Content Based Image Retrieval Using Color Histogram with Shape and Texture

Laxmi.V. Kullur[1], R. H. Goudar[1], V. T. Desai[2],Vinayakamurthy[3]
[1]Department of CNE, VTU Belagavi
[2]Department of CSE, VSMIT, Nippani
[3]Dept of MCA, Reva University, Bengaluru

Abstract: In this paper I have done retrieving of images using contents of image like color, texture and shape. Extracting the contents of image called image retrieval. This extraction of image contents from large amount of database is not that easy. Here content represents color, shape and texture of an image. This complete process is called content based image retrieval (CBIR). In this paper proposed method is HSV color histogram feature with shape and texture features using these methods extracting the image features, combination of these three features gives much more exact results for CBIR system. In this paper, all three contents of color, shape and texture based on retrieving of similar image from database is done and more priority of retrieving images is given to color content in database images. Besides the HSV color histogram or color moments are taken by distributing the pictures into pieces, subsequently it will give spatial color data. The recovery is more precise and time taken is less.

Keywords: Color, Texture, Shape and Content Based Image Retrieval (CBIR), Introduction.

In 1992 CBIR was originated and is also called as query by image content (QBIC). It will extract te contents of images from the database stored images that makes similarity to input query image. This extraction of the contents of the image from huge amount of database is not that easy. The complete process of this retrieval is called content based image retrieval. In this paper I am using RGB color model, HSV color model and also here describing the RGB to HSV conversion based on these methods retrieve the image from database. This recovery is more precise and time taken is less.

I. RELATED WORK

In 2009, Yuhang zhang.et al [4] exhibited the recovery framework which depends on color quantization with curvelet transform. Number of distinct colors utilized in this color quantization technique for reducing and decreasing image pixels. The principle expectation is unique image should have correct match with the new image. Computer graphics is the one of this application of Color quantization. This curve let transforms also called as wavelet transforms method. Orbitory function is represented by this method and orbitory function is nothing but superposition of a set of basic functions.

In 2010 Dr. H. B. Kekre, Priyadarshini Mukherjee, Shobhit Wadhwa, et.al [3] proposed various operators such as gradient operator and also they proposed slope magnitude method these two methods are very important to extract shape features. By using this gradient operator's method maximum and minimum will be calculated in the first order derivative of the image. For detecting edges we will use this method only. In this method when the second order derivative will be zero first order derivatives will be maximum. And also this shape reflects specific object limits. So these methods are very important for this CBIR framework.

In 2006, JingLi, Alliunsion et.al[2]presented the multi training support vector machine for Image Retrieval. The SVM classifier is temperamental for a little size preparing set on the grounds that the ideal hyper plane, dictated by the support vectors, can be exceptionally delicate to the preparation illustrations. In CBIR RF, the quantity of feedback samples is generally little, in light of the fact that the client is hesitant to stamp many specimens. Thus, the execution of the framework might be poor because of lacking and vaguely named tests also, The kernel technique can't apply its ordinary ability on the grounds that the highlight measurements are substantially higher than the quantity of preparing tests. In this situation, the part machine can accomplish a zero preparing blunder however poor generalization. In this paper SVM classifier is utilized to arrange the pictures into various class and the likeness measure is brought just with the pictures in a similar class.

In 2016, Prashant Srivastava; Ashish khare et.al [1] exhibits the extraction of image using Scale Invariant Feature Transform and moments. Here the Scale Invariant Feature Transform (SIFT) method consists of two parts: first one is STFT detector and second one is SIFT descriptor. The key purposes of portrayals will be ascertained by the SIFT descriptor. The key focuses which are mapped on the picture will be figured by the SIFT detector. And Color moments depicts likelihood or probability dispersion of colors in an image and how unique colors are appropriated all through the whole image and utilized as a part of image recovery framework, each image speaks to some objects and it thinks about how colors are disseminated between two comparative images and recovers comparative image in light of their comparable score.

In 2013, Qin-jun Qiu et al. [5] proposed the HSV color based histogram for substance based picture recovery framework this HSV color model is based on polar coordinates but not Cartesian coordinates. Colors in the HSV color are defined as Hue, Saturation and Value. Hue describes for which color it belongs to. It may be red or green or blue (what color it belongs to). The color may be strong or weak and also describes the purity of the color. Hue varies from 0 to 1.0 and saturation from 0 to 1.0. Hue varies from shades of impure white to grey color it means absence of white color in that field. Brightness is very important parameter in this technique that represents by value, brightness or intensity increases here. This HSV Textron histogram depends on nature pictures as shape descriptor and a shading shape descriptor.

II. PROPOSED WORK

Here we proposed a method in which color, texture and shape contents are using for retrieving the pictures. Because these three contents very common and many time used features. When texture, shape and color features are utilized for extraction process then results are become very clear and effective. Below figure represents general working of CBIR.

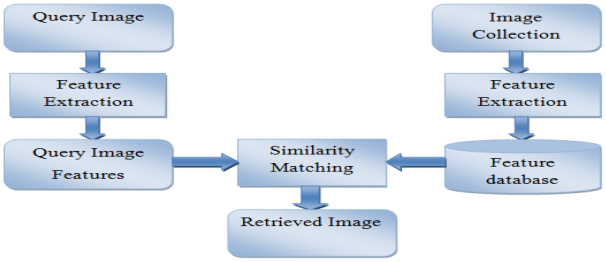

Fig: 1 Block diagram of CBIR System.

A. Color, Texture & Shape Retrieval Techniques

In this image retrieval based on color it includes more part histogram and fuzzy histogram system and we are using these methods to find similarity distance. Below steps shows how color retrieval works.

(1) Firstly we should be select color space.
(2) After that quantization of the color space will be finished.
(3) Next we will remove the elements of color.
(4) After that compute the similarity matches.

For object identification and feature extraction of color we are utilising the color attributes that is principle procedure of this CBIR, it can also help to watch performance of system of multiple measurements on the single pixel of the image. The bins are represented by bars of color histogram and bins presented by the x-axis. The number of bins will be totally dependent on the number of colors in an image. The numbers of pixels of each bin are signified by y-axis.

B. RGB color model

The RGB means Red, Green, and Blue. This color model is used in CRT screens and color raster forms. That colors are added together to produce the desired color so they are considered as the addition primaries. The RGB model uses the Cartesian coordinate system and (0, 0, 0) display black color to (1, 1, 1) white color which represents the grey-scale. Below figure represented as color model and its co-ordinates.

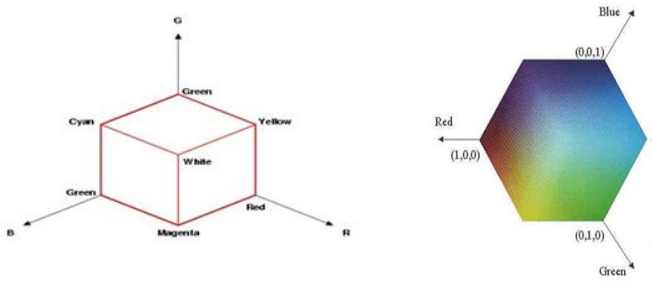

Fig: 2 RGB color model and Co-ordinates System.

Formulas for RGB color conversions shown below;

Red – Green Sector

For $0^{\circ} < \text{Hue} \leq 120^{\circ}$

$$b = 1/3(1 - Sa), r = 1/3\left[1 + \frac{SaCosHue}{Cos(60 - Hue)}\right], g = 1 - (r + b)$$

Green – Blue Sector

For $120^{\circ} < \text{Hue} \leq 240^{\circ}$

$$r = 1/3(1 - Sa), g = 1/3\left[1 + \frac{SaCosHue}{Cos(60 - Hue)}\right], b = 1 - (r + b)$$

Blue - Red Sector

For $240^{\circ} < \text{Hue} \leq 360^{\circ}$

$$g = 1/3(1 - Sa), b = 1/3\left[1 + \frac{SaCosHue}{Cos(60 - Hue)}\right], r = 1 - (r + b)$$

C. HSV color model

In this model HSV (Hue, Saturation, and Value). Hue represents for which pure color it is specified. The tones and shades of red color have same hue value. Saturation represents how much the content of white color in image has. Fully saturated red color has saturation of 1 and white has saturation of 0. Value represents the brightness the color is and also represents the intensity values in image. As hue movements from 0 to 1.0, color change from red, through yellow, green, cyan, blue, and magenta, back to red, so that there are truly red values both at 0 and 1.0. As saturation varies from 0 to 1.0, corresponding colors become increasingly brightness.

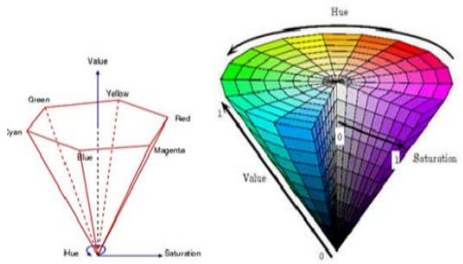

Fig: 3 HSV color model and Co-ordinates System.

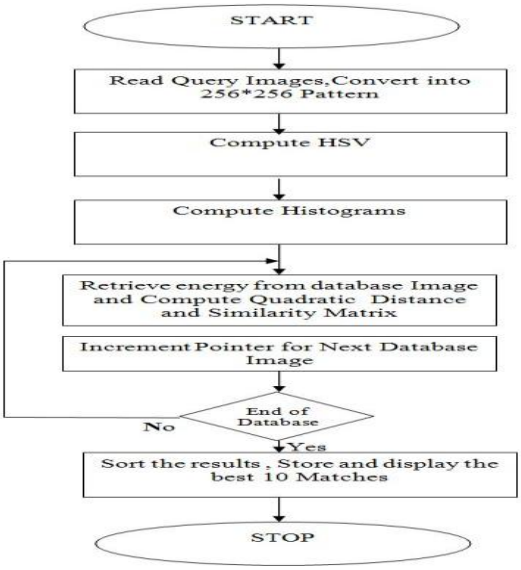

Fig: 4 Flow diagram for color feature extraction and retrieval.

Above flowchart deals the color content retrieval and image retrieval. In this flow diagram first we will read the input image also called query image and convert it into 256*256 patterns. After that perform HSV model and also performed with quadratic distance and similarity matrix. And increment the pointer for next database image after we will get best 10 matches here.

D. RGB to HSV Conversion.

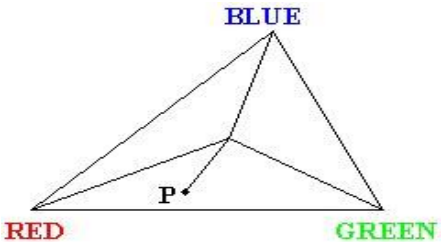

Fig: 5 Conversions from RGB to HSV

The hue of the point P is indicating the edge between the lines interfacing P to the triangle focus and also red color indicates the triangle centre. The point P of the saturation is the separation amongst P and triangle centre. The value (power) of the point P is represented as height on a perpendicular to the triangle. On that similar line greyscale points are arranged and also, the transformation equation is as per the following:

$$H = \cos^{-1}\left\{\frac{\frac{1}{2}[(R-G)+(R-B)]}{\sqrt{(R-G)^2+(R-B)(G-B)}}\right\}$$

$$S = 1 - \frac{3}{R+G+B}\,[\min RGB]$$

$$V = \frac{1}{3}\,(R+G+B)$$

III. **RESULTS**

This CBIR technique implemented using MATLAB R2014a which running on windows 7 ultimate operating system. This main topic includes experimental results from the proposed work.

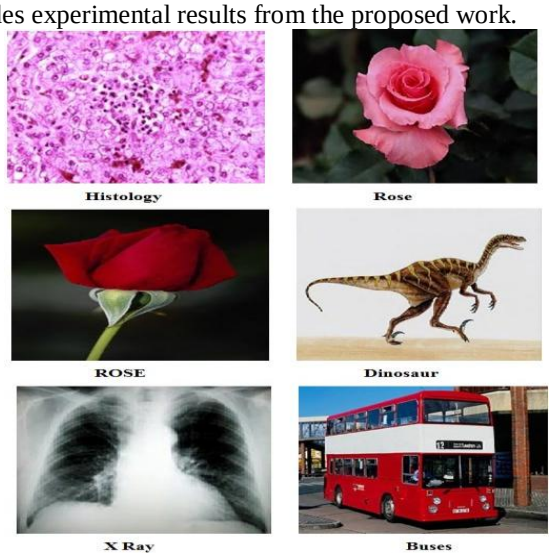

Fig: 6 Sample images of database

These images contain database images and up to maximum 70 images are stored in database that have collection of different combinations of images like they may be buses, X-Ray images, Roses and all as shown below.

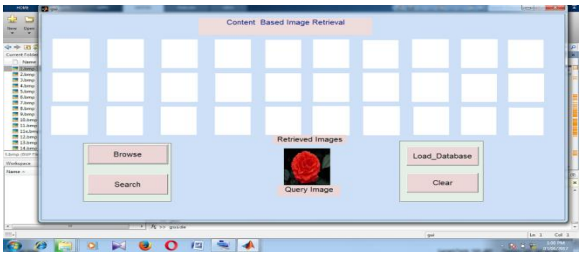

Fig: 7 Selecting a Query Image

Here we will select the input image which image want to retrieve from the database and which image already stored in database.

Fig: 8 Retrieved Images

In this snapshot we will get retrieved image from database and this image best matched image. After browsing the image, the middle image showing the input query image. User will click on search button to retrieve the similar images from the database images as shown in above results.

IV. CONCLUSIONS

This paper uses three features for image retrieval from database images; those are color, shape and texture contents. Compare to shape and texture features, color feature retrival gives best similar retrieval of image from the database images. This paper quickly retrieves images within a short period of time.

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