) belongs to Gj

Where A(i,j)not belongs to Gj

Then the occurrence frequency of kth image ik A of ith group i G in all MN images is

N(i,k)= **Σ N(ijk)**

The occurrence frequency of all images of *i*th group *G* in all *MN* images is

N(i)= **Σ N(ik)**

The normalized version of it is

P(i) *= N(i)/* **Σ** *N(i)*

The bigger *i P* indicates that the images in *i*th group *i G* possess a high proportion in all *MN* images, and the solution is considered a good one. In this paper, it is taken as fitness function.[7] The bigger *i P* indicates that the images in *i*th group *i G* possess a high proportion in all *MN* images, and the solution is considered a good one. In this paper, it is taken as fitness function. maximum *P** = max *Pi* is taken as the optimal solution. According to the optimal solution the weights *Wc* and *Wt* are assigned, then the image retrieval results with these two weights are taken as the ultimate retrieval results

V.EXPERIMENT AND ANALYSIS

In this paper, experimental data set contains 1000 images from Corel database of images, divided into 10 categories, each category has 100 images.[6] Experimental images covers a wealthy of content, including landscapes animals, plants, monuments, transport (cars, planes) and so on. Selection of each type in the 80 images as training samples, 20 samples for testing. In section 3, we study two kinds of feature extraction techniques: feature extraction techniques based on the HSV color space and texture feature extraction technology.[5] At texture feature extraction techniques, we introduce two different extraction methods the gray co-occurrence matrix and CCM. Color and texture are just in part describing the characteristics of images. Image database varies some images dramatic ups and downs in gray-level, showing a very strong texture characteristic, and some images from a number of smooth but the colors are different regional composition.

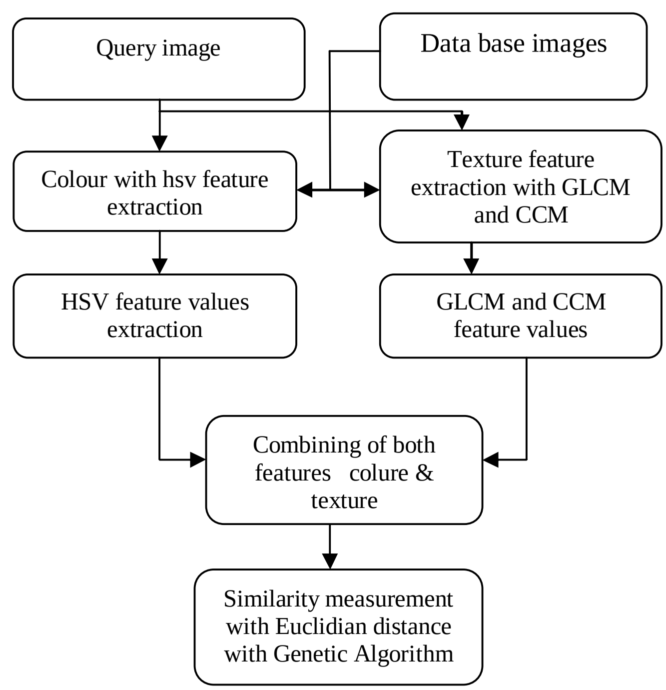

Figure 2. Algorithm schematic diagram

Only simple features of image information can not get comprehensive description of image content. We consider the color and texture features combining not only be able to express more image information, but also to describe image from the different aspects for more detailed information in order to obtain better search results. Retrieval algorithm flow is as follows

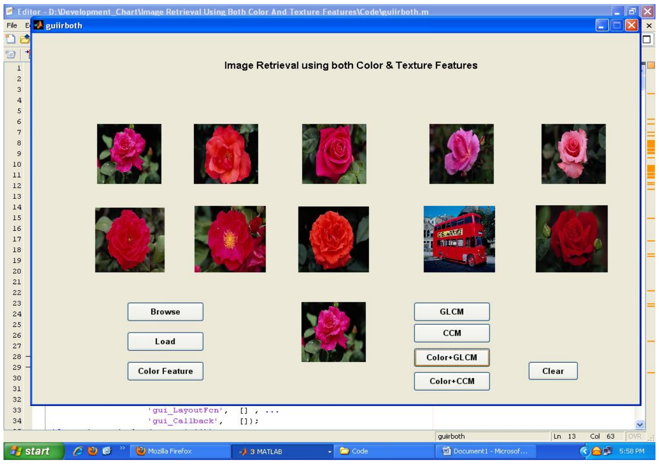

Figure 3. GLCM Algorithm scheme

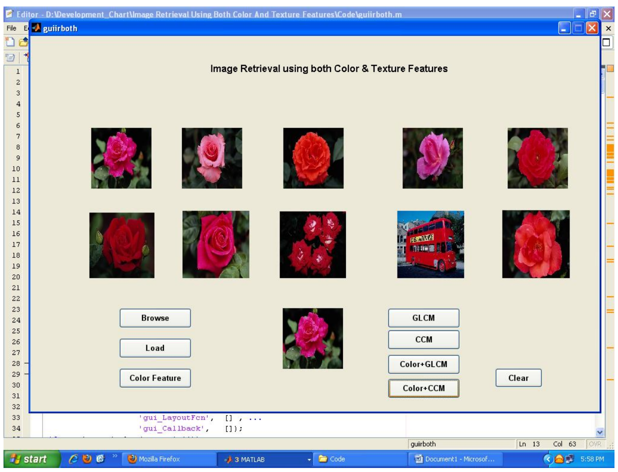

Figure 4. CCM Algorithm scheme

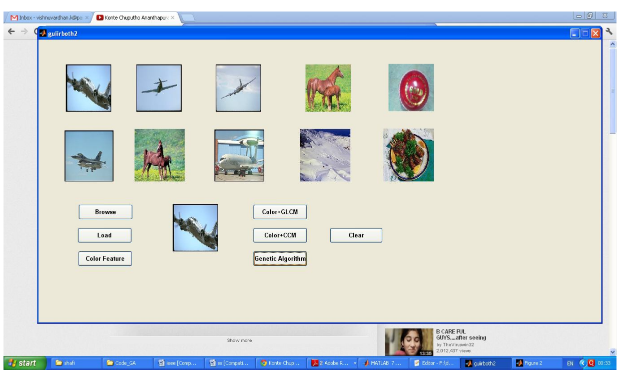

Figure 5. Genetic algorithm scheme

Corel image library is used to evaluate the proposed algorithm. It contains dozens categories, each of which has about 60 images. The total number of images is about 1000. They are flower, waterfowl, automobile, beach, mountain, loin, bridge, butterfly, plane, building and tiger and so forth.

VI.CONCLUSION

This paper proposed an image retrieval method based multi-feature similarity score fusion. For a query image, multiple similarity score lists based on different features are obtained. Then using genetic algorithm, multi-feature similarity scores are fused, and better image retrieval results are gained. In this paper, when we evaluated the fitness of an individual, we considered only the occurrence frequencies of an image in retrieval result, and not the location of an image in retrieval result. However, the location of an image in retrieval result reflects directly the similarity of it and query image. So, this factor should be taken into account when evaluating the fitness of an individual, which is also our future work.

Retrieval result contrast

Retraival algorithm	Recall	precision
Colour	24.2	37.9
Glcm+ccm	27.6	40.3
GA	30.4	45.2

This paper presents an approach based on HSV colour space and texture characteristics of the image retrieval. Through the quantification of HSV colour space, we combine colour features and gray- level co-occurrence matrix as well as CCM separately, using normalized Euclidean distance classifier. Through the image retrieval experiment, indicating that the use of colour features and texture characteristics of the image retrieval method is superior to a single colour image retrieval method, and colour characteristics combining colour texture features for the integrated characteristics of colour image retrieval has obvious advantages retrieval. Apart from reflecting the CCM texture features, it also reflects the composition of its colour, and improve the performance of image retrieval has important research value.

REFERENCES

[1] Rui,Y.,Huang,T.S.,Mehrotra,S. [Shared],"Retrieval with relevance feedback in MARS", In Proc of the IEEE Int'1 Conf. on Image Processing, New York, pp. 815-818, 1997.

[2] H. T. Shen, B. C. Ooi, K. L. Tan, "Giving meanings to www images" Proceedings of ACM Multimedia, pp. 39-48, 2000.

[3] B S Manjunath, W Y Ma, "Texture feature for browsing and retrieval of image data",IEEE Transaction on PAMI, Vol 18, No. 8, pp.837-842, 1996.

[4] Y. Rui, C. Alfred, T. S. Huang, "Modified descriptor for shape representation, a practical approach",In:Proc of First Int's workshop on Image Database andMultimedia Search, 1996.

[5] Cao LiHua, Liu Wei, and Li GuoHui, "Research and

[6] H. Yu, M. Li, H.-J. Zhang, J. Feng, "Color texture moments for content-based image retrieval," In International Conference on Image Processing, pp. 24-28, 2002.

[7] Anil K. Jain , Aditya Vailaya, "Image retrieval using color and shape," Pattern Recognition, vol. 29, pp. 1233-1244, 1996.

[8] Xiuqi Li, Shu-Ching Chen, Mei-Ling Shyu, Borko Furht, "Image Retrieval By Color, Texture, And Spatial Information," In: Proceedings of the the 8th International Conference on Distributed Multimedia Systems (DMS 2002), San Francisco Bay, CA, USA, pp. 152–159 , 2002.

[9] I. Markov, N. Vassilieva, "Image Retrieval: Color and Texture Combining Based on Query-Image," ICISP 2008, LNCS 5099, Springer-Verlag Berlin Heidelberg, 2008, pp. 430–438.

[10]. D. Dori. Unifying system structure and behaviour through object-process analysis. Journal of Object-Oriented Analysis, July-August:66{73, 1996.

[11.]D. Dori and M. Goodman. From object-process analysis to object-process design. Annals of Software Engineering, 2, 1996.