Study on Content based Retrieval and Semantic Technique

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Abstract- With the popularity of the network and development of multimedia technology, the traditional information retrieval techniques do not meet the users' demand. Recently, the content-based image retrieval has become the hot topic and the techniques of content-based image retrieval have been achieved great development. In this paper, the basic components like color, texture, shape and semantic image etc. of content-based image retrieval system are introduced. The semantic-based image retrieval is a better way to solve the "semantic gap" problem, so the semantic-based image retrieval method is discussed. Other related techniques such as relevance feedback and performance evaluation are also discussed. In this paper we survey some technical aspects of current content-based image retrieval systems.

KEYWORDS Image retrieval, content-based image retrieval, color, texture, shape and semantic-based image retrieval.

I. INTRODUCTION

Content-based image retrieval (CBIR), also known as query by image content (QBIC) and content-based visual information retrieval (CBVIR) is the application of computer vision techniques to the image retrieval problem, that is, the problem of searching for digital images in large databases for a recent scientific overview of the CBIR field). Content based image retrieval is opposed to concept based approaches."Content-based" means that the search will analyze the actual contents of the image rather than the metadata such as keywords, tags, and/or descriptions associated with the image. The term 'content' in this context might refer to colors, shapes, textures, or any other information that can be derived from the image itself. The ideal CBIR system from a user perspective would involve what is referred to as semantic retrieval, where the user makes a request like "find pictures of Abraham Lincoln". This type of open-ended task is very difficult for computers to perform - pictures of Chihuahuas and Great Danes look very different, and Lincoln may not always be facing the camera or in the same pose. Current CBIR systems therefore generally make use of lower-level features like texture, color, and shape, although some systems take advantage of very common higher-level features like faces. Not every CBIR system is generic. Some systems are designed for a specific domain, e.g. shape matching can be used for finding parts inside a CAD-CAM database.

II. VISUAL FEATURES OF CBIR

Within visual feature scope, the features can be further classified as general features and domain specific features. The former include color, texture and shape features while the latter is application dependent and may include.

1.**Color**: Color searches will usually involve comparing color histograms, though this is not the only technique in practice. 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. In image retrieval, color histogram is the most commonly used color feature representation. Statistically it denotes the joint probability of the intensities of the three color channel.

2 **.Texture:** Texture refers to the visual patterns that have properties of homogeneity that do not result from the Presence of only a single color of intensity. It is an innate property of virtually all surfaces, including clouds, trees, bricks, hair, fabric, etc. it contains important information about the structural arrangement of surfaces and their relationship to the surrounding environment. Because of this importance and usefulness in Pattern Recognition and Computer vision, there existed rich research results in the past three decades. Now, it further finds its way in Image Retrieval. More and more research achievements are being added to it. In the early 70's, Haralick et al. proposed the occurrence matrix representation of texture feature. This approach explored the gray level spatial dependency of texture. It first constructed the co-occurrence matrix based on the orientation and distance between image pixels and then extracted meaningful statistics from the matrix as the texture representation. Many other researchers followed the same line and further proposed enhanced versions. For example, Gotlieb and Kreyszig studied the statistics originally proposed in and experimentally found out that contrast, inverse deference moment and entropy had the biggest discriminatory power.

Shape: In Image Retrieval, depending on the applications, some require the shape representation to be invariant to translocation, rotation, scaling; while others do not. Obviously, if a representation satisfies the former Requirement, it will satisfy the letter as well. Therefore, in the following we will focus on shape representations that is transformation invariant. In general, the shape representation can be divided into two categories, Boundary-based and region-based. The former uses only the outer boundary of the shape while the letter uses the entire shape region. The most successful representatives for these two categories are Fourier Descriptor and Moment Invariants. The main idea of Fourier Descriptor is to use the Fourier transformed boundary as the shape feature. Some early work can be found in. To take into account the digitization noise in the image domain, Rui et al. proposed a modified Fourier Descriptor which is both robust to noise and invariant to geometric transformation. The main idea of Moment Invariants is to use region-based moments, which are invariants to transformations, as the shape feature. Hu identified seven such moments. Based on his work, many improved Versions emerged. In, based on the discrete version of Green's theorem, Yang and Albertson proposed a fast method of computing moments in binary images. Motivated by the fact that most useful invariants were found by extensive experience and trial-and-error, Kapur et al. developed algorithms to systematically generate and research for a given geometry's invariants. Realizing that most researchers did not consider what happened to the invariants after image digitization, Gross and Latecki developed an approach which preserved the qualitative differential geometry of the object boundary, even after an image was digitized. In, a framework of algebraic curves and invariants is proposed to represent local geometric invariants are used in objects matching and recognition.

QBIC: QBIC or Query by image content. It was developed by IBM, Almaden Research Centre to allow users to graphically pose and refine queries based on multiple visual properties such as color, texture and shape. It supports queries based on input images, user-constructed sketches, and selected color and texture patterns. Color features computed are: the 3D average color vector of an object or the whole image in RGB, YIQ, lab, and Munsell color space and a 256-dimensional RGB color Histogram. The texture features used in QBIC are modified versions of the coarseness, contrast, and directionally features proposed by Tamura. The shape features consists of shape area, circularity, eccentricity, major axis orientation and a set of algebraic moment invariants. The major axis orientation and eccentricity are computed from the second order covariance matrix of the boundary pixels: the major axis orientation as the direction of the largest eigen vector and eccentricity as the ratio of the smallest eigen value to the largest one. For all database images, these shape features are extracted for all the object contours, semi automatically computed in the database population step.

III. CONCLUSION

In this section, we summarize the discussion on content based model retrieval techniques from the previous methods. The feature are classified into the low level classes color, texture, shape, and the higher level classes layout and face detection. The use of keywords is also listed. In this paper, we compare many image retrieval techniques based on color, texture, and shape and semantic. We obtain better retrieval results in semantics based image retrieval and performance factor increases. Indexing data structures are often not used. Indeed, for small collection of images, an indexing data structures is not needed, and a linear search can be sufficiently fast. Contemporary computers can perform simple matching of hundreds of images in near real time. It is widely recognized that most current content-based image retrieval system work with low-level features (color, texture, shape), and the next generation systems should operate at higher semantic level. One way to achieve this is to let the system recognize objects and scenes. In this paper we survey some technical aspects of current content-based image retrieval.

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