Abstract: This paper describes the earlier work done by researchers on image retrieval using text and the driving force behind the content based image retrieval. The three most common features upon which images are compared in content based retrieval are color, shape, and texture. Color is the most extensively used visual content for image retrieval. Commonly used color descriptors are the color histogram, color coherence vector, color correlogram, and color moments. Among these the color histogram is easy to compute and effective in characterizing both the global and local distribution of colors in an image. My work is related to finding effect of rotation, change in distance and angle on histogram.

1. Introduction:

Work on image retrieval started in late 1970s. In 1979, a conference on Database Techniques for Pictorial Applications [1] was held in Florence. Since then, the application potential of image database management techniques has attracted the attention of researchers [2, 3, 4, 5]. Traditionally, images were first annotated with text and then searched using a text-based approach from traditional database management systems. Survey of early text-based image retrieval methods can be found in [6,7].

Text-based image retrieval uses traditional database techniques to manage images. Through text descriptions, images can be organized by topical or semantic hierarchies to facilitate easy navigation and browsing based on standard Boolean queries. However, since automatically generating descriptive texts for a wide spectrum of images is not feasible, most text-based image retrieval systems require manual annotation of images. But, annotating images manually is a tedious and time consuming task for large image databases, and is often context-sensitive and incomplete. As a result, it is difficult for the traditional text-based methods to support a variety of task-dependent queries.

In the early 1990s, because of advances in Internet, invention of digital cameras and fast growth of digital technology results in digitization of all kinds of materials. Existing files, project reports, journals, conference papers, magazines, advertisements, paintings, books, historical manuscripts, newspapers, maps, videos images are converted into scanned digital images. The difficulties faced by text-based retrieval became more and more severe. The efficient management of the rapidly expanding visual information became an urgent problem. This need formed the driving force behind the emergence of content-based image retrieval techniques.

Part 2 of this paper includes discussion on CBIR framework. Part 3 is about image content descriptors, where focus is on color space and color histogram. Part 4 is all about experimental work done on histogram generation and its statistical information. Part 5 is conclusion.

2. CBIR Framework:

Content Based Image Retrieval is a technique which uses visual clues to retrieve images from large scale databases. The typical CBIR framework (Figure 1) include Databases, Image Retrieval Engine and similarity measurement task.

Databases: CBIR framework includes three types of databases mainly:

1) The image collection database that contains the raw images for visual display purpose
2) The visual feature database that stores the visual features extracted from the images using different techniques. This is the most required information of CBIR.
3) The text annotation database which contains the key words and metadata of the images.

Image Retrieval Engine: It contains two sub-modules 1)Query Interface and 2)Query-Processing. The Query interface is used for query formulation and collects the needed information from the user and displays back the retrieval results to the users in the form of response.

The query-processing sub module describe the visual contents of the images, extract and described them by multi-dimensional feature vectors. The feature vectors of the images in the database form a feature database. To retrieve images, users provide the retrieval system with example images or sketched figures.

Similarity Measurement: The similarities/distances between the feature vectors of the query image and those of the images in the database are then calculated and retrieval is performed with the aid of an indexing scheme. The indexing scheme provides an efficient way to search for the image database. Recent retrieval systems have incorporated users’ relevance feedback to modify the retrieval process in order to generate perceptually and semantically more meaningful retrieval results.
There are two major characteristics of this system architecture: □ Multidiscipline and Inter-discipline nature. □ Interactive nature between human and computer

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3. Image Content Descriptors:
Choice of the image descriptor depends on type of images in a database. E.g. if database includes scene images then color is the best option because we can differentiate sky, tree, grass and ground. Image content may include both visual and semantic content. Visual content can be very general or domain specific. General visual content include color, texture, shape, spatial relationship, etc. Domain specific visual content, like human faces, is application dependent and may involve domain knowledge. Semantic content is obtained either by textual annotation or by complex inference procedures based on visual content.

A good visual content descriptor should be invariant to the accidental variance introduced by the imaging process. A visual content descriptor can be either global or local. A global descriptor uses the visual features of the whole image, whereas a local descriptor uses the visual features of regions or objects to describe the image content. To obtain the local visual descriptors, an image is often divided into parts first. The simplest way of dividing an image is to use a partition, which cuts the image into tiles of equal size and shape.

**Color:** Color is the most extensively used visual content for image retrieval [8,9]. Its three-dimensional values make its discrimination potentiality superior to the single dimensional gray values of images. Color space plays major role during describing color description. Each pixel of the image can be represented as a point in a 3D color space. Commonly used color space for image retrieval include GB,CMY,HSV, CIE L*a*b*, CIE L*u*v*. All of them have their own importance. So we can’t say which is the best. RGB space is a widely used color space for image display.

Color Descriptors: Commonly used color descriptors are the color histogram, color coherence vector, color correlogram, and color moments. Color Histogram is discussed with some related work.

**Color Histogram**
Histogram shows the distribution of the number of pixels for each quantized bin The color histogram serves as an effective representation of the color content of an image. The color histogram is easy to compute and effective in characterizing both the global and local distribution of colors in an image. In addition, it changes slowly with the scale and viewing angle. Since any pixel in the image can be described by three components in a particular color space like RGB, a histogram can be defined for each component. More bins a color histogram contains, the more discrimination power it has. However, a histogram with a large number of bins will not only increase the computational cost, but will also be inappropriate for building efficient indexes for image databases.

4. Related work on Histogram:
I have taken few images at my home, keeping surrounding constant. Images are taken by changing the distance, rotating the camera and rotating the images. Each image is of size 3264x4928 (total pixel count is 48254976)and of type ‘intensity’. Attributes of each image i.e. minimum & maximum intensity are identified. Histogram is generated for each component of RGB image and its gray-scale image, keeping bin count 30. Statistical information like mean, standard deviation and number of pixels for each bin count of histogram is noted. Matlab R2014b is used to conduct the experiments.Total number of images analyzed are 75. Results are shown only for 6 images.

<table>
<thead>
<tr>
<th>Image Name</th>
<th>Gray-Scale Histogram</th>
<th>Histogram for R Channel</th>
<th>Histogram for G Channel</th>
<th>Histogram for B Channel</th>
<th>Intensity of image</th>
<th>Histogram Info.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I11.jpeg</td>
<td><img src="image1" alt="Histogram" /></td>
<td><img src="image2" alt="Histogram" /></td>
<td><img src="image3" alt="Histogram" /></td>
<td><img src="image4" alt="Histogram" /></td>
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<td><img src="image6" alt="Histogram" /></td>
<td><img src="image7" alt="Histogram" /></td>
<td><img src="image8" alt="Histogram" /></td>
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<tr>
<td>I13.jpeg</td>
<td><img src="image9" alt="Histogram" /></td>
<td><img src="image10" alt="Histogram" /></td>
<td><img src="image11" alt="Histogram" /></td>
<td><img src="image12" alt="Histogram" /></td>
<td>2</td>
<td>80.4654, 50.2826</td>
</tr>
</tbody>
</table>
Figure 2: Histogram and statistical information of image

<table>
<thead>
<tr>
<th>Image</th>
<th>Bin Count</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
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<td>220</td>
<td>80.9466</td>
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<tr>
<td>I15.jpeg</td>
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<td>I21.jpeg</td>
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<td>I26.jpeg</td>
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<td>98.2396</td>
</tr>
</tbody>
</table>

Figure 3: Image i11.jpeg with bin count for 30 bins

Figure 4: Images taken by rotating an object

Figure 5: Images taken by changing distance of an object
Each column in the histogram represents how many pixels in the photograph have the pixel value represented by the column. The histogram doesn’t tell you where those pixels are located within the image. Following two different images have same black and white area. So bin count for black and white color will be same.

![Figure 6: different images same histogram](image)

5. Conclusion:
Color is the most extensively used visual content for image retrieval. The color histogram is easy to compute. It changes slowly with the scale and viewing angle. By computing statistical information about histogram like mean, standard deviation as feature vector, we can find similar images stored in the database. But the major drawback of color histogram is, two different images with equal distribution of color contents shows same histogram. Hence, it can’t be used for retrieving similar images. Storing statistical information of histogram of segmented image as a feature vector will give the required result.

Reference