QUERY BY IMAGE CONTENT IN IMAGE PROCESSING

G Sasi Bhushana Rao
Assoc Prof, CSE Department
Bonam Venkata Chalamayya Engineering College
Odalarevu,EG(dt),AP, India

B Narasimha Rao
Assoc Prof, CSE Department
Bonam Venkata Chalamayya Engineering College
Odalarevu,EG(dt),AP, India

P V N Sagar
Assistant Prof, S&H Department
Bonam Venkata Chalamayya Engineering College
Odalarevu,EG(dt),AP, India

Abstract: **Content Based Image Retrieval (CBIR) is the most interesting research areas due to the proliferation of video and image data in digital way. Basically, CBIR is on developing technologies to bridge the gap that currently prevents wide-deployment of image content-based search engines. Image search engines currently in use such as Google Images and Yahoo! Image search, are based on textual explanation of images. With the speed and perfection retrieval of image from huge databases is an important problem that needs to be discussed. Here, images are manually annotated with phases, which depends totally on the public view, and then retrieved using text-based search methods. This method is both time-consuming and prone to errors. Hence, such search engines result in retrieving many non-relevant images. To overcome such drawbacks of text based image retrieval, CBIR is introduced where the visual content of an image, such as color, texture and shape, is extracted automatically; In this paper, we will try to study the basic block diagram of CBIR and the different techniques currently being used, such as color histogram.**

Keywords: Methods of Image Retrieval, CBIR, color feature, color histogram

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 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. The term 'content' in this context might refer colors, shapes, textures, or any other information that can be derived from the image itself. Without the ability to examine image content, searches must rely on metadata such as captions or keywords. Such metadata must be generated by a human and stored alongside each image in the database.

Problems with traditional methods of image indexing have led to the rise of interest in techniques for retrieving images on the basis of automatically-derived features such as color, texture and shape – a technology now generally referred to as Content-Based Image Retrieval (CBIR). However, the technology still lacks maturity, and is not yet being used on a significant scale. In the absence of hard evidence on the effectiveness of CBIR techniques in practice, opinion is still sharply divided about their usefulness in handling real-life queries in large and diverse image collections. The concepts which are presently used for CBIR system are all under research.

II. IMAGE RETRIEVAL METHODS

Image retrieval consists of two different methods:

1. Text-Based image retrieval
2. Content-Based image retrieval

The Text-Based image retrieval method is based on keyword and it is easy to be implemented. The images are manually annotated with keywords, and then retrieved using text-based search methods. Textual annotation can be thought of as an instantiation of mental image; hence it depends totally on the person's perception. This method is both time-consuming and prone to errors. Hence, such search engines result in retrieving many non-relevant images. For example, in a search engine if the user enters text as Plane, it can be a plane surface or an aero plane. Also, the fact that two visually different images can convey the same concept and different concepts may be present in an image, brings about a gap between image retrieval by concept and retrieval by content.

Content-Based image retrieval (CBIR) is also known as query by image content. Content-based means the search will analyze the actual contents of image. In CBIR, the visual content of an image is extracted automatically. There are many features that make an image; but four of them are considered to be main features i.e. colour, texture, shape and spatial properties. The retrieval of images is totally dependent on these features. However, spatial properties are implicitly taken into account. So, the main features to consider are colour, texture and shape.

III. CONTENT-BASED IMAGE RETRIEVAL SYSTEM

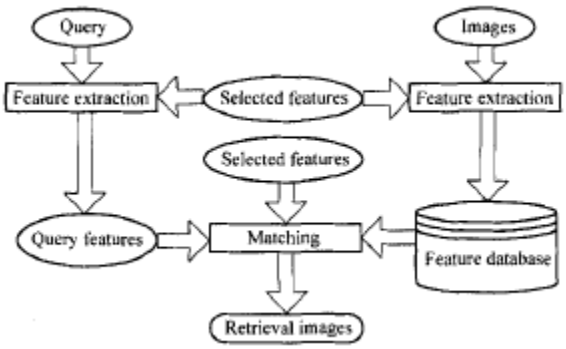

Fig. 1 Block diagram for CBIR system

In a typical CBIR process, the features from each image are extracted and stored in the database efficiently. To retrieve the images, extract the corresponding features from the query image and search the image database to identify the images that are similar to it; and returns the results[2] [4]. Thus, a typical CBIR system (Fig.1) consists of three major components and the variations of them depend on features used.

i. Feature extraction – Analyze raw image data to extract feature specific information; plays an important role to support for efficient and fast retrieval of similar images from image databases.

ii. Feature storage – Provide efficient storage for the extracted information, also help to improve searching speed.

iii. Similarity measure – Measure the difference between images for determining the relevance between images, yielding a result that is visually similar.

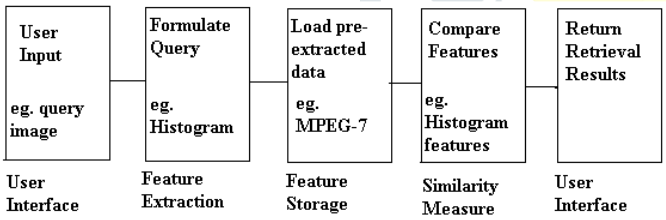

Fig. 2 Flow of a typical CBIR process

Fig. 2 describes the flow of a typical CBIR process. In the whole CBIR process, feature extraction is crucial [3]. Feature extraction and similarity measure are very dependent on the features used. In each feature, there would be more than one representation. Among these representations, histogram is the most commonly used technique to describe features. In practice, a feature or a combination of features is often used to search for images. The relevance between a query image and any target image is ranked according to a similarity measure computed from the visual features.

IV. IV COLOR MODEL:

One of the most important features that make possible the recognition of images by humans is color. Color is a property that depends on the reflection of light to the eye and the processing of that information in the brain. Color not only adds beauty to objects but also more information [6]. Hence, it s a powerful tool in CBIR. There are many color models to express color such as the RGB color model, the YUV color model and the HSV color model. The HSV model is most consistent as it includes the human visual model [5]. H represents color hue and it is the wavelength of the light reflected from an object or throughout the object; S represents color saturation i.e. how much white is added to the color; V represents vale (brightness) i.e. the degree of color shading. But, the computer can identify only the RGB color components of an image, in which R represents the red component, G represents the green component and B the blue component. Therefore, the following formula is used for image conversion from RGB color space to HSV color space.

$$h' = \begin{cases} \frac{(g-b)}{\delta} & if \quad r = \max \\ \frac{2+(b-r)}{\delta} & if \quad g = \max \\ \frac{4+(r-g)}{\delta} & if \quad b = \max \end{cases} \qquad h = h' * 60 \qquad s = \frac{max - min}{max} \qquad v = \frac{r+g+b}{3}$$

$\max=MAX(r,g,b)$, $\min=MIN(r,g,b)$,
$\delta=\max-\min$,
$h \in [0,360]$, $(s,v) \in [0,1.0]$

V. COLOR QUANTIZATION

For a true color image, the number of the kind of the colors up to 224 = 16777216, so directly extract color feature from true color will lead to large computation. In order to reduce the computation, without a significant reduction in image quality, some representative color is extracted to represent image, thereby to reduce storage space and enhance the purpose of processing speed [7]. The color regions are perceptually distinguishable to some extent. The human eye cannot detect small color different and may perceive these very similar colors as the same color. This leads to the quantization of color, which means that some pre-specified colors will be present on the image and each color is mapped to some of these pre-specified colors. One obvious consequence of this is that each color space may require different levels of quantized colors, which is nothing but a different quantization scheme. There are 36, 72 and 256 quantitative color quantization and we can depend on different need to select different levels of quantitative methods. In Fig.3, the effect of color quantization is illustrated. Fig. 3(a) is the original image with RGB color space and Fig.3 (b) is the image produced after transformation into HSV color space and quantization.

Fig.3 Transformation and Quantization of tiger image
(a) Original image.
(b) Image produced by applying RGB to HSV color transformation and Quantization

VI. COLOR HISTOGRAM

A color histogram is a type of bar graph, where each bar represents a particular color of the color space being used. We can get a color histogram of an image in the RGB or HSV color space. The bars in a color histogram are referred to as bins and they represent the x-axis. The number of bins depends on the number of colors there are in an image. The y-axis denotes the number of pixels there are in each bin. In other words how many pixels in an image are of a particular color [8]. However, color histogram has its own drawbacks, such as the color histograms of different images may be the same: there are two unrelated images in Fig.4, but they are the same as the color histogram in Fig.5.

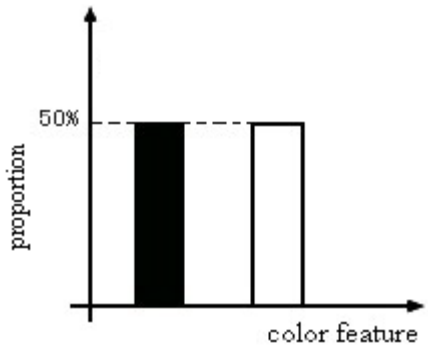

Fig.5 Color Histogram

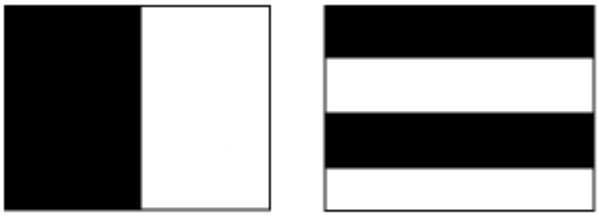

Fig.4 Two unrelated images

VII. CONCLUSION

The traditional image retrieval mainly depends on color, texture and shape. For these basic visual features are just parts of image information, the retrieval results are not so perfect. After the absolute analysis of the results obtained by each method following conclusions can be drawn. When only color is considered as retrieval parameter in CBIR gives only 62.5% of average retrieval efficiency.

In addition, the similarity measures between visual features do not necessarily match human perception. Hence different similarity measures are also to be studied.

REFERENCES

[1] Jing-Ming Guo and Heri Prasetyo,"Content-Based Image Retrieval Using Features Extracted From Halftoning-Based Block Truncation Coding," IEEE Transactions On Image Processing, Vol. 24, No. 3,pp.1010-1024, March 2015.

[2] E. J. Delp and O. R. Mitchell, "Image compression using block truncation coding," IEEE Trans. Commun., vol. 27, no. 9,pp. 1335–1342, Sep. 1979.

[3] V. Udpikar and J. Raina, "BTC image coding using vector quantization," IEEE Trans. Commun., vol. 35, no. 3, pp. 352–356, Mar. 1987.

[4] Y. Wu and D. C. Coll, "BTC-VQ-DCT hybrid coding of digital images," IEEE Trans. Commun., vol. 39, no. 9, pp. 1283–1287, Sep. 1991.

[5] C. S. Huang and Y. Lin, "Hybrid block truncation coding," IEEE Signal Process. Lett., vol. 4, no. 12, pp. 328–330, Dec. 1997.

[6] Y.-G. Wu and S.-C. Tai, "An efficient BTC image compression technique," IEEE Trans. Consum. Electron., vol. 44, no. 2, pp. 317–325, May 1998.

[7] M. Lema and O. R. Mitchell, "Absolute moment block truncation coding and its application to color images," IEEE Trans. Commun., vol. 32, no. 10, pp. 1148–1157, Oct. 1984.

[8] J.-M. Guo and M.-F. Wu, "Improved block truncation coding based on the void-and-cluster dithering approach," IEEE Trans. Image Process., vol. 18, no. 1, pp. 211–213, Jan. 2009.

[9] J.-M. Guo, "High efficiency ordered dither block truncation coding with dither array LUT and its scalable coding application," Digit. Signal Process., vol. 20, no. 1, pp. 97–110, Jan. 2010.

[10] J.-M. Guo, M.-F. Wu, and Y.-C. Kang, "Watermarking in conjugate ordered dither block truncation coding images," Signal Process., vol. 89, no. 10, pp. 1864–1882, Oct. 2009.

[11] J.-M. Guo and J.-J. Tsai, "Reversible data hiding in highly efficient compression scheme," in Proc. IEEE Int. Conf. Acoust., Speech, Signal Process., Apr. 2009, pp. 2012–2024.

[12] G. Qiu, "Color image indexing using BTC," IEEE Trans. Image Process., vol. 12, no. 1, pp. 93–101, Jan. 2003.

[13] M. R. Gahroudi and M. R. Sarshar, "Image retrieval based on texture and color method in BTC-VQ compressed domain," in Proc. 9th Int. Symp. Signal Process. Appl., Feb. 2007, pp. 1–4.

[14] F.-X. Yu, H. Luo, and Z.-M. Lu, "Colour image retrieval using pattern cooccurrence matrices based on BTC and VQ," Electron. Lett., vol. 47, no. 2, pp. 100–101, Jan. 2011.

[15] S. Silakari, M. Motwani, and M. Maheshwari, "Color image clustering using block truncation algorithm," Int. J. Comput. Sci. Issues, vol. 4, no. 2, pp. 31–35, 2009.