Content based image retrieval: A Survey

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ABSTRACT

CBIR is rapidly becoming area of interest. It is the application of computer vision techniques to the image retrieval problem. It is the problem of searching for digital images in large datasets. Content-based image retrieval is contrary to traditional concept-based perspective. The meaning of "Content-based" is that the searching is performing by image rather than keyword, description & tags. In this paper survey of CBIR methods exhibit. The objective of this paper is to provide an idea of CBIR methods and how the image is extracted using different way.

Keyword: - *CBIR, Image retrieval, digital image, datasets.*

1. INTRODUCTION

With the development in multimedia and internet technologies, a large amount of multimedia data in the form of video, audio and images has been used in many fields like satellite data, medical treatment, video and still images repositories, surveillance system and digital forensics. This has created a continuing demand of systems that can reserve and retrieve multimedia data in an effective way. A large number of multimedia information storage and retrieval systems have been developed till now for catering these demands.

Due to revolutionary growth of digital imaging & internet technology, development of efficient & smart scheme for image retrieval from a large image collection became an prime research issue.

The process of retrieval of relevant images from an image database on the basis of primitive (e.g. shape, color, texture etc.) or semantic image features extracted automatically is known as Content Based Image Retrieval.

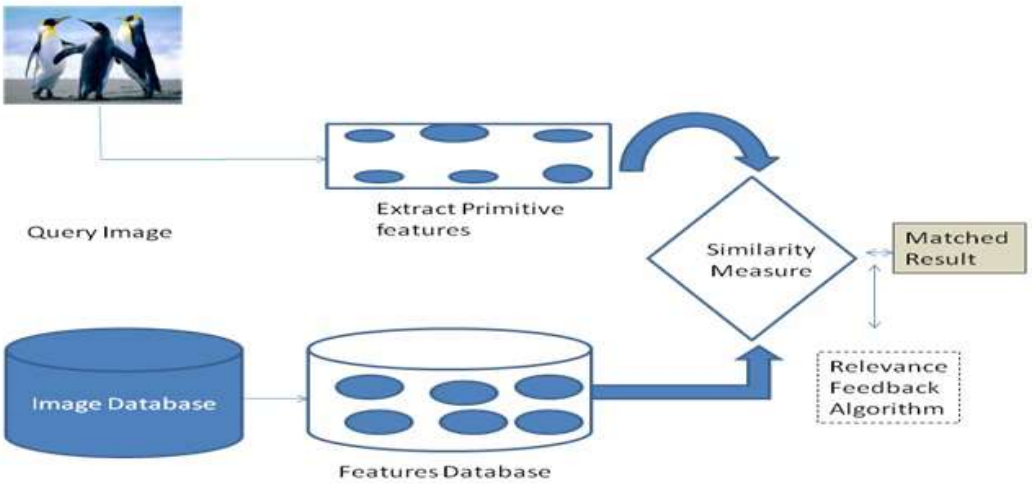

Fig -1 Architecture of a typical CBIR system

CBIR Applications

- CBIR is the application of computer vision.

- Security Check: Fingerprint or retina scanning for access privileges.
- Intellectual Property: Trademark image registration, where a new candidate mark is compared with existing marks to ensure no risk of confusing property ownership.
- Medical Diagnosis(X-ray, CT, ……): Using CBIR in a medical database of medical images to the aid diagnosis by identifying similar past cases with the help of big data images[6].
- Crime prevention (security filtering,):Automatic face recognition systems, used by police forces.
- Commerce (fashion, catalogue,)
- Biomedicine
- Cultural (art galleries, museums,)
- Military (radar, aerial,)
- Entertainment (personal album,)

2. LITERATURE SURVEY

Literature survey is very important for gaining and understanding much more knowledge about specific area of a subject. CBIR (Content based image retrieval) has come long way before 1990. There are many CBIR algorithms as the result of those researches and most of those algorithms process image into several layers of tasks. Those layers of tasks consist of extracting the multidimensional features of an image query and compare it with images in the database are perform after the system populate database with images. Populating database with withdraw information from the images and indexed appropriately will influence the performance of retrieval. The information consists of color, shape, texture and the rest of image characteristic.

CBIR has attracted researchers from many research fields, including artificial intelligence, computer vision, machine learning and human factors. Image is indexed by its visual content. Visual content is described by Low level features (Color, texture, shape, layout etc.) and High level descriptors (Face, iconic pattern, context, spatial reasoning, semantic information etc.).

Some widely used color, texture, shape and spatial relationship features are discussed in the following section.

2.1 Color Features

The most commonly used feature of an image is color. The perceived color at any pixel of an image is obtained by mixing three preliminary colors in appropriate proportion. The three dimensional color provides more discriminating data than the single dimensional gray level values. Before extracting color descriptor, first a proper color space must be determined. Commonly used color spaces for image retrieval application are HSV, RGB and opponent color space etc. There is no conformity over which color space is best but one of the desirable characteristic of color space for image retrieval task is its uniformity.

2.2 Texture Features

There is no specific definition of texture. Textures are represented by texture which is then placed into a number of sets, depending on how many textures are detected in the image. Texture measures look for visual patterns in images and how they are spatially defined. These sites not only define the texture, but also locate the texture in the image.

One can define texture as the visual pattern that has properties of homogeneity not resulting from the presence of only an intensity or single color. Various techniques for texture analysis have been investigated in the field of pattern recognition and computer vision. The texture extraction techniques can be classified into two categories: structural and statistical.

Other methods of classifying textures include:

- Orthogonal Transforms
- Co-occurrence matrix
- Wavelet Transform
- Laws texture energy

2.3 Shape Features

The most important semantic information about an image is provided by shape feature. Shape features are usually described using region or part of an image. The accuracy of shape features mainly depends upon the segmentation scheme used to divide an image into meaningful objects.

In image retrieval technique, as per applications, shape representation are required to be either invariant to translation, scaling and rotation or not. Hence, two categories of shape representations can be distinguished, region and boundary based. The first category utilizes entire shape region while the other access only the outer boundary of the shape region. The most successful representatives for these two categories are moment invariants and Fourier descriptor. The main idea behind a Fourier descriptor is to use the Fourier transformed boundary as the shape feature.

3. TRANSFORM TECHNIQUES

Content based image retrieval includes various transform techniques, such as 1) Discrete Cosine transform 2) Discrete Fourier Transform 3) Discrete Wavelet Transform 4) Curvelet transform.

Table -1: Transform Techniques

Transform Technique	Description
Discrete Cosine Transform	Discrete cosine transform has emerged as the image transformation in most visual systems. Converting a signal into elementary frequency components is a technique of a discrete cosine transform (DCT). It expresses a sequence of finitely numerous data points in terms of a sum of cosine functions oscillating at different frequencies which is broadly used in image compression. It captures only real(even) component of the functions
Discrete Fourier Transform	Discrete Fourier Transform used in frequency analysis and filtering. DFT captures both even and odd (imaginary) components. The implicit periodicity of DFT gives rise to boundary discontinuities that result in significant high frequency content.
Discrete Wavelet Transform	Discrete Wavelet transform (DWT).It is a mathematical tool for hierarchically decomposing an image. It is useful for processing of non-stationary signals. The transform is based on small waves, called wavelets, of limited duration and varying frequency. Wavelet transform provides both spatial and frequency description of an image. Unlike conventional Fourier transform, in DWT temporal information is retained in this transformation process.
Curvelet Transform	Curvelet transform or Curvelets are an appropriate basis for representing images or other functions, which is smooth apart from singularities along smooth curves. Where the curves have bounded curvature that means where objects in the image have a minimum length scale. This property holds for geometrical diagrams, cartoons and text. As one zooms in on such images, the edges they contain appear increasingly straight. Curvelets take advantage of this property, by defining the higher resolution Curvelets to be more extended than the lower resolution Curvelets. However, natural images or photographs do not have this property; they have detail at every scale. Therefore, for natural images, it is preferable to use some sort of directional wavelet transform whose wavelets have the same aspect ratio at every scale.

4. PROPOSED SYSTEM

To overcome the limitations of existing system new transform technique which is called as Ripplet Transform is used. The conventional transforms like Cosine Transform, Fourier Transform (FT) and Wavelet Transform (WT) suffer from different limitations like discontinuities. It includes edges and contours in pictures. To handle this problem, Jun XU et al. proposed a new MGA-tool called RT. Ripplet Transform (RT) is a higher dimensional generalization of the Curvelet Transform (CVT), is used to represent picture or 2D signals at different scales and different directions.

5. CONCLUSION

The main purpose of this survey is to provide a brief idea about features of content based image retrieval. Many systems use texture and color features, few systems use shape feature, and still less use layout features. Here we present three features that is color, texture & shape. Also the different transform techniques used for CBIR is discussed in this paper. In proposed work Ripplet Transform in used for effective content based image retrieval.

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