CONTENT BASED IMAGE RETRIEVAL :A REVIEW

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Abstract— **Content based image retrieval is the task of retrieve the images from the large collection of database on the basis of their own visual content. This paper provides the survey of technical achievements in the research area of content based image retrieval (CBIR). The research in this field way began way back at the end of nineteenth century but this has gained impetus from 1970 onwards with the thrust from two major research communities, database management and computer vision. This paper tries to provide comprehensive review of Content Based Image Retrieval**

Index Terms— **Image Retrieval, Content Based Image Retieval, CBIR Techniques .**

I. INTRODUCTION

Due to exponential increase of size of so called multimedia files in recent years because of the substantial increase of affordable memory storage on one hand and the wide spread of World Wide Web (www) on the other hand, the need for the efficient tool to retrieve the images from the large data base becomes crucial. This motivates the extensive research into image retrieval systems. From the historical perspective, the earlier image retrieval systems are rather text-based with the thrust from database management community since the images are required to be annotated and indexed accordingly [1]. However with the substantial increase of the size of images as well as size of image database, the task of user-based annotation becomes very cumbersome and at some extent subjective and thereby, incomplete as the text often fails to convey the rich structure of images. In the early 1990s, to overcome these difficulties this motivates the research into what is referred as content based image retrieval (CBIR) where retrieval is based on the automating matching of feature of query image with that of image database through some image-image similarity evaluation [2]. Therefore images will be indexed according to their own visual content such as color, texture, shape

II. APPLICATION

i) The advantages of such systems range from simple users searching a particular image on the web.
ii) Various types of professionals like police force for picture recognition in crime prevention.
iii) Medicine diagnosis
iv) Architectural and engineering design
v) Fashion and publishing
vi) Geographical information and remote sensing systems

III. CBIR: AN OVERVIEW

Content based image retrieval: 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.

"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. CBIR is desirable because most web based image search engines rely purely on metadata and this produces a lot of garbage in the results. Also having humans manually enter keywords for images in a large database can be inefficient, expensive and may not capture every keyword that describes the image. Thus a system that can filter images based on their content would provide better indexing and return more accurate results.

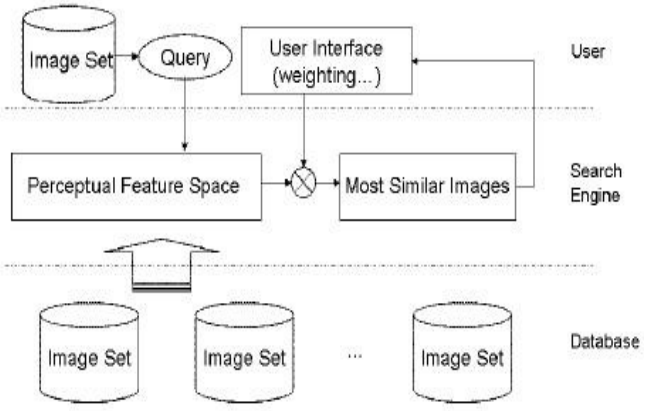

Figure: Generic CBIR system

There are three fundamental bases for content based image retrieval, i.e. visual feature extraction, multidimensional indexing, and retrieval system design[14].

1 Feature extraction and indexing of image database according to the chosen visual features, which from the perceptual feature space, for example color, shape, texture or any combination of above.
2 Feature extraction of query image.
3 Matching the query image to the most similar images in the database according to some image-image similarity measure. This forms the search part of CBIR systems.
4 User interface and feedback which governs the display of the outcomes, their ranking, the type of user interaction with possibility of refining the search through some automatic or manual preferences scheme etc.

ISSN: 2278 – 7798

CBIR involves the following four parts in system realization: data collection, build up feature database, search in the database, arrange the order and deal with the results of the retrieval [8].

***Data collection*:** Using the Internet spider program that can collect webs automatically to interview Internet and do the collection 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.

Build up feature: This system based on indexing. Firstly we analyse the collected images and then extract the feature information. Currently, the features that use widely involve low level features such as color, texture and so on, the middle level features such as shape etc.

***Search the Database*:** the search engine will search the suited feature from the database and calculate the similar distance, then find several related webs and images with the minimum similar distance.

***Process and index the results*:** Index the image obtained from searching due to the similarity of features, then return the retrieval images to the user and let the user select. If the user is not satisfied with the searching result, he can re-retrieval the image again, and searches database again.

IV. TYPES OF CBIR BASED IMAGE RETRIEVAL:

a) *Region-based*: The Netra and Blobworld are two earlier region based image retrieval systems [4]. During retrieval, a user is provided with segmented regions of the query image, and is required to assign several properties, such as the regions to be matched, the features of the regions, and even the weights of different features [5].

b) *Object-based*: Object-based image retrieval systems retrieve images from a database based on the appearance of physical objects in those images. These objects can be elephants, stop signs, helicopters, buildings, faces, or any other object that the user wishes to find. One common way to search for objects in images is to first segment the image in the database and then compare each segmented region against a region in some query image presented by the user [6]. Such image retrieval systems are generally successful for objects that can be easily separated from the background and that have distinctive colors or textures[13].

c) *Example-based* : Users give a sample image, or portion of an image, that the system uses as a base for the search[13]. The system then finds images that are similar to the base image.

d) ***Feedback-based*:** System shows user a sample of pictures and asks for rating from the user. Using these ratings, system re-queries and repeats until the right image is found [7]

IV. FEATURE EXTRACTION:

The different methods based on features are used to extract the images. The main features based methods are described as following.

a) *Color:* Color is the feature of content based image retrieval systems for retrieve the image. First a color space is used to represent color images. The RGB space where the gray level intensity is represented as the sum of red, green and blue gray level intensities [9]. Variety of color spaces include, RGB, LUV, HSV (HSL), YCrCb and the huemin-max-difference (HMMD) [10].Common color features or descriptors in CBIR systems include, color-covariance matrix, color histogram, color moments and color coherence vector. The Color Structure Descriptor (CSD) represents an image by both the local structure of the color and the color distribution of the image or image region.

b) *Texture:* The notion of texture generally refers to the presence of a spatial pattern the has some properties of homogeneity [11]. 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. The relative brightness of pairs of pixels is computed such that degree of contrast, regularity, coarseness and directionality may be estimated (Tamura, Mori & Yamawaki, 1978). However, the problem is in identifying patterns of co-pixel variation and associating them with particular classes of textures such as *silky*, or *rough*.

c) *Shape*: Shape is also one of the important features of an image. 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. Image queries in CBIR systems are traditionally performed by using an example image or a series of images. Generally we can divided the shape into two categories, region-based and boundary-based. In the late years we just uses only the outer boundary of the shape while the current uses the entire shape region [9], [12].

VI. CBIR TECHNIQUES

Different implementations of CBIR make use of different types of user queries.

CBIR system using QBE: Query-by-example or pictorial-query approaches make the system return similar images to the example image given by a user. The underlying search algorithms may vary depending on the application, but result images should all share common elements with the provided example.

ISSN: 2278 – 7798

Options for providing example images to the system include:

- A pre-existing image may be supplied by the user or chosen from a random set.
- The user draws a rough approximation of the image they are looking for, for example with blobs of color or general shapes.

To begin a search, the user has an example image to submit as a query. The example images Type equation here.can be a photograph, user-painted example, or line- drawing sketch. The query serves as an approximation of the objective image being sought. The CBIR systems access the image in the database, matches the query against the information in the database, and scores the images in terms of similarity. . In this method, images are retrieved by their contents: color, texture, shape, or objects. The matching is based on chromatic and textures features with equal weights. Thus, the degree of similarity between query images and images in databases can be measured by color distribution, texture distribution, shape similarity, or object presence between the two images. The top *k*-best images are returned as results. Upon receiving the result, user evaluates if the images in the result are relevant and selects another image from the result or database to refine the query. This query technique removes the difficulties that can arise when trying to describe images with words.

Semantic retrieval: 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 dogs" or even "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.

Other query methods: Other query methods include browsing for example images, navigating customized/hierarchical categories, querying by image region (rather than the entire image), querying by multiple example images, querying by visual sketch, querying by direct specification of image features, and multimodal queries (e.g. combining touch, voice, etc.) .

CBIR systems can also make use of *relevance feedback*, where the user progressively refines the search results by marking images in the results as "relevant", "not relevant", or "neutral" to the search query, then repeating the search with the new information

VII. APPLICATIONS

Examples of CBIR applications are:

- **Crime prevention:** Automatic face recognition systems, used by police forces.
- **Security Check:** Finger print or retina scanning for access privileges.
- **Medical Diagnosis:** Using CBIR in a medical database of medical images to aid diagnosis by identifying similar past cases.
- **Intellectual Property:** Trademark image registration, where a new candidate mark is compared with existing marks to ensure no risk of confusing property ownership.

VIII. CONCLUSION

- As conclusion, this paper provides a image retrieval work. A wide researches of have been made on image retrieval. Each work has its own techniques, contribution and limitations. As a review paper, it might not include each and every aspects of individual work, however this paper attempts to deal with a detailed review of the most common , traditional and modern content based retrieval

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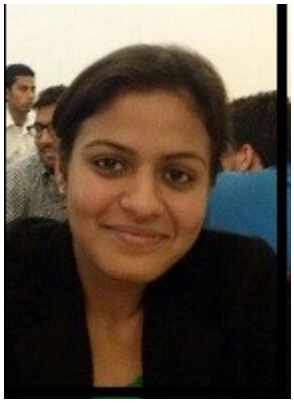
ISSN: 2278 – 7798



I received B.Tech. degree in information Technology from Maharishi Dayanand University (MDU), India in 2011 and pursuing my M.Tech degree from Deen Bandhu Chotu Ram University of Science and Technology, India. My area of interest is to find the efficient method to retrieve the image in the field of Digital Image Processing.

ISSN: 2278 – 7798