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A Comparative study and evaluation on various Content based Image Retrieval Methodologies

Lata Kuldeep
Computer Technology & application
Dept. of CSE, SSGI, SSTC
Bhilai , C.G., India
latakuldip@gmail.com

Shreya Jain
Assistant Professor
Dept. of CSE, SSGI, SSTC
Bhilai , C.G., India
shreyajain.0312@gmail.com

Abstract— The digital image data has tremendous growth in amount, quantity and heterogeneity. The conventional information retrieval techniques does not gratify the user's demand, so an efficient system is require to develop for content based image retrieval. The content based image retrieval are comely very useful for the purpose of exact and fast retrieval of different images. The problem of content based image retrieval is based on generation of distinctive query. The low level visual content features of query image that is color, texture, shape and spatial location is used for retrieving image . These distinct features of images are extracted and executed for a equivalence check among images. In this paper, First we analysis the visual content description of image and then the elementary schemes use for content based image retrieval are considered. We also inscription the comparison between query image and target image of large data base accompanied by the indexing scheme to retrieve the image. Objective of this research paper is to select the best methods which having the better retrieval rate when image is retrieve from the large database for the aspect level of the image analysis. A brief overview of CBIR methods has been introduced which is depend on Grey level co-occurrence matrix and is used for the selection of distinctive features.

Keywords— CBIR, Image Feature Extraction, Image Analysis, Image Retrieval, Feature selection ,Grey level co-occurrence matrix, similarity measurement.

INTRODUCTION

Content-based image retrieval (CBIR), also define as query by image content (QBIC) and content-based visual information retrieval (CBVIR) is the approach of computer vision techniques to solve the problem of image retrieval ,it deal with the complication of discerning for digital images in huge databases . Content-based image retrieval is conflicting to concept-based approaches. In CBIR there are different methods that combines color, texture and shape on the basis of the feature extraction and representation for image retrieval [1][2]."Content-based" represent that the search examine the contents of the image alternative than metadata such as keywords, tags, or descriptions affiliated with the image. The terminology "content" in this context might indicate colors, textures, shapes, or any different fact that can be obtain from the image virtually. Different CBIR systems have adopted different techniques .Few of the techniques have used Low Level Features for Content Based Image Retrieval [3].

LITERATURE REVIEW

In this paper, a new technique of fusion visual attention model to segment and remove the ROI from an image and then use the product for image retrieval purposes. The main profit of this concept lies in the improvement of the performance of this retrieval strategy in terms of two parameters: Precision and Recall. Visual attention model has also verified to be extremely useful in segmenting the image and removing the Region of Interest (ROI) with less number of unwanted pixels. The use of Visual Attention model has also been fruitfully implemented for Image retrieval Purposes. It has been discovered that the performance parameters of the retrieval system is enhanced due the incorporation of visual attention. The existing drawback of one performance parameters being enhanced at the cost of the other has also been invalidate with both parameters being discovered to be more or less same and of high value[4].In this paper attempts to provide a complete survey of the recent technical achievements in high-level semantic-based image retrieval. In this different condition including low-level image feature extraction, correlation measurement, and deriving high-level semantic features. It identify five major section of the state-of-the-art techniques in narrowing down the 'semantic gap': (1) using object ontology to represent high-level concepts; (2) using machine learning methods to accomplish low-level features with query

concepts; (3) using relevance feedback to review users' intention; (4) generating semantic template to guide high-level image retrieval; (5) fusing the evidences from HTML text and the content of images for WWW image retrieval .As a result Extensive experiments on CBIR systems determine that low-level image features cannot consistently describe high-level semantic concepts in the users 'attention. It is believed that CBIR systems should gave maximum support in bridging the 'semantic gap' among low-level visual features and the richness of human semantics[5].In this paper , an image retrieval scheme that is depend on the concept of Maximum RGB color correlation index among images with promising results are given. The algorithm is easy to appliance. The data were evaluate by means of percentage average precision and recall . The results describe that this method can be used to make appropriate retrieval decision and has a maximum precision and recall rate. The introduce image retrieval system has a large detection rate with RGB parallel index. This method is advanced image retrieval model which maximum precision rate for high disclosure. However, The images must were resized before enumerate the correlation of them. There were compressed to the matrices of the similar size. Cause in difference sizes of similarity images, search times were increase[6]. In this paper a CBIR method is introduced which is based on the performance analysis of different distance metrics using the quantized histogram statistical texture features in the DCT domain. Exclusive the DC and the first three AC coefficients having more powerful energy are selected in each DCT block to get the quantized histogram statistical texture features. The correlation measurement is performed by using seven distance metrics. As results are analyzed on the basis of seven distance metrics independently using different quantized histogram bins such that the Euclidean distance has better efficiency in computation and effective retrieval in 32 bins quantization. This has good performance in terms of precision and F-Score [7]. In this paper , a framework which is able to select the most applicable features to analyze newly received images thereby improving the retrieval accuracy and efficiency. An refined algorithm is proposed here. The fuzzy C-means algorithm (FCM) constitute of designing feature vectors after segmentation which will be used in correlation comparison among query image and database images. The introduced algorithm has been tested on various different real images and its performance is seen to be quite satisfactory when compared with the achievement of conventional rules of content based image retrieval [8]. In this paper, a performance analogy is done on different image transforms related Wavelet transform, Haar transform Fourier transform, Walsh-Hadamard transform and discrete cosine transform using a fuzzy similarity range . This method is suitable to just 2D shapes. It is seen that presenting to retrieval performance Wavelet transform gives the first class result with respect to average precision and recall values encompassed by the transforms used in comparison. It has greater recall and precision values and greater crossover point [9]. To improve proficiency of compressed image retrieval, it define a novel statistical feature extraction algorithm to represent the image content precisely in its compressed domain. The statistical feature extracted is primarily through computing a set of moments straight from DCT coefficients without associating full decompression or inverse DCT. Ensuing the algorithm design, a content-based image retrieval system is designed especially targeting retrieving joint picture expert group compressed images .Results show that the system is almost invariable to translation, scaling and rotation transforms, while excellent retrieval certainty and effectiveness is achieved[10]. In this paper an approach is introduced for CBIR in which the statistical texture features are removed from the quantized histograms in the DCT domain. Exclusively the DC and the first three AC coefficients having more powerful energy are selected in each DCT block to access the statistical quantized histogram texture features. The approach is operate in two steps: In the first step, the inquiry of the results of the different combinations of the statistical quantized histogram texture features is operated for the optimum feature consolidation. Results show that the aggregate of more features gives improved results as compared to a single feature or a small number of the texture features aggregation. In the second step, the comparison of the various quantization bins is performed using the excellent and the optimum texture features consolidation. It concluded that the aggregation of more statistical texture features and the quantization of 32 bins for the ideal combination of features give good enforcement in terms of precision in the DCT domain for the compressed JPEG images[11]. In this Paper, a Multi feature model for the Content Based Image Retrieval System by connecting the color Histogram, Color Moment, texture, and edge Histogram descriptor are needed and the Euclidian distances are estimated of the every features are added and the averages are made .The image contents analyzed in this work are by using computer vision and image processing algorithms. For color the histogram of images are figured, for texture co-occurrence matrix based on entropy, energy, etc., are calculated and for edge density it is Edge Histogram Descriptor (EHD) that is computed. For retrieval of images, the averages of the four techniques are made and the outcome image is retrieved. The results are quite excellent or most of the query images and it is possible to further enhance by fine tuning the threshold and adding relevance feedback [12].

PROBLEM IDENTIFICATION

As the size of digital information grows aggressively, large volumes of raw data essential to be extracted. Nowadays, there are several methods to personalize and manipulate data according to our needs. The most frequent method is to use Image Mining. Image Mining has been used in previous years for extracting accurate, valid, and potentially useful knowledge from large volumes of raw data .The extracted knowledge must be accurate, readable, intelligible, and ease of responsive. Image mining has been used in most new inter-

disciplinary area such as database, visualization, artificial intelligence statistics, parallel computing and other fields. However, with the appearance of massive image databases, the classical manual and image based search experience from the following limitations:

Time Complexity: Manual annotations desire too much time and are excessive to implement. As the number of images in a database extends, the difficulty in finding desired images expand. It is not achievable to manually annotate all attributes of the image content for huge number of images.

Divergence of subjective perception: Manual annotations fail to deal with the **d**ivergence of subjective perception. The slogan, "an image says extended than a thousand words," implies a Content-Based method to Image Database Retrieval that the textual definition is not sufficient for depicting abstract perception. Typically, an image usually involve several objects, which dispatch specific information. To gather all knowledge, concepts, thoughts, and perception for the content of any images is almost impossible.

Image collection: There is some complication in the image collection. If the illumination situation for each image is given, color balancing may be executed in the pre-processing step, in order to decrease the impact of mismatched color balance among the query and Train Database images.

Feature extraction: Its deal with the complication that it has only some descriptive guideline were chosen to characterize the homogeneity contents of images. In the future, many other guidelines of descriptive statistics can be needed. Along with this we can apply dimension decrease on extracted features to satisfy the retrieval time as the size of the database is expanded.

METHODOLOGY

DCT block transformation:

In this ,first the RGB color image is transformed into gray scale image to decrease the computations because it contains of only a single plane while the RGB image contain of three planes: red, green and blue and each composed is a two dimensional matrix of pixel values from 0 to 256. Due to this issue the RGB color image is transformed into gray scale which is a single component of 0 to 256 pixel values to decrease the computation cost. The gray scale image is divided into simple non-overlapping 8 × 8 blocks. Then all these blocks are translate into DCT blocks in the frequency domain [7]. Each piece is in a 2-dimensional matrix. The 2-geometric DCT of a block of the size M× M for a ,b =1,2,. . .. .,M, can be formulated as:

$$F(i,j)=\frac{1}{\sqrt{2M}}c(i)c(j)\sum_{a=1}^{M}\sum_{b=1}^{M}f(a,b)\cos\left[\frac{(2a+1)i\pi}{2M}\right]\times\cos\left[\frac{(2b+1)j\pi}{2M}\right] \quad (1)$$

$$c(i)=\begin{cases}\frac{1}{\sqrt{2}} & if\ i=0\\ 1 & if\ i>0\end{cases} \quad (2)$$

where F(i, j) is the transformed block, f(a, b) is the element of the block and M is the size of the block. The first uppermost DCT coefficient in the DCT block is F(0, 0) in (1); it is the average intensity value of a block and it is also called the DC coordinate or energy of the block. The other coordinate of the DCT blocks are called AC coefficients, which correspond to the various frequencies .After the DCT translation, the DC coordinate of all the blocks and the first three AC coordinate are chose in a zigzag order as shown in fig 1.

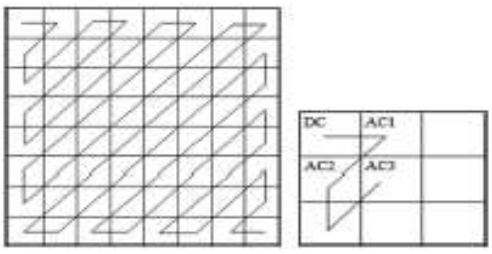


Fig 1**:** 8 × 8 DCT block coefficients in zigzag order

Wavelet Transform:

Wavelet is used to dissolve a signal. The practical application of wavelet compression arrangement is similar to sub band coding arrangement. As in the case of sub band coding, we dissolve the signal using filter banks. The results of the filter banks are down sampled, encoded and quantized .The decoder decodes the coded illustration, up samples and disintegrate the signal using a synthesis filter bank. Figure.2. shows sub band dissolution. We begin with an N×M image. We filter individual row and then down sample to achieve two N×M/2 images. We then refine individual column and sub sample the filter output to achieve four sub images , the one achieved by low-pass filtering the rows and columns is indicate to as the LL image, the one achieved by low – pass filtering the rows and high pass refining the columns is indicated to as the LH image, the one indicated by high-pass refining the rows and low- pass refining the columns is called the HL image and the sub image achieved by high-pass refining the rows and columns is indicated to as the HH image. Each of the sub images obtained in this pattern can then be refined and sub sampled to achieve four more sub images. This process can be remain until the desired sub band structure is achieve [13].

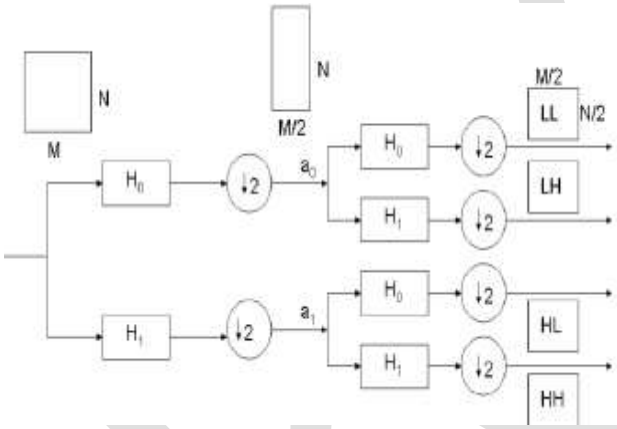


Fig 2: Sub band decomposition of an N×M Image

Laplacian Pyramid:

The Laplacian Pyramid is dissolution of the authentic image into a ranking of images. Figure 3 shows the dissolution of an image into its Laplacian Pyramid statement. The authentic image is at the upper left corner. The images instantly below and to the right of the authentic image are the coarse and schedule signal respectively resulting from the first level of dissolution of the authentic image. The images adjacent to and under the improper signal of the first level of dissolution are the detail and improper signals respectively of the second level dissolution [13].

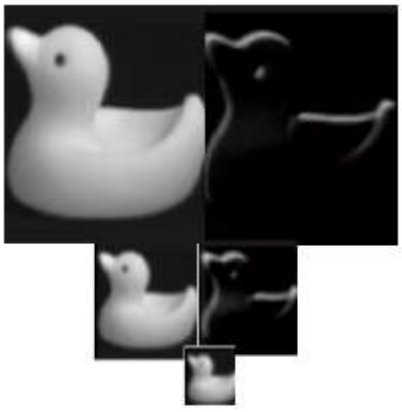
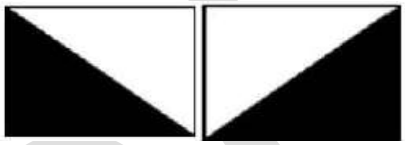


Fig 3: Laplacian Pyramid Decomposition

Gabor filters:

They are widely used for texture resolution because its similar characteristics with human concept. A two dimensional Gabor function f(x ,y) consists of a sinusoidal plane wave of some frequency and coordination , regulated by a two dimensional translated Gaussian enclosure. Gabor Filter have one mother filter using that other filter banks are developed and their features are estimated and stored in database. Structure of distinct types of Edges [14].

(a)Vertical edge (b) Horizontal edge



(c)135 degree edge (d)45 degree edge

(e)Non directional edge

Fig.4: Different types of edges

Steerable Pyramid:

The Steerable Pyramid originate a multi-scale, multi-directional illustration of the image. The image is disintegrate toward low-pass sub-band and high-pass sub-band and dissolution is iterated in the low-pass sub-band. The Steerable Pyramid decomposition is identical to the two-dimensional discrete wavelet transform although with directional sub bands [13].
Steps to exclusive features from a color image by applying Steerable Pyramid are as follows:
1. This approach first resizes the image to 128 ×128. Then partition the image into R, G, and B element.

2. Assign the low pass filter and high pass filter on each element (R, G, and B).

3. The low frequency part is the most supreme part of the signal. High frequency element contains less information as correlated to low frequency element. Hence, the output of the low pass filter collected from the first stage can be down sampled by a factor of 2. The procedure of filtering and down sampling can be imitated to get a multi-level decomposition.

4. Then directional sub bands (8 Nos.) are accessed from the output of low pass filter of each step.

5. Enumerate the features such as mean and standard deviation of directional sub bands of query image along with images in the database. Then Normalized Euclidean Distance [7] is used to enumerate the similarity measure amidst query image and images from the database.

CONCLUSION

From the literature survey it is achieved that a wide variety of CBIR techniques have been planned in different papers. The election feature is one of the supreme aspects of Image Retrieval System to better acquisition user's intention. It will exhibit the images from database which are the further interest to the user. The principle of this survey is to provide an outline of the performance of content based image retrieval systems. Most systems need color and texture features, few systems need shape feature and still less need design features. Fusion of distinct techniques of CBIR has been used broadly in various areas to enhance the performance of the system and to accomplish better results in distinct applications.

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