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A Study for Searching an Image through Content Features

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Abstract- **There is different methods of searching an image from database. Most methods use keywords for image retrieval. It is easy to search an image from small database consisting of 10 to 20 images. Even human beings can search easily. But problems come when we have to search an image from a huge database, (say) from 10000 or more images. It is very difficult and time consuming to compare query image (QR i.e query image is an image which we want to search) with all the images of large database one by one to search an image. Finding an image from large collection of database is termed as Image Retrieval (IR). It becomes a very difficult task when an image to be searched from millions of images especially from internet. Searching an image with the help of image content features (Color, Shape, Edge Detection , Texture Etc.) instead of keywords is called Content Based Image Retrieval(CBIR).[5]**

Keywords - Image Retrieval; CBIR; Extraction

I. INTRODUCTION

Identifying an image from the huge database is called the image retrieval. Here the images can be retrieved on the basis of local and global features derived from color, texture, and simple shape information. There are number of difficulties in content based image retrieval due to the less amount of information related to extracted features in stored database. One problem frequently arises in content based image retrieval, when the image to be searched from a database that contains only strongly restricted domain. The other problem of searching concerned image occurs when the image is to be searched from a huge dynamic collection of different images. It is very difficult to make an index of images in world wide web. The simple problem in CBIR is that human beings cannot understand contents features extracted from images and used by a computer to index the images in a database. In this paper, we will concentrate on the retrieval of image through its contents features. The actual work is here is to take a query image first or it can be called an input image. Then next step is to identified and extract the important features from the image that will help in the process of retrieval image from the database. CBIR refers to image content that is retrieved directly, by which the images with certain features or containing certain content will be searched in an image database. The main idea of CBIR is to analyze image information by low level features of an image [1], which include color, texture, shape and space relationship of objects etc., and to set up feature vectors of an image as its index. Retrieval methods focus on similar retrieval and are mainly carried out according to the multi-dimensional features of an image. Some QBIR system retrieved images on low-level features such as texture and color of an image [1]. Main work is to retrieve the image. The object of the image may be the good candidate for retrieval and it includes the categories of the object classes (city/human/animal/sunset/beach). It is not certain that the image could be retrieved by a user with a different description. The problem is fundamentally one of communication between an information/image seeker/user and the image retrieval system. Since the user may have differing needs and knowledge about the image collection, an image retrieval system must support various forms for query formulation [2]. In general, image retrieval queries can be classified as:

A. Attribute-based queries, which use context and/ structural metadata values to retrieve images, for example:
   - *Find image number 'x'* or
   - *Find images from the 26 of January* (the Republic Day national holiday day).

B. Textual queries, which use a term-based specification of the desired images that can be matched to textual image descriptors, for example:
   - *Find images of sunsets* or
   - *Find images of Prime Minister Modi delivering a campaign speech*

C. Visual base queries, which give visual characteristics (color, texture) or an image example, that can be compared to visual descriptors. Examples include:
   - *Retrieve the image based on the visual contents like color(where color is Red/Blue/Green/Yellow) , text, pixel level etc.*
   - *Based on the Object set.*

Retrieval of the image by visual contents required signatures that can be indexed. An image query is analyzed using the same descriptor technique(s) giving a query signature, which is then compared to the image signature(s) from the database image and find out the similarity between images. To implement this technique we need an input image as search criteria and a query specifying criteria. The same method should be used to store the image into the database.

If the input query image is same type as in the Data Base. But if the type is different than this technique will not work i.e. if you are trying to retrieve an original image on the basis of a sketch or scanned painting.

II. SAMPLE CBIR ARCHITECTURE

Content-Based Image Retrieval (CBIR), a technique which uses visual contents to search images from large scale image

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databases according to users' interests, has been an active and fast advancing research area in last 3 decades.

There are following components of Content Based Image Retrieval:

User
Search for Images
Feature Extraction
System Administrator
Insert/Delete Images
Indexing Mechanism
Database Handler
Database

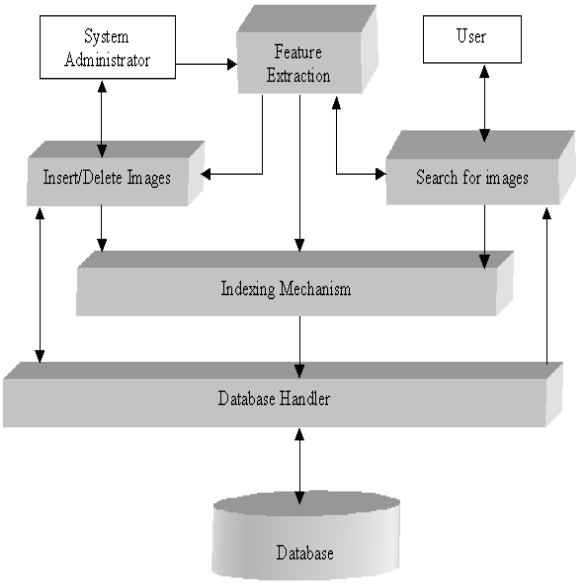
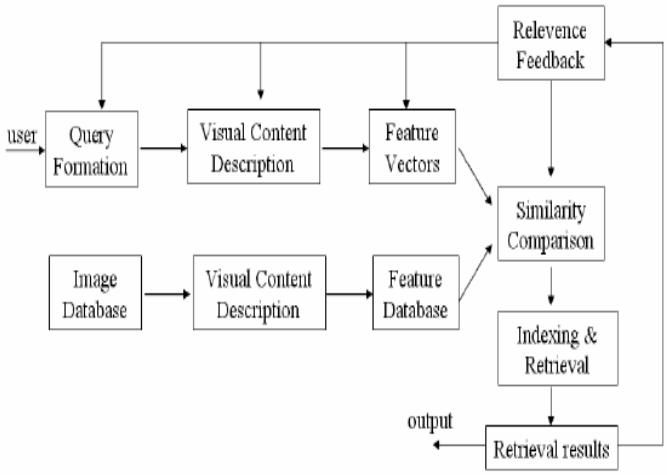


Figure II.1: Basic Architecture of Image Retrieval [4].

III. WORKING OF GENERAL CBIR SYSTEM



IV. STEPS OF IMAGE RETRIEVAL

CBIR involves the subsequent four parts in system realization [6], data collection, build up feature database, search in the database, arrange the order and deal with the results of the retrieval [1].The four steps are-

(i). Data Collection

(ii). Extraction of Features from Database

(iii). Comparison with Database

(iv). Result Analysis

(i). Data Collection

By using Internet spider program that can collect webs automatically to interview Internet and do the gathering of the images on the web site, then it will go over all the other webs through the URL, repeating this process and collecting all the images it has reviewed into the server.

(ii). Extraction of Features from Database

Using index system program do analysis for the collected images and extract the feature information. At this time, the features that use widely involve low-level features such as color; texture and so on, the middle-level features such as shape.

(iii). Comparison with Database

System extracts the feature of image that waits for search when user input the image sample that need search, then the search engine will search the suitable feature from the database and calculate the similar distance, then find some related webs and images with the lowest similar distance.

(iv). Result Analysis

Index the image obtained from searching due to the similarity of features, and then returns the retrieval images to the user and allows the user select. If the user is not pleased with the searching result, he can retrieval the image again, and searches database again.

V. FEATURES EXTRACTION

Feature (content) extraction [7] is the basis of content-based image retrieval. In a broad sense, features may include both text-based features (key words, annotations) and visual features (color, texture, shape, faces). However, since there already exists rich literature on text-based feature extraction in the DBMS and information retrieval research communities, we will confine ourselves to the techniques of visual feature extraction. Within the 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, for example, human faces and finger prints. The domain-specific features are better covered in pattern recognition literature and may involve much domain knowledge which we will not have enough space to cover in this paper. Therefore, the remainder of the section will concentrate on those general features which can be used in most applications. Because of perception subjectivity, there does not exist in a single best presentation for a given feature.[8]

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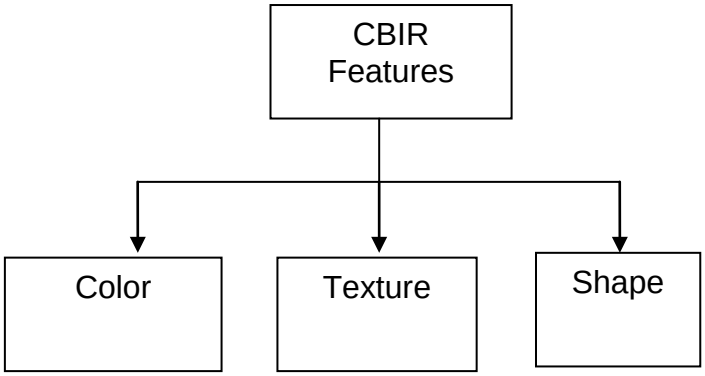

Figure V.1: Feature of an Image for Extraction

a. Color Feature

One of the most significant features of image color. Using color human beings can search images but there are number of problems with color because shade of particular color may vary from person to person due to light reflection. Moreover there are number of shades of one particular color. The color feature is one of the most widely used visual features in image retrieval. It is relatively robust to background complication and independent of image size and orientation. Some representative studies of color perception and color spaces can be found in [9-10].

JPEG, BMP, GIF, PNG etc. are the various image formats that use Red, Green, Blue (RGB) color scheme to store the image. There are three different axis of RGB color space. RGB scheme uses hexadecimal color codes to represent different colors. The hexadecimal code consist of values1,2,3,4,5,6,7,8,9,A,B,C,D,E,F .If all the codes are 000000 ,then it will represent black color. When the color code is FFFFFF ,then white color is represented. Code FF0000 represents red color, code 00FF00 represents green color and code 0000FF represents blue color. Codes FF0000, CC0000, 990000, 550000 etc all represent red color but with different shades. Similarly, different colors are represented by altering hexadecimal code values.

These color codes are used to representing images in CBIR systems. A color codes are like three bars of graphs where different color are represented by different bar. Images characterized by color features have many advantages:

- Efficiency

There is high percentage of relevance between the query image and extracted matched images.

- Strength

The color histogram is invariant to rotation of the image on the view axis and changes in small steps when rotated otherwise or scaled .It is also not sensitive to changes in image and histogram resolution and occlusion.

- Simplicity

The construction of the color histogram is a simple process, including scanning the image, the resolution of the histogram, assigning color values to, and building the histogram using color components as indices.

- Low Storage Requirements

The color histogram size is significantly smaller than the image itself, because of color quantization.

b. Texture Features

In the field of computer vision and image processing there is no exact definition of texture [11], available texture definitions are based on texture analysis methods and the features extracted from the image. Texture is a main component of human visual perception. Like color, this also makes it an essential feature to consider when querying image databases. Everyone can recognize texture but, it is not easy to define. Unlike color, texture occurs over a region rather than on a point. It is normally defined purely by grey levels and as such is orthogonal to color. Texture has qualities like periodicity and scale; it can be described in terms of coarseness, direction, contrast. However texture can be considered as repeated patterns of pixels over a spatial domain, of which the addition of noise to the patterns and their repetition frequencies result in textures that can become visible to random and unstructured. Or in other word we can say that visual patterns in image surface are located using texture property that have properties of homogeneity. It contains important information related to the structural arrangement of the surface, such as; skies, branches of trees, rocks, sun etc. Texture property also enables the relationship of the surface to the surrounding environment [12].

Textual queries, which use a term-based specification of the desired images that can be, matched to textual image descriptors, for example:

- Issues in Texture Analysis

 Texture Classification is concerned with identifying a given textured region from a given set of texture classes. Each of these regions has unique texture quality. Basically Statistical methods are extensively used like GLCM, contrast, entropy, homogeneity.

 Texture segmentation: Another is texture segmentation is concerned with automatically determining the boundaries between various texture regions in an image.

- Text-based image retrieval

Often, the image requester is able to give a verbal specification of the content of the required images, for example images showing

- "Hello How are U
- "wedding parties at a Modi Temple Patiala".

These text-based queries can be formulated as free-text or a term list that can be compared to such text descriptors as description, subjects, title and/or the text surrounding an embedded image, using the text retrieval techniques.

As noted, if "Google's" whale images (i.e. the Web pages containing whale images) were collected in an extended (with multimedia functionality) or-DB, it would also be possible to use an extended sql3/Text query such as:

select images from image database where
contains (Web-pages, 'Hello' and 'How' and 'U');

Both Google/Image and SQL3/Text use term indexes developed on text fields to facilitate query execution, as well as contains and similar to operators.

c. Shape Features

Another major image feature is the shape of the object contained in the image Surface configuration characteristics of an image can also be defined using shape feature of an image. It permits an object to be distinguished from its surroundings by its outline [12] Boundary-based, and Region based are the two methods used in shape features. Boundary-based shape representation only uses the outer boundary of the shape. This

is done by describing the considered region using its external characteristics, like the pixels along the object boundary. But the Region-based shape representation is totally dissimilar from the prior method .It uses the entire shape region by describing the considered region using its internal characteristics; i.e., the pixels contained in that region .The shape of an object is a binary image representing the extent of objects. In region-based considers the shape being composed of a set of two-dimensional regions, while the boundary based representation presents the shape by its outline. While in region-based feature vectors often result in shorter feature vectors and simpler matching algorithms. However, generally they fail to produce well-organized similarity retrieval. On the other hand, feature vectors extracted from boundary-based representations provide a richer description of the shape. This scheme has led to the development of the multi-resolution shape presentations, which proved very useful in similarity assessment.

VI. ALGORITHM

STEP1: Load query image that is the image which is to be retrieved.
STEP2: Process the query image and convert it into binary image (or grey scale image).The converted binary image contains two colors-black and white.'0' represents black and '1' represents white
STEP3:Detect the edges of the binary image using Corner Matrix and Corner Detector method which put 1's where edges are detected and '0' where no edge is found.
STEP4: Now compare this image with all the images present in database one by one.
STEP5:Find the maximum matches features and strongest points.
STEP6: Find Ist nearby image having maximum matched features.
STEP7:Find the IInd nearby image .
STEP8:EXIT

VII. CONCLUSION

In this paper we study the content based image retrieval. Searching an image through objects features present in an image instead of using any keyword is known as content based image retrieval that is CBIR. In content based image retrieval, we present an algorithm to retrieve an image through image contents. This algorithm first convert the image to be searched in grey scale image and then detect the edges that is edge detection and compare with the database . It finds two nearby images from the database.

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