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Techniques of Content Based Image Retrieval: A Review

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Abstract: *The abstract should summarize the content of the paper. Try to keep the abstract below nowadays, computer vision and digital image processing are useful for content based image retrieval. Basically, computer vision systems try to retrieve an image to a user-defined specification or pattern (e.g., shape sketch, image color etc.). The goal of computer vision is to support image retrieval based on content properties like; shape, color, textures usually en coded in the form of feature vectors. Content based image retrieval (CBIR) considers the characteristics of the image itself, for example its shapes, colors and textures. In this study various techniques are used for feature extractions of CBIR images.*
Keywords: *Content Based Image Retrieval (CBIR), Shape, Feature Extraction.*

I. Introduction

Content based image retrieval also known as query by image content. Content based means that the search analyzes the content of the image rather than the metadata such as keyword tags or descriptions associated with the image[1]. To overcome the above disadvantages in text-based retrieval system, content based image retrieval (CBIR) was introduced in the early 1980s. In CBIR, images are indexed by their visual content, such as color, texture, shapes [2]. The term "Content" is the in the content might refer to colors, shape, textures or any other information that can be derived from the image itself. CBIR is desirable because searches that rely purely on metadata are dependent on annotation quality & completeness .Many CBIR systems have been developed, but the problems of retrieving images on the basis of their pixel content remains largely unsolved .CBIR is used for automatic indexing and retrieval of image depending upon the contents of the image known as features. The availability of image known as features. The availability of image capturing devices such as digital camera, image scanners, the size of digital image collection in increasing rapidly. It is imp to efficiently store and retrieve image for different application such as fashion design, crime prevention, medicine, architecture. CBIR is image have rich content. This content can be extracted as various content features. It takes the responsibility of forming the query away from the user and each image will now describe by its own features. In CBIR system image processing techniques are used extract visual features such as color, texture and shape from images the system uses a query model to convert the image into a representation of a query, based on features extracted from the input image. A retrieval model performs image retrieval by computing similarities between the image in object and query image. Content based image retrieval is defined as a process to find similar image database when a query image. The basic diagram of textural features is extracted from the both query image and the image in the database. The distance between the feature vectors of the query image and database are then computed and ranked .The image database that has the highest similarity to the query image are retrieved. Than the performance analysis is carried out using precision and recall. CBIR is working with different type of having two type of image liked labeled and unlabeled.

In this paper which study different approaches to image retrieval they are Multistage CBIR , Combining Object Detection Techniques with CBIR Systems, CBIR using color and texture[9], Image retrieval based on Integration between color histogram and shape feature, color histogram based image retrieval[3]. After studying these approaches we will drive to our conclusion shown in figure 1. The main goal of CBIR is efficiency during image indexing and retrieval, thereby reducing the need for human intervention in the indexing process [4]. The computer must be able to retrieve images from a database without any human interruption on specific domain such as color and texture. One of the main tasks for CBIR systems is similarity comparison; extracting feature of every image based on its pixel values and devising rules for comparing images. These features become the image representation for measuring similarity with other images in the database [5]. An image is compared to other images by calculating the difference between their corresponding features. Some of the existing CBIR systems extract features from the entire image instead of certain regions in it. These features are referred to as Global features.

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,)

II. Lterature survey

CBIR has attracted researchers from many research fields, including computer vision, artificial intelligence, human factors, and machine learning. In spite of, or perhaps because of, the relatively young age of CBIR as a phenomenon and research area, there has been an enormous growth of research articles on the topic. Many of their findings are already outdated by now, but two very important aspects of CBIR that are highlighted in their article are still very relevant today: the sensory gap and the semantic gap. The sensory gap is the unavoidable difference between the real object and the information observers can compile about the object. This gap can never be closed completely, but it can to an ever increasing extent be narrowed by improved sensors, signal processing and sensor fusion. The semantic gap is hence about the difference between the significance of data for humans and the representation of the same data in information processing systems. As highlighted in the most recent review article by, CBIR technology boils down to two fundamental problems:

1) To mathematically describe the image content (its image signature).

2) To assess the similarity between a pair of images based on their signatures.

In spite of the apparent simplicity of this, there are significant obstacles that need to be overcome in order to create a useful CBIR system. To find a good image signature using suitable image features is far from easy. We can of course represent an image as an array of pixel values, but this corresponds very poorly to how humans interpret and understand images. We survey feature extraction and selection techniques adopted in content based image retrieval (CBIR); a technique that uses the visual content of a still image to search for similar images in large-scale image databases, according to a user's interest. The CBIR problem is motivated by the need to search the exponentially increasing space of image and video databases efficiently and effectively. The visual content of an image is analyzed primarily in terms of low-level features extracted from the image. These constitute color, texture and shape features.

II. Techniques

3.1 Query techniques based CBIR Retrieval:

Query techniques example is query techniques that involve providing the CBIR system with an example image that it will then base its search upon. The underlying search algorithm may vary depending on the application, but result images should all provide.

i) A preexisting image may be chosen from supplied by the user or chosen from a random set.

ii) The user drowse rough approximation of the image they are looking for.

3.2 Color based CBIR Retrieval:

Computing distance measure based on color similarity is achieved by computing the color histogram for each image that identifies the proportion of an pixels within an image holding specific value. Based on the color they contain is one of the most widely used techniques because it can be completed without regard to image size or orientation. Research has also attempted to segment color, proportion by region and by the spatial relationship among several color regions. Color is a powerful descriptor that simplifies object identification [9] and is one of the most frequently used visual features for content-based image retrieval. To extract the color features from the content of an image, a proper color space and an effective color descriptor have to be determined. But gray level and pseudo color is insufficient to give the whole description of an image. But for a color image the results are better.

3.3 Texture based CBIR Retrieval:

Texture measures look for visual patterns in images and how they are spatially defined. Textures are represented by texture which are then placed into a number of sets, depending on how many textures are detected in the image. These sites not only define the texture, but also where in the image the texture is located. Texture in CBIR can be used for at least two purposes [10].First, an image can be considered to be a mosaic that consists of different texture regions. These regions can be used as examples to search and retrieve similar areas. Second, the texture can be employed for automatically annotating the content of an image. For example, the texture of an infected skin region can be used for annotating regions with the same infection Textural representation approaches can be classified into statistical approaches and structural approaches [11]. Statistical approaches analyze textural characteristics according to the statistical distribution of image intensity. Approaches in this category include gray level co-occurrence matrix, fractal model, Tamura feature, World decomposition. Structural approaches characterize texture by identifying a set of structural primitives and certain placement rules. If medical images are represented in gray level, texture becomes a crucial feature, which provides indications about scenic depth, the spatial distribution of tonal variations, and surface orientation. For example, abnormal symptoms in female breasts include calcification, architectural distortion, asymmetry, masses, and so forth. All of these reveal specific textural patterns on the mammograms [12]. However, selection of texture features for specifying textural structure should take account of the influence from the modulation transfer function on texture . As the intensifying screens are used to enhance the radiographs, the blurring effect also changes texture features, that is, spatial resolution, contrast, and sharpness are all reduced in the output. Low resolution and contrast result in difficulties in measuring the pattern of tissue and structure of organs.

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 [13]. The relative brightness of pairs of pixels are computed such that degree of contrast, regularity, coarseness and directionality may be estimated. The problem is in identifying patterns of co-pixel variation and associating them with particular classes of textures [14] such as silk, or rough.

Other methods of classifying textures include:

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

3.4: Shape based CBIR Retrieval:

The shape may be defined as the characteristic surface configuration of an object; an outline or contour[15]. It permits an object to be distinguished from its surroundings by its outline [11]. The 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.. Shape descriptors may also need to be invariant to translation, rotation, and scale.[20,21] .

Some shape descriptors include [12-16-17]:

- Fourier transforms
- Moment Invariant

For ex. In Google image typing ‘Apple’ returns the Apple products as well as the Apple fruit. The main reason is the ambiguity in the language several other limitations.[18,19].

III. DAGRAM TEXTUAL FEATURE

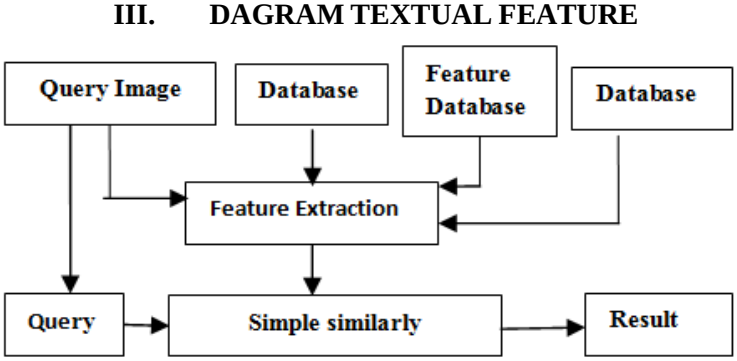

Figure 1. Flow Digram Textual Feature

Table-1: The Various Feature Techniques:

Various Features	Techniques	Characteristics
Color Features	Conventional color histogram (CCH), fuzzy color histogram (FCH),[20,21]Color correlogram,	Easy computation. Does not encode spatial info. Does not encode color pixel similarity. Considers degree of color similarity between pixels. Robust to quantization error. Robust to changes in light intensity.
Texture Features	Steerable pyramid, Contour let transform, Complex directional filter bank (CDFB)	Basic filters are translation and rotation of a single function The filter is a linear combination of basic functions Only for rotation-invariant texture retrieval. Combination of a Laplacian pyramid and directional filter bank. Low computational complexity. Optimally achieves joint resolution in space and spatial frequency. Computationally intensive. Highest texture retrieval results. Retrieval results comparable with Gabor wavelet results Shift Invariant.
Shape Extraction	Fourier Descriptor, Moment Invariants, Directional Histograms,	In the phase of understanding and implementing shape.

III. Conclusion

The CBIR is retrieval of an image from a data based on content feature such as color, texture and shape insufficiency in certain application our approach. In the phase of understating and implementing shape and the color correlogram describe the global distribution of local spatial correlation of colors. It is very easy to compute using techniques . It's more stable than the color histogram method. We are presenting a three feature color, shape and texture and color histogram is mostly used to represent color feature, but it cannot entirely characterize the image and is also rotation invariant about the view axis with the help of image database .

The goal of medical image database it to provide an effective means for organizing, searching and indexing a large collection of medical images. Content based image retrieval is a promising approach to achieve these tasks and has developed a number of techniques used in medical image but big database are used more technique using CBIR . The retrieval of relevant image based on measuring the similarity between automatically derived features (color, shape, texture) of the query image and that of image stored in the database, a problem popularly knows a content based image retrieval is a highly challenging task.

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