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A EFFECTIVE CONTENT BASED IMAGE RETRIEVAL SYSTEM BASED ON FEATURES AND TECHNIQUES

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ABSTRACT— Image retrieval has been popular for several years. This paper propose a generalized query method of content based image retrieval system **(CBIR)** by using the several features and technique [1] i.e. color, texture, shape and **GLCM**, and also content based image retrieval system based on the combination of local and global features. The local features used are Bi-directional Empirical Mode Decomposition **(BEMD)** technique for edge detection and Harris corner detector to detect the corner points of an image. The global feature used is **HSV** color feature. The results show the CBIR systems performs well in the training and using a query method which increases the system searching ability and also using this combination of color, texture and shape is better as obtaining output with a several feature and technique and significant improvement in the retrieval accuracy.

Keywords: CBIR, Feature Extraction, Edge Detection Technique, Harris Corner Detector.

I. INTRODUCTION

Image retrieval is the processing of searching and retrieving images from a huge dataset. For centuries, most of the images retrieval is text-based which means searching is based on those keyword and text generated by human's creation.[2] The text-based image retrieval systems only concern about the text described by humans, instead of looking into the content of images. In order to overcome these drawbacks, content based images retrieval (CBIR) was first introduced by Kato in 1992.

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The term, CBIR, is widely used for retrieving desired images from a large collection, which is based on extracting the features (such as color, texture and shapes) from images themselves. We provide a description of the Optimized Content Based Image Retrieval model with texture feature extraction is done using GLCM, a content based image retrieval system based on the combination of local and global features. The local features used are Bi-directional Empirical Mode Decomposition (BEMD) technique for edge detection and Harris corner detector to detect the corner points of an image and the global feature used is HSV color feature. Literature Review in Section 2 and Recent Work in Section 3 Research work in Section 4. Finally, Sections 5 is Conclusion.

CONTENT BASED IMAGE RETIREVAL:

For centuries, most of the images retrieval is text-based which means searching is based on those keyword and text generated by human's creation.[1] The text-based image retrieval systems only concern about the text described by humans, instead of looking into the content of images. Images become a mere replica of what human has seen since birth, and this limits the images retrieval. This may leads to many drawbacks. To overcome those drawbacks of text-based image retrieval, Content-based image retrieval was first introduced by Kato in 1992. CBIR is widely used for retrieving desired images from a large collection, which is based on extracting the features (such as color, texture and shapes) from images themselves.

FEATURE EXTRACTION:

In the image retrieval, feature extraction is the most import issue of the first step. Deciding the features needed to be extracted is always popular issues, and then it still comes back to the basic features of the images such as:

Color histograms are basic and fundamental feature of the images. It is the most commonly used and usually gets obvious effect result. [3] [4].

Tamura proposed six images features based on human visualization [5], coarseness, contrast, directionality, line-likeness, regularity, and roughness. [6] [7].

Shape Feature. Besides color, shape is the most commonly used features. Some image retrieval applications require the shape representation to be invariant to rotation, translation, and scaling.

MPEG-7 Features: The Moving Picture Experts Group (MPEG) defines some description of visual named MPEG-7. It includes Color Layout, Color Structure, Dominant Color, Scalable Color, Edge Histogram, Homogeneous Texture, Texture Browsing, Region-based Shape, Contour-based Shape, Camera Motion, Parametric Motion and Motion Activity features [8].

CONTRAST CONTEXT HISTOGRAM (CCH)

Contrast Context Histogram is first proposed for image descriptor [9].CCH first uses histograms to measure the differences in intensity between various salient points around an object. Through comparing the positive and negative histograms of the same object. The CCH method effectively resists image variability between photos of the same object.

GRAY LEVEL CO-OCCURENCE MATRIX:

Gray level co-occurrence matrix (GLCM) is one of the most known texture analysis methods. It estimates image properties related to second order statistics. GLCM is created by calculating how often a pixel with gray-level (grayscale intensity) value occurs horizontally adjacent to a pixel with the value.

HARRIS CORNER DETECTOR

The core idea in the Harris corner detector is the usage of the auto correlation function to find the pixels were the signals change in the two directions.

BI-DIRECTIONAL EMPIRICAL MODE DECOMPOSITION TECHNIQUE:

Edge is an important feature in an image and carries important information about the objects present in the image. Extraction of edges is known as edge detection. Edge detection aims to localize the boundaries of objects in an image and significantly reduces the amount of data to be processed. In this work the edge detection is based on the BEMD technique. During the decomposition of the image by the BEMD technique, the first Intrinsic Mode Frequency (IMF) is obtained and this gives the better characteristics of an edge. A clear edge of an image is obtained by processing the first IMF with a threshold. This process is known as shifting.

II. LITERATURE REVIEW

Early work on image retrieval can be traced back to the late 1970s. In 1979, a conference on Database Techniques for Pictorial Applications was held in Florence. Since then, the application potential of image database management techniques has attracted the attention of researchers. In the early 1990s, as a result of advances in the Internet and new digital image sensor technologies, the volume of digital images produced by scientific, educational, medical, industrial, and other applications available to users increased dramatically. The difficulties faced by text - based retrieval became more and more severe. The efficient management of the rapidly expanding visual information became an urgent problem. In 1996, Greg Pass Ramin Zabih [10] described for comparing images called histogram refinement, which imposes additional constraints on histogram based matching. Histogram refinement splits the pixels in a given bucket into several classes, based upon some local property. Within a given bucket, only pixels in the same class are compared. Here describe a split histogram called a color coherence vector (CCV), which partitions each histogram bucket based on spatial coherence. After that Chad Carson, Serge Belongie, Hay it Greenspan, and Jitendra Malik [11] Retrieve images from large and varied collections using image content as a key is a challenging and important problem. In 1997 they present a new image representation which provides a transformation from the raw pixel data to a small set of localized coherent regions in color and texture space. This so-called "blob world" representation is based on segmentation using the Expectation Maximization algorithm on combined color and texture features. The texture features we use for the segmentation arise from a new approach to texture description and scale selection. Then Yong Rui, Thomas S. Huang and Sharad Mehrotra [12] in 1998 research many visual feature representations have been explored and many system built. While these research efforts establish the basis of CBIR, the usefulness of the proposed approaches is limited. Specifically, these efforts have relatively ignored two distinct characteristics of CBIR systems: (1) the gap between high level concepts and low level features; (2) subjectivity of human perception of visual content. This research proposes a relevance feedback based interactive retrieval approach, which effectively takes into account the above two characteristics in CBIR. During the retrieval process, the user's high level query and perception subjectivity are captured by dynamically updated weights based on the user's relevant feedback. This approach greatly reduces the user's effort of composing a query and captures the user's information need more precisely.

In 1999 Mircea Ionescu, Anca Ralescu [13] analysed the performance of Content-Based Image Retrieval (CBIR) systems is mainly depending on the image similarity measure it use , the feature space of each image is real - valued the Fuzzy Hamming Distance which can be successfully used as image similarity measure. The study reports in 1999, shows the results of applying Fuzzy Hamming Distance as a similarity measure between the color histograms of two images. The Fuzzy Hamming Distance is suitable for this application because it can take into account not only the number of different colors but also the magnitude of this difference. Constantin Vertan , Nozha Boujemaa [14] propose to revisit the use of color image content as an image descriptor through the introduction of fuzziness, which naturally arises due to the imprecision of the pixel color values and human perception. In 2000 they proposed the use of both fuzzy color histograms and their corresponding fuzzy distances for the retrieval of color images within various databases. Again in 2000 Stefano Berretti, Alberto Del Bimbo, and Pietro Pala, [15] proposes retrieval by shape similarity using local descriptors and effective indexing. Shapes are partitioned into tokens in correspondence with their protrusions, and each token is modeled according to a set of perceptually salient attributes. Shape indexing is obtained by arranging shape tokens into a suitably modified M-tree index structure. Two distinct distance functions model respectively, token and shape perceptual similarity Arnold W.M. Smeulders, Marcel Worring, Simone Santini, Amarnath Gupta, and Ramesh Jain, [16] starts discussing In 2000 the working conditions of content-based retrieval: patterns of use, types of pictures, the role of semantics, and the sensory gap. Subsequent sections discuss computational steps for image retrieval systems. Step one of the review is image processing for retrieval sorted by color, texture, and local geometry. Features for retrieval are discussed next, sorted by: accumulative and global features, salient points, object and shape features, signs, and structural combinations thereof. Similarity of pictures and objects in pictures is reviewed for each of the feature types, in close connection to the types and means of feedback the user of the systems is capable of giving by interaction. In the concluding section, presenting the view on: the driving force of the field, the heritage from computer vision, the influence on computer vision, the role of similarity and of interaction, the need for databases, the problem of evaluation, and the role of the semantic gap. Constantin Vertan, Nozha Boujemaa [17] in 2001 focuses on the possible embedding of the uncertainty regarding the colors of an image into histogram type descriptors. The uncertainty naturally arises from both the quantization of the color components and the human perception of colors. Fuzzy histograms measure the typicality of each color within the image. And also define various fuzzy color histograms following a taxonomy that classifies fuzzy techniques as crude fuzzy, fuzzy paradigm based, fuzzy aggregation and fuzzy inferential. For these fuzzy sets, must develop appropriate similarity measures and distances. For a region-based image retrieval system, performance depends critically on the accuracy of object segmentation. Yixin Chen James Z Wang [18] proposed a soft computing approach, unified feature matching (UFM), which greatly increases the robustness of the retrieval system against segmentation related uncertainties. In the retrieval system, an image is represented by a set of segmented regions each of which is characterized by a fuzzy feature (fuzzy set) reflecting color, texture, and shape properties. Ju Han and Kai - Kuang Ma,[19] in 2002 presents a new color histogram representation, called fuzzy color histogram (FCH), by considering the color similarity of each pixel's color associated to all the histogram bins through fuzzy-set membership function. A novel and fast approach for computing the membership values based on fuzzy c-means algorithm is introduced. The proposed FCH is further exploited in the application of image indexing and retrieval. Experimental results clearly show that FCH yields better retrieval results than CCH. Minakshi Banerjee, Malay K. Kundu [20] in 2003 discussed the common problem in content based image retrieval (CBIR) is selection of features. Image characterization with lesser number of features involving lower computational cost is always desirable. Edge is a strong feature e for characterizing an image so a robust technique is presented for extracting edge map of an image which is followed by computation of global feature (like fuzzy compactness) using gray level as well as shape information of the edge map. Unlike other existing techniques it does not require pre segmentation for the computation of features. This algorithm is also computationally attractive as it computes different features with limited number of selected pixels. DeokHwan Kim , ChinWan Chung [21] in 2003 propose a new content-based image retrieval method using adaptive classification and cluster merging to find multiple clusters of a complex image query. When the measures of a retrieval method are invariant under linear transformations, the method can achieve the same retrieval quality regardless of the shapes of clusters of a query. Yuhang Wang, Fillia Makedon, James Ford, Li Shen Dina Goldin [22] in 2004 propose a novel framework for automatic metadata generation based on fuzzy k- NN classification that generates fuzzy semantic metadata describing spatial relations between objects in an image. For each pair of objects of interest, the corresponding R-Histogram is computed and used as input for a set of fuzzy k-NN classifiers. Typical content-based image retrieval (CBIR) system would need to handle the vagueness in the user queries as well as the inherent uncertainty in image representation, similarity measure, and relevance feedback. Raghu Krishnapuram, Swarup Medasani, Sung Hwan Jung, Young-Sik Choi, and Rajesh Balasubramaniam [23] in 2004 discuss how fuzzy set theory can be effectively used for this purpose and describe an image retrieval system called FIRST (Fuzzy Image Retrieval Systems) which incorporates many of these ideas. S. Kulkarni, B. Verma1, P. Sharma and H. Selvaraj [24] proposed a neuro-fuzzy technique for content based image retrieval in 2005. The technique is based on fuzzy interpretation of natural language, neural network learning and searching algorithms. Firstly, fuzzy logic is developed to interpret natural expressions such as mostly, many and few. Secondly, a neural network is designed to learn the meaning of mostly red, many red and few red Rouhollah Rahmani, Sally A. Goldman, Hui Zhang, John Krettek, and Jason E. Fritts [25] in 2005 presents a localized CBIR system , that uses labeled images in conjunction with a multiple instance learning algorithm to first identify the desired object and re - weight the features, and then to rank images in the database using a similarity measure that is based upon individual regions within the image. Ryszard S. Chora´s (2007) contributes their work for the identification of the problems existing in CBIR and Biometrics systems describing image content and image feature extraction. They have described a possible approach to mapping image content onto low-level features. Their paper investigated the use of a number of different color , texture and shape features for image retrieval in CBIR and Biometrics systems. Verma, Mahajan, (2012) have used canny and sobel edge detection algorithm for extracting the shape features for the images. After extracting the shape feature, the classified images are indexed and labeled for making easy for applying retrieval algorithm in order to retrieve the relevant images from the database. In their work, retrieval of the images from the huge image database as required by the user can get perfectly by using canny edge detection technique according to results. Pattanaik, Bhalke (2012) has worked to prove that Content Based Image Retrieval has overcome all the limitation of Text Based Image Retrieval by considering the contents or features of image. A query image can be retrieved efficiently from a large database. A Database consists of different types of images has implemented on the system. Different Features such as histogram, color mean, Color structure descriptor texture is taken into consideration for extracting similar images from the database. From the experimental result it is seen that combined features can give better performance than the single feature. So selection of feature is one of the important issues in the image retrieval. The system is said to be efficient if semantic gap is minimum .The result can be improved in future by introducing feedback and user choice in the system.

III. RECENT WORK

Several reviews of the literature on image retrieval have been published, from a variety of different viewpoints. Enser [1995] reviews methods for providing subject access to pictorial data, developing a four-category framework to classify different approaches. He discusses the strengths and limitations both of conventional methods based on linguistic cues for both indexing and search, and experimental systems using visual cues for one or both of these. His conclusions are that, while there are serious limitations in current text-based techniques for subject access to image data, significant research advances will be needed before visually-based methods are adequate for this task. He also notes, as does Cawkell [1993] in an earlier study, that more dialogue between researchers into image analysis and information retrieval is needed.

Aigrain et al [1996] discuss the main principles of automatic image similarity matching for database retrieval, emphasizing the difficulty of expressing this in terms of automatically generated features. They review a selection of current techniques for both still image retrieval and video data management, including video parsing, shot detection, key frame extraction and video skimming. They conclude that the field is expanding rapidly, but that many major research challenges remain, including the difficulty of expressing semantic information in terms of

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primitive image features, and the need for significantly improved user interfaces. CBIR techniques are likely to be of most use in restricted subject domains, and where synergies with other types of data (particularly text and speech) can be exploited.

Eakins [1996] proposes a framework for image retrieval (outlined in section Error! Reference source not found. Above), classifying image queries into a series of levels, and discussing the extent to which advances in technology are likely to meet users' needs at each level. His conclusion is that automatic CBIR techniques can already address many of users' requirements at level 1, and will be capable of making a significant contribution at level 2 if current research ideas can be successfully exploited. They are however most unlikely to make any impact at level 3 in the foreseeable future.

Idris and Panchanathan [1997] a provide an in-depth review of CBIR technology, explaining the principles behind techniques for color, texture, shape and spatial indexing and retrieval in some detail. They also discuss the issues involved in video segmentation, motion detection and retrieval techniques for compressed images. They identify a number of key unanswered research questions, including the development of more robust and compact image content features, more accurate modeling of human perceptions of image similarity, the identification of more efficient physical storage and indexing techniques, and the development of methods of recognizing objects within images.

De Marsicoi et al [1997] also review current CBIR technology, providing a useful feature-by-feature comparison of 20 experimental and commercial systems. In addition to these reviews of the literature, a survey of "non-text information retrieval" was carried out in 1995 on behalf of the European Commission by staff from GMD (Gesellschaft für Mathematik und Datenverarbeitung), Darmstadt and University Joseph Fourier de Grenoble [Berrut et al, 1995]. This reviewed current indexing practice in a number of European image, video and sound archives, surveyed the current research literature, and assessed the likely future impact of recent research and development on electronic publishing. The survey found that all current operational image archives used text-based indexing methods, which were perceived to have a number of shortcomings. In particular, indexing vocabularies were not felt to be adequate for non-text material. Despite this, users seemed generally satisfied with existing systems. The report concluded that standard information retrieval techniques were appropriate for managing collections of non-text data, though the adoption of intelligent text retrieval techniques such as the inference-based methods developed in the INQUERY project [Turtle and Croft, 1991] could be beneficial. Support vector machines(SVM) are extensively used to learn from relevance feedback due to their capability of effectively tackling the above difficulties. However, the performance of SVM depends on the tuning of a number of parameters. It is a different approach based on the nearest neighbor paradigm. Each image is ranked according to a relevance score depending on nearest neighbor distances. This approach allows recalling a higher percentage of images with respect to SVM-based techniques there after quotient space granularity computing theory into image retrieval field, clarify the granularity thinking in image retrieval, and a novel image retrieval method is imported. Firstly, aiming at the Different behaviors under different granularities, obtain color features under different granularities, achieve different quotient spaces; secondly, do the attribute combination to the obtained quotient spaces according to the quotient space granularity combination principle; and then realize image retrieval using the combined attribute function.[Then a combination of three feature extraction methods namely color, texture, and edge histogram descriptor is reviewed. There is a provision to add new features in future for better retrieval efficiency. Any combination of these methods, which is more appropriate for the application, can be used for retrieval. This is provided through. User Interface (UI) in the form of relevance feedback. The image properties analyzed in this work are by using computer vision and image processing algorithms. For color the histogram of images are computed, for texture co-occurrence matrix based entropy, energy, etc, are calculated and for edge density it is Edge Histogram Descriptor (EHD) that is found. After that local patterns constrained image histograms (LPCIH) for efficient image retrieval is presented. Extracting information through combining local texture patterns with global image histogram, LPCIH is an effective image feature representation method with a flexible image segmentation process. This kind of feature representation is robust and invariant for several image transforms, such as rotation, scaling and damaging. In another system the image is represented by a Fuzzy Attributed Relational Graph (FARG) that describe search object in the image, its attributes and spatial relation. The texture and color attributes are computed in a way that model the Human Vision System (HSV).

Rajshree S. Dubey in (2010) IJCSE illustrated about an Image mining methods which is dependent on the Color Histogram, texture of that Image. The query image is considered, then the Color Histogram and Texture is created and in accordance with this the resultant Image is found. They have examined a histogram-based search techniques and color texture techniques in two different color spaces, RGB and HSV. Histogram search distinguish an image through its color distribution. It is revealed that images retrieved by using the global color histogram possibly will not be semantically related although they share comparable color distribution in some results.

A. Kannan et al. In (2010) IEEE this paper author describes that image mining is the main concept which can extract potential information from the collection. For color based image extraction RGB model is used, RGB component taken from each and every image. Images are stored by mean values of Red, Green, blue components of target images. The top ranked images are further regrouped according to texture features. The gray level co-occurrence matrix (GLCM) used texture calculations (contrast, dissimilarity, homogeneity).The images are classified into clusters with the help of GLCM based on Low texture, average texture and high texture. Texture based classification is simply easy and efficient for real time applications as compared to Entropy method. The authors also evaluate the performance with the help of precision v/s recall graph. Recall value 1 just by retrieving all images and precision value kept in a higher value by retrieving only few images.

Jan-Ming Ho et al. in (2012) IEEE in this paper a novel system Architecture for CBIR system which combines techniques includes color analysis, with content-based image retrieval as well as data mining techniques. In this first time segmentation and grid module, feature extraction module, K-means clustering and bring in the neighborhood module to build the CBIR system. Concept of neighborhood color analysis module recognizes the side of every grids of image is first contributed in this paper. In this paper work not only for Image retrieval it improves quality or fact of being exact and accurate image. In this method CBIR having two parts: - learning and querying. In learning is a training process in this a sample of images put as an input and k-means algorithm for feature extraction. Finally classification set as a learning code book. In querying part image searching process explained and matched the image with output image and the output matched with user query. The main motive to use segmentation and grid computing used to decrease the computing time. in this image divide into F*F grid , where F describe the Feature Module and neighbor module and again sub divide Into S*S, where S describe the color feature

IV. RESEARCH WORK IN CBIR

There are various areas to work with for the improvement of the content based image retrieval system. It is already been discussed that the existing techniques may be used to improve the quality of image retrieval and the understanding of user intentions. An approach that combines two different feature like local and global features to image retrieval, together with active use of context information and interaction has been proposed. We build a generalized query method which increases the system searching ability and provide more accurate content descriptions of places of interest places by performing color feature analysis and CCH image extraction simultaneously. As a result, the CBIR system will be able to suggest more relevant annotations and descriptions.

V. CONCLUSIONS

Most content-based image retrieval systems are products of research, and therefore emphasize one aspect of content-based retrieval. Most systems use color and texture features, few systems use shape feature, and still less use several features. It is widely recognized that most current content-based image retrieval systems work with low level features (color, texture, shape, spatial), and that next generation systems should operate at a higher semantic level. The purpose of this survey is to provide an overview of the system searching ability and more accurate content description of image retrieval by performing the several features and techniques.

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