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A REVIEW ON VARIOUS APPROACHES OF CBIR USING COLOR AND SHAPE BASED FEATURES

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ABSTRACT

Content base image retrieval is the process for extraction of relevant images from the dataset images based on feature descriptors. In the process of content base image retrieval various types of retrieval approaches have been processed by users that are colour based or shape based as well as query based. In this paper various approaches of content base image retrieval has been discussed that can be used for extraction colour and shape based features from the image. Various approaches that can be used for feature extraction has been illustrated with their merits and demerits.

Keywords: CBIR, Color Histogram, Color Moment, Edge directions and Region moments.

I. INTRODUCTION

1.1 Content-based image retrieval

Content-based image retrieval, a technique which uses visual contents to search images from large scale image databases according to users' interests, has been an active and fast advancing research area since the 1990s. During the past decade, remarkable progress has been made in both theoretical research and system development. However, there remain many challenging research problems that continue to attract researchers from multiple disciplines.

CBIR operates on a totally different principle from keyword indexing. Primitive features characterizing image content, such as color, texture and shape, are computed for both stored and query images, and used to identify (say) the 20 stored images most closely matching the query. Semantic features such as the type of object present in the image are harder to extract, though this remains an active research topic. Video retrieval is a topic of increasing importance –here, CBIR techniques are also used to break up long videos into individual shots, extract still key frames summarizing the content of each shot, and search for video clips containing specified types of movement. 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 before any kind of reasoning about the image's contents is possible. Image databases thus differ fundamentally from text databases, where the raw material has already been logically structured by the author. There is no equivalent of level 1 retrieval in a text database.

CBIR draws many of its methods from the field of image processing and computer vision, and is regarded by some as a subset of that field. It differs from these fields principally through its emphasis on the retrieval of images with desired characteristics from a collection of significant size. Image processing covers a much wider field, including image enhancement, compression, transmission, and interpretation. While there are grey areas,

the distinction between mainstream image analysis and CBIR is usually fairly clear-cut. An example may make this clear. Many police forces now use automatic face recognition systems. Such systems may be used in one of two ways. Firstly, the image in front of the camera may be compared with a single individual's database record to verify his or her identity. In this case, only two images are matched, a process few observers would call CBIR. Secondly, the entire database may be searched to find the most closely matching images. This is a genuine example of CBIR.

1.2 CBIR techniques

In contrast to the text-based approach of the systems described, CBIR operates on a totally different principle, retrieving stored images from a collection by comparing features automatically extracted from the images themselves. The commonest features used are mathematical measures of color, texture or shape hence virtually all current CBIR systems, whether commercial or experimental, operate at level 1. A typical system allows users to formulate queries by submitting an example of the type of image being sought, though some offer alternatives such as selection from a palette or sketch input. The system then identifies those stored images whose feature values match those of the query most closely, and displays thumbnails of these images on the screen. Color retrieval several methods for retrieving images on the basis of color similarity have been described in the literature, but most are variations on the same basic idea. Each image added to the collection is analyzed to compute a color histogram which shows the proportion of pixels of each color within the image. The color histogram for each image is then stored in the database. At search time, the user can either specify the desired proportion of each color or submit an example image from which a color histogram is calculated. Either way, the matching process then retrieves those images whose color histograms match those of the query most closely.

1.3 Texture retrieval

The ability to retrieve images on the basis of texture similarity may not seem very useful. But the ability to match on texture similarity can often be useful in distinguishing between areas of images with similar color. A variety of techniques has been used for measuring texture similarity; the best-established rely on comparing values of what are known as second-order statistics calculated from query and stored images. Essentially, these calculate the relative brightness of selected pairs of pixels from each image. From these it is possible to calculate measures of image texture such as the degree of contrast, coarseness, directionality and regularity or periodicity, directionality and randomness. Alternative methods of texture analysis for retrieval include the use of Gabor filters and fractals. Texture queries can be formulated in a similar manner to color queries, by selecting examples of desired textures from a palette, or by supplying an example query image.

1.4 Shape retrieval

The ability to retrieve by shape is perhaps the most obvious requirement at the primitive level. Unlike texture, shape is a fairly well-defined concept –and there is considerable evidence that natural objects are primarily recognized by their shape. A number of features characteristic of object shape are computed for every object identified within each stored image. Queries are then answered by computing the same set of features for the query image, and retrieving those stored images whose features most closely match those of the query. Two

main types of shape feature are commonly used –global features such as aspect ratio, circularity and moment invariants and local features such as sets of consecutive boundary segments.

Shape matching of three-dimensional objects is a more challenging task –particularly where only a single 2-D view of the object in question is available. While no general solution to this problem is possible, some useful inroads have been made into the problem of identifying at least some instances of a given object from different viewpoints. One approach has been to build up a set of plausible 3-D models from the available 2-D image, and match them with other models in the database. Another is to generate a series of alternative 2-D views of each database object, each of which is matched with the query image. Related research issues in this area include defining 3-D shape similarity measures

II. LITERATURE SURVEY

Begüm Demir "A Novel Active Learning Method in Relevance Feedback for Content-Based Remote Sensing Image Retrieval" Conventional relevance feedback (RF) schemes improve the performance of content-based image retrieval (CBIR) requiring the user to annotate a large number of images. To reduce the labeling effort of the user, this paper presents a novel active learning (AL) method to drive RF for retrieving remote sensing images from large archives in the framework of the support vector machine classifier. The proposed AL method is specifically designed for CBIR and defines an effective and as small as possible set of relevant and irrelevant images with regard to a general query image by jointly evaluating three criteria: 1) uncertainty; 2) diversity; and 3) density of images in the archive. The uncertainty and diversity criteria aim at selecting the most informative images in the archive, whereas the density criterion goal is to choose the images that are representative of the underlying distribution of data in the archive. The proposed AL method assesses jointly the three criteria based on two successive steps. In the first step, the most uncertain (i.e., ambiguous) images are selected from the archive on the basis of the margin sampling strategy. In the second step, the images that are both diverse (i.e., distant) to each other and associated to the high-density regions of the image feature space in the archive are chosen from the most uncertain images. This step is achieved by a novel clustering-based strategy. The proposed AL method for driving the RF contributes to mitigate problems of unbalanced and biased set of relevant and irrelevant images. Experimental results show the effectiveness of the proposed AL method.

Wei Du "Content-based music similarity computation with relevant component analysis" Content-based music similarity is becoming important because of the millions of songs with online distribution. However, current methods have to treat the same attention on unrelated information or different informative information. In this paper, a new method is proposed to compute the music similarity with relevant component analysis. Considering the different weights for different parts, this method pays more attention on those parts with informative features by ranking the Mel-frequency spectral coefficients frames on energy, and masters the song features more precisely compared with other methods. Experimental results on public dataset Musi Clef show that this method works faster on music similarity computation task without sacrificing the accuracy of the similarity measurement.

Mohd Sollehudin Md Said"Preservation of gelatin-based phantom material using vinegar and its life-span study for application in microwave imaging" Gelatin-based material can be used in phantom modelling for microwave imaging applications, but unfortunately, this type of phantom has a short life span. Formaldehyde has been used

previously to preserve gelatin-based material, but it might be hazardous. This paper presents a life-span study for gelatin-based material that has been preserved by vinegar in different amounts, observed through the conducted dielectric measurement from 1 GHz to 6 GHz. The Debye parameters are derived to define a Debye relaxation model of the acid contents in a solution of water and vinegar. The study is then focused on dielectric trends prior to and after the addition of different amounts of vinegar into a gelatin-based material. The life-span study concentrates on changes in the sample's dielectric properties over a storage period of six weeks. The obtained findings in this study are useful to validate the suitability of vinegar to be used as preservative in gelatin-based material for microwave imaging purposes.

F. Sabahi "An unsupervised learning based method for content-based image retrieval using Hopfield neural network", corporations and individuals have large image databases due to the explosion of multimedia and storage devices available. Furthermore, the accessibility to high speed internet has escalated the level of multimedia exchanged by users across cyberspace every second. Accordingly, it has increased the demand for searching among large databases of images. Conventionally, text-based image retrieval is used. The major problems in text-based image retrieval are related to annotation that is often impossible due to human perception of images being subjective, and also due to the size of the information that needs indexing. To overcome such limitations, content-based image retrieval systems have been proposed. However, there is a key hindrance, namely, the need to match the human visual system to overcome the semantic gap between human perception and low-level features. In this paper, we propose a new unsupervised method based on Hopfield neural networks that seek to model human visual memory to increase the efficacy of retrieval and reduce the semantic gap. A comparative study with other neural-network based methods, such as the feed forward back propagation and Boltzmann deep learning, shows the effectiveness of our method.

Abdolraheem Khader Alhassan "Colour and texture fusion-based method for content-based Image Retrieval", Content-based image retrieval (CBIR) is a technique uses visual contents such as colour, texture and shape to search images from large scale image databases according to users' interest. In a CBIR, visual image content is represented in form of image features, which are extracted automatically and there is no manual intervention, thus eliminating the dependency on humans in the feature extraction stage. Recent studies in CBIR get the similarity results and retrieve images based on one type of feature which are colour, texture or shape. In this study authors proposed a fusion based retrieval model for merging results taken from colour and texture image features based different fusion methods. After implementing our proposed retrieval model on Wang image dataset which widely used in CBIR, the results show that CombMEAN fusion approach has the best and high precision value and outperformed both individual colour and texture retrieval model in both top10 and top20 retrieved images.

Xu Tang "SAR Image Content Retrieval Based on Fuzzy Similarity and Relevance Feedback", This paper presents a new content-based synthetic aperture radar (SAR) image retrieval method to search out SAR image patches, which consists of two essential parts: an initial retrieval and later refined results. To obtain the proper initial retrievals, we develop a similarity measure named region-based fuzzy matching (RFM) to evaluate the similarities between SAR image patches. First, to reduce the negative influence of speckle noise, we segment the SAR image patches into brightness-texture regions at the super pixel level rather than the pixel level.

Second, a multiscale edge detector is utilized to resolve the multiscale property of the SAR image patches, and then the edge regions of the SAR image patches are defined by those edge features. Third, to overcome the segmented uncertainty and the blurry boundaries, the obtained regions are described by fuzzy features. Finally, the RFM similarity between two SAR image patches is converted into the linear summation of the resemblance between different fuzzy feature sets.

III. APPROACHES USED

3.1 Color: The chromatic attribute of an image is firstly interrelated with color, which is a part of 3-D module and system. The color image is used to assign the appropriate color space.RGB (Red, Green, and Blue), CMY (Cyan, Magenta, and Yellow), HSV (Hue, Saturation and Value) and LHS (Luminance, Hue and Saturation) are the most popular color spaces. Like Histogram, color moments, color co-relogram, color based image retrieval can be extracted in many ways. Commonly used color based image is color histogram. Probability of color finding pair at determines pixel distances are acknowledged.

These methods are explained in following way-

3.2 Color Moments: The color distribution of the image is characterized by its moments. First, second and third central moment of each of the color channels is stored as a color feature.

3.3 Color Histogram: This is a graphical representation of numerical data. This is estimation of the distribution of continuous variables. For the construction of a histogram, first step is Bin that is responsible to divide the entire range of value.

3.4 Shape: This is a very important attribute of image segmentation. Its effective and vigorous representation plays an important role in retrieval of images. Shape features in images are extracted using many approaches.

They are 1-D function for shape Representation, Polygonal approximation, spatial inter-relation, Moment, Scale-Space Method, and Shape Transform Domain. An important shape feature has to be picking over depending upon the situation and the nature of the image. Some of the shape features are discussed in this section.

3.5 Histogram of Edge Directions: The edge histogram extracts the general shape information in the image. In the image, the edge information contained is acquired, using edge detection algorithms like canny, sobel, etc. The edge directions are quantized into a number of bins. For achieving scale invariance, the histogram is normalized with respect to the number of pixels in the image.

3.6 Region Moments: Among this descriptor, moments are very popular. Some of them are invariant moments, Zernike moments and Legendre moments.

IV. CONCLUSION

CBIR is the field of image processing that has been utilized in various field of digital imaging. In this paper various approaches and recent evolutions in CBIR has been illustrated that impact on use of content based image retrieval. In the process of CBIR various properties of images have been utilized that can be used for extraction of features. In this paper various approaches based on shape and colours have been discussed that can be used for extraction of valuable features. On the basis of review of literature survey we can illustrate that an

optimal approach that combines features of colours and shape can lead to high accuracy in terms of content based image retrieval.

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