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Research Paper

RESEARCH AND IMPLEMENTATION OF AN IMAGE RETRIEVAL SYSTEM BASED ON COLOR, TEXURE AND SHAPE FEATURS ANALYSIS

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In this paper we are Image retrieval, initiated in the late 1970's, aims to provide an effective and efficient tool for managing large image databases. With the ever-growing volume of digital images generated, stored, accessed and analyzed, this specific technique continually gains momentum, and has witnessed several major breakthroughs. The initial image retrieval is based on keyword annotation, which is a natural extension of text retrieval. In this approach, the images are first annotated manually by keywords, and then retrieved by their annotations. However, it suffers from several main difficulties, e.g., the large amount of manual labor required to annotate the whole database, and the inconsistency among different annotators in perceiving the same image.

Keywords: Content based image reatraival, GLCM CCM

INTRODUCTION

To overcome these difficulties, an alternative scheme, Content Based Image Retrieval (CBIR) was proposed in the early 1990's, which makes use of low-level image features instead of the keyword features to represent images, such as color, texture, and shape. Its advantage over keyword based image retrieval lies in the fact that feature extraction can be performed automatically and the image's own content is always consistent. CBIR system can be implemented based on single feature which may not be enough for describing an image hence this approach of multi feature is used for image retrieval. Information is multisource, and information fusion approach is diverse. The problem how to organize multi-source information in a suitable way to achieve the intended results attracts extensive attention from the researchers in this field. Image to be retrieved is given as a query image to the system. next

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step is feature extraction. More features will provide more information in this project we will take the color feature and texture feature of an image for image retrieval. Because different features reflect the different characteristics of the image, if those features are integrated reasonably, the results will reserve both the discriminate information of multi-feature and eliminate the interference resulted from the difference of multi-feature. Image retrieval method based on multi-feature similarity score fusion using genetic algorithm in this project. This paper analyzed image retrieval results based on color feature and texture feature, and proposed a strategy to fuse multi-feature similarity score. Further, with genetic algorithm, the weights of similarity score are assigned automatically, and a fine image retrieval result is gained.

IMAGE FEATURES

As noted in the above section, there are many different features associated to an image:

Color

Texture

Shape

Local Features

This section will provide a high level over view of these features.

Color

Computing distance measures based on color similarity is achieved by computing a color histogram for each image that identifies the proportion of pixels within an image holding specific values (that humans express as colors). Current research is attempting to segment color proportion by region and by spatial relationship among several color regions. Examining images based on the colors they contain is one of the most widely used techniques because it does not depend on image size or orientation

Texture

Texture measures look for visual patterns in images and how they are spatially defined. Textures are represented by texels which are then placed into a number of sets, depending on how many textures are detected in the image. These sets not only define the texture, but also where in the image the texture is located. Texture is a difficult concept to represent. The identification of specific textures in an image is achieved primarily by modeling texture as a two-dimensional gray level variation

Shape

Shape does not refer to the shape of an image but to the shape of a particular region that is being sought out. Shapes will often be determined first applying segmentation or edge detection to an image. Other methods like (Tushabe and Wilkinson, 2008) use shape filters to identify given shapes of an image. In some case accurate shape detection will require human intervention because methods like segmentation are very difficult to completely automate. Shape may be defined as the characteristic surface configuration of an object; an outline or contour.

Local Features

Often termed as spatial information, the basic idea of local features is to be able to identify characteristics of an image by the individual objects within the image instead of viewing the image globally. Specifically, the spatial layout of colors, textures, and shapes or objects within an images vs. the entire image.

The image content is mainly embodied in color, texture and shape, etc. The color 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 multi-feature similarity score. For convenience, this paper only discusses the fusion method of two-feature similarity score. Without loss of generality, the used features are color feature and texture feature. The following part describes the used extraction method of color feature and texture feature.

IMAGE FEATURE EXTRACTION

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, 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 are coded as 2.2.1 Steps to find color feature In this proposed scheme the color features are extracted using Color Histogram in HSV color space. The steps to find the color feature are as follows.

Step 1: RGB image is transformed to HSV model and the perceived distance between colors is in proportion to Euclidean distance between corresponding pixels in HSV color model.

Step 2: Quantization in terms of color histograms refers to the process of reducing the number of bins by taking colors that are very similar to each other and putting them in the same bin. In the HSV space the Hue is quantized into 16 bins and is among [0, 1 5], saturation is quantized into 4 bins and is among [0, 3], and value is quantized into 4 bins and is among [0, 3]. Among these, the human cognition about color is mainly based on hue, then saturation and finally value. Thus the quantized results are coded as in

$$C = 16 \times H + 4 \times S + v \quad ...(1)$$

where C is a integer between 0 and 255.

Step 3: Obtain the color histogram of an image in HSV color space. Color histogram is a representation of the distribution of colors in an image. For digital images, a color histogram represents the number of pixels that have colors in each of a fixed list of color ranges that span the image's color space, the set of all possible colors.

Step 4: The similarity between color feature values of query image and that of the database image is calculated using Euclidean distance similarity measure given in the closer the distance, the higher the similarity

$$C = 16H + 4S + V$$

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

Texture Feature Extraction

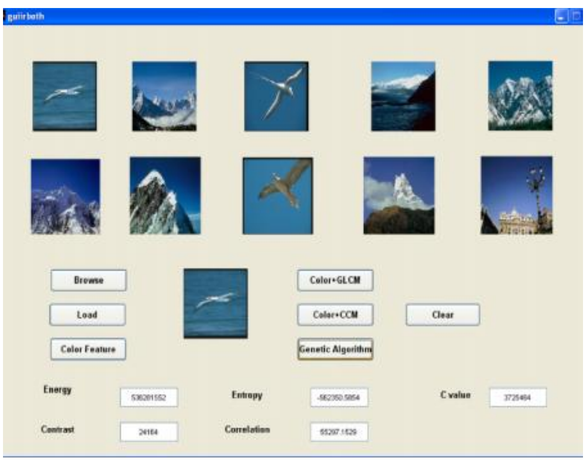
In this paper, the statistical properties of image cooccurrence matrix are taken as texture features of an image.

Firstly, color image is converted to grayscale image, and the image co-occurrence matrix is gained. Then, the following five statistical properties are calculated to describing image content. They are contrast, energy, entropy, correlation and local stationary. All these statistical properties are calculated in 4 directions, so we can get 20 texture features. At last, we calculated the means and variances of these five kinds of statistical properties, and took the results as the ultimate texture features, denoted as:

$$T = («1, «2, «3, «4, «5; ±1, ±2, ±3, ±4, ±5)$$

EXPERIMENTS AND ANALYSIS

Figure: Extracted Images from the Data Base



SIMILARITY

An image similarity method based on the fusion of similarity scores of feature similarity ranking lists is proposed. It takes an advantage of combining the similarity value scores of all feature types representing the image content by means of different integration algorithms when computing the image similarity. Three fusion algorithms for the purpose of fusing image feature similarity scores from the feature similarity ranking lists are proposed. Image retrieval experimental consequences of the evaluation on four general purpose image databases with 4,444 images classified into 150 semantic categories reveal that a proposed method results in the best overall retrieval performance in comparison to the methods employing single feature similarity lists when determining image similarity with an average retrieval precision higher about 15%. Compared to two well-known image retrieval system, simplicity and WBIIS, the proposed method brings an increase of 4% and 27% respectively in average retrieval precision. The proposed method based on multiple criteria thus provides better approximation of the user's similarity criteria when modeling image similarity. One of the most important issues in the present image retrieval is modeling image similarity. Image is typically modeled as a collection of low-level image features. Image similarity computation involves the application of different feature similarity measures on the extracted image features. Based on the overall image similarity to the (user's) query image, the database images are ranked in a single similarity ranking list. Finally, the most similar images from the similarity ranking list are presented to the end user. In the recent survey of 56 Content Based Image Retrieval (CBIR) systems, most of the systems are employing a single similarity values ranking list. As an alternative approach to this one, the application of the three different feature similarity rank's score fusion algorithms (cf. 2) when ranking overall image similarity in terms of partial feature similarities without using human relevance judgments is approached. The focus on how the creation of the final similarity values ranking list between a query image q and database images from the low-level image feature's similarity ranking lists is emphasized. Combining different feature similarity score ranking using data fusion methods based on multiple criteria in a rank aggregation manner is done. Fusion of feature similarity value scores in case of two algorithms is derived in a non-heuristical manner. The third approach is done in a heuristical manner. The empirical evaluation is done on four general purpose image databases containing 4,444 images in 150 semantic categories. In total, more than 66,000 queries are executed, based on which several performance measures are computed. In 2, proposed feature similarity ranking lists fusion algorithms are described. An empirical evaluation and comparison of the proposed algorithms is demonstrated.

CONCLUSSION

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.

REFERENCES

1. Anil K Jain and Aditya Vailaya (1996), "Image Retrieval Using Color and Shape", *Pattern Recognition*, Vol. 29, pp. 1233-1244.
2. Gudivada V N and Raghavan V V (1995), "Content Based Image Retrieval Systems", *IEEE Computer*, Vol. 28, pp. 18-22.
3. Jovic M, Hatakeyama Y, Dong F and Hirota K (2006), "Image Retrieval Based on Similarity Score Fusion from Feature Similarity Ranking Lists", 3rd International Conference on Fuzzy Systems and Knowledge Discovery (FSKD), pp. 461-470, LNAI 4223, Springer-Verlag, Berlin Heidelberg.
4. Markov I and Vassilieva N (2008), "Image Retrieval: Color and Texture Combining Based on Query-Image", pp. 430-438, ICISP, LNCS 5099, Springer-Verlag Berlin Heidelberg.
5. Prasad B G, Biswas K K and Gupta S K (2004), "Region-Based Image Retrieval Using Integrated Color, Shape, and Location Index", *Computer Vision and Image Understanding*, Vol. 94, pp. 193-233.
6. Ritendra Datta, Dhiraj Joshi, Jia Li and James Z Wang (2008), "Image Retrieval:

Ideas, Influences, and Trends of the New Age", *ACM Computing Surveys*, Vol. 40, pp. 1-60.

7. Tai X Y and Wang L D (2008), "Medical Image Retrieval Based on Color Texture Algorithm and GTI Model", *Bioinformatics and Biomedical Engineering*, ICBBE, The 2nd International Conference, pp. 2574-2578.

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

9. Young Deok Chun, Nam Chul Kim and Ick Hoon Jang (2008), "Content-Based Image Retrieval Using Multiresolution Color and Texture Features", *IEEE Transaction on Multimedia*, Vol. 10, pp. 1073-1084.

10. Yu H, Li M, Zhang H-J and Feng J (2002), "Color Texture Moments for Content-Based Image Retrieval", in International Conference on Image Processing, pp. 24-28.