A Proposed Method for Image Retrieval using Histogram values and Texture Descriptor Analysis

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Abstract— **Color and Texture information have been the primitive image descriptors in content based image retrieval systems. In this article, a method is proposed for image mining based on analysis of color Histogram values and texture descriptor of an image. For this purpose, three functions are used for texture descriptor analysis such as entropy, local range and standard deviation. To extract the color properties of an image, histogram values are used. The combination of the color and texture features of the image provides a robust feature set for image retrieval.**

Index Terms— *content-based image retrieval, color histogram, image texture.*

I. INTRODUCTION

With the steady growth of computer power, rapidly declining cost of storage and ever-increasing access to the Internet, digital acquisition of information has become increasingly popular in recent years. Digital information is preferable to analog formats because of convenient sharing and distribution properties. This trend has motivated research in image databases, which were nearly ignored by traditional computer systems due to the enormous amount of data necessary to represent images and the difficulty of automatically analyzing images. Currently, storage is less of an issue since huge storage capacity is available at low cost. However, effective indexing and searching of large scale image databases remains as a challenge for computer systems.

The Content Based Image Retrieval System (CBIR) is a system, which retrieves the images from an image collection where the retrieval is based on a query, which is specified by content and not by index or address. The query image is an image in which a user is interested and wants to find similar images from the image collection. The CBIR system retrieves relevant images from an image collection based on automatic

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derived features. The derived features include primitive features like texture, color, and shape. The features may also be logical features like identity of objects shown, abstract features like significance of some scene-depicted etc.There are many general-purpose image search engines. In the commercial domain, IBM QBIC is one of the earliest developed systems. Recently, additional systems have been developed at IBM T.J. Watson, VIRAGE , NEC AMORE , Bell Laboratory , Interpix (Yahoo), Excalibur, and Scour.net. In the academic domain, MIT Photobook is one of the earliest. Berkeley Blobworld, Columbia VisualSEEK and Web SEEK, CMU Informedia , UCSB NeTra, UCSD, WBIIS are some of the recent systems. The proposed CBIR system can be extended at the other primitive feature vectors like, color and shape [1].

Color is a feature of the great majority of content based image retrieval system. However the robustness, effectiveness, and efficiency of its use in image indexing are still open issues. In image preprocessing, the features used to represent color information and the measures adopted to compute similarity between the features of two images are critically analyzed [2].

However, despite many research efforts, the existing low-level features are still not powerful enough to represent image content. Some features can achieve relatively good performance, but their feature dimensions are usually too high, or the implementation of the algorithm is difficult [3].

Feature extraction is very crucial step in image retrieval system to describe the image with minimum number of descriptors. The basic visual features of images include color and texture [4].Research in content based image retrieval today is a lively disciplined, expanding in breadth [5].Representative features extracted from images are stored in feature database and used for object-based image retrieval [6].

Texture is another important property of images. Various texture representations have been investigated in pattern recognition and computer vision. Texture representation methods can be classified into two categories: structural and statistical. Structural methods, including morphological operator and adjacency graph, describe texture by identifying structural primitives and their placement rules. They tend to be most effective when applied to textures that are very regular. Statistical methods, including Fourier power spectra,

co-occurrence matrices, shift-invariant principal component analysis (SPCA), Tamura feature, Wold decomposition, Markov random field, fractal model, and multi-resolution filtering techniques such as Gabor and Haar wavelet transform, characterize texture by the statistical distribution of the image intensity[1].

II. PROPOSED METHOD FOR IMAGE RETRIEVAL

Images retrieval can be performed from the digital image database on the basis of colour, shape or texture. Among all these three features combination of texture and colour feature works very effectively in most situations.

According to Figure 1 when a query image is submitted for image retrieval, its color and texture features are extracted and matching operation is performed between query image features and the image features stored in database, the results closes to the query image is then retrieved from the database.
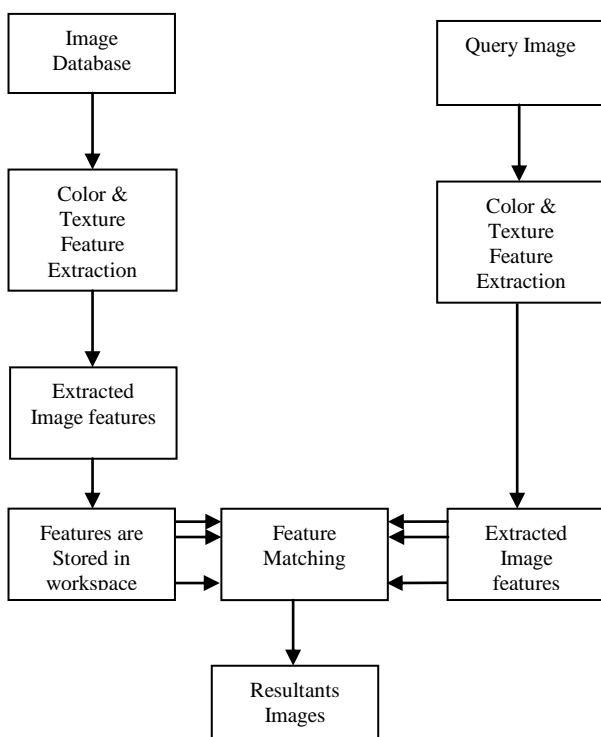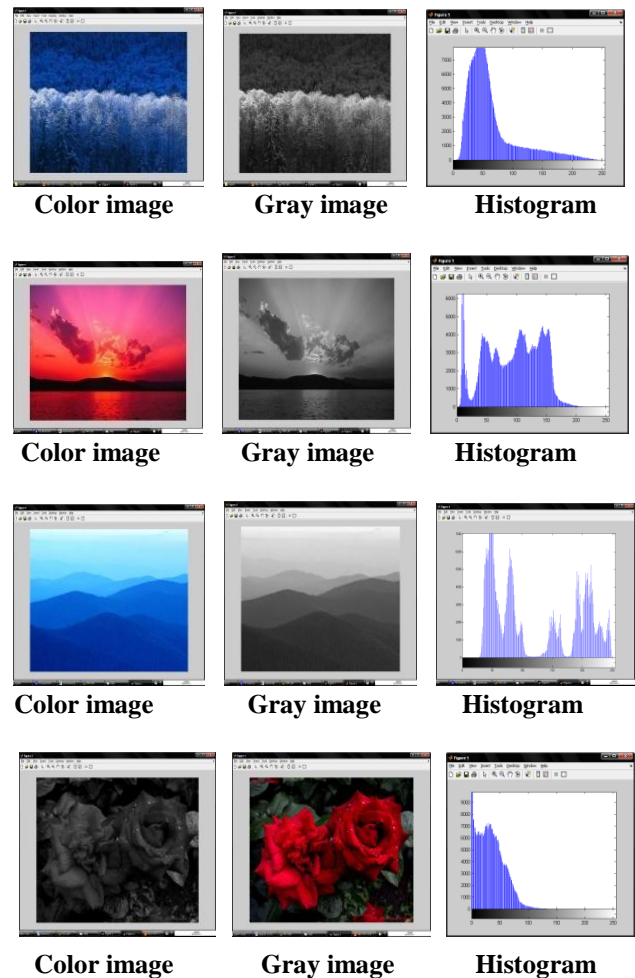

Figure1: Proposed System Architecture

A. Color Feature extraction

Color histograms are frequently used to compare images. Examples of their use in multimedia applications include scene break detection and querying a database of images Color histograms are popular because they are trivial to compute, and tend to be robust against small changes in camera viewpoint [7].In this paper gray level variations are used to compute the histogram of any image. For this purpose the color image is first converted in to gray level image. Then the histogram values are computed for gray level variations. According to histogram values, images are extracted from the database.

Color image **Gray image** **Histogram**

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Color image **Gray image** **Histogram**

Color image **Gray image** **Histogram**

The figures above represent different color images with their corresponding gray images and histograms.

A. Texture Feature extraction

Feature extraction is very crucial step in image retrieval system to describe the image with minimum number of descriptors [8]. Texture is an important property of many types of images. To extract the texture features, entropy, local range and standard deviation measures are used as performance parameters.

Texture= (Entropy +Standard deviation + local Range)

1) Entropy

Entropy is a statistical measure of randomness that can be used to characterize the texture of the input image.

The value of entropy can be calculated as:

$$ENT = \sum_{K=1}^{M} P_k \log 1/P_k$$

Where,
ENT=Entropy of I/P.
M=Total no. of samples
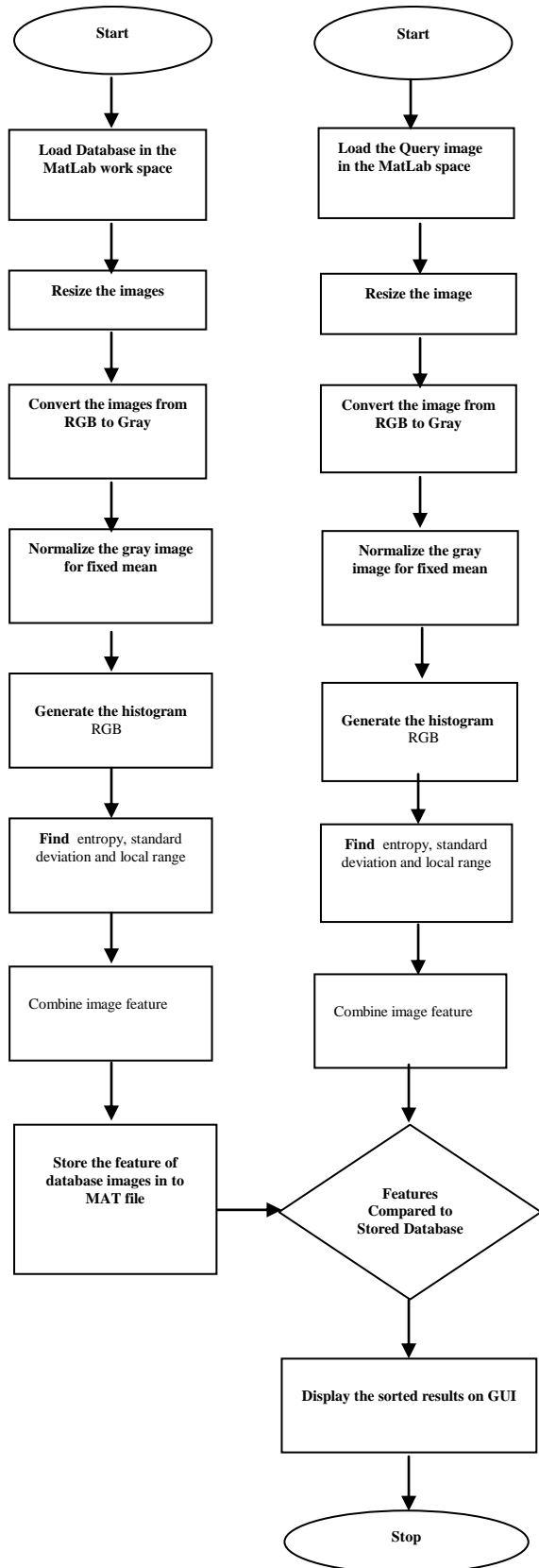P=Probability of I/P occurrences.

B. Flow Chart for Proposed Scheme

Figure 2: Flowchart for proposed method

1) Standard Deviation
The standard deviation value can be calculated as:

$$S = (1/n\text{-}1 \sum_{i=1}^{n} (x_i\text{-}\overline{x})^2)^{1/2}$$

where,

$$\overline{x} = 1/n \sum_{i=1}^{n} x_i$$

Where, n=No. of elements in the sample.

2) Local Range
LC= (maximum value of chosen pixel-minimum value of chosen pixel).

III. IMAGE RETRIEVAL IS PERFORMED WITH THE COMBINED HISTOGRAM VALUE AND TEXTURE DESCRIPTOR.

Combined value of color and texture feature works very effectively in most situations. This paper uses histogram, entropy, standard deviation and local range.

Image Retrieval=Color feature +Texture Feature

A. Algorithm for Proposed Scheme

Step 1: Load database in the Mat lab workspace.
Step 2: Resize the image for [128. 128].
Step 3: Convert image from RGB to Gray.
Step 4: Normalize the gray image for fixed mean.
Step 5: Generate the histogram of RGB.
Step 6: Find entropy, standard deviation and local range of Gray.
Step 7: Combine the image feature.
Step 08: Load the test image.
Step 09: Apply the procedure 2-7 to find combine feature of test image.
Step 10: Determine the normalized Euclidean distance of test image with stored image of database.
Step 11: Sort the normalized Euclidean distance values to perform indexing.
Step 12: Display the result on GUI.

According to Figure 2 when a query image is submitted for image retrieval ,its color features are extracted and matching operation is performed between query image features and the image features stored in database then the results closes to the query image is retrieved from the database.First we load the database in the Matlab workspace after loading the database we resize the image for [128, 128] to get the similar size of images after that we Convert images from RGB to Gray texture and Generate histogram for color image. Then we normalize the gray image for fixed mean. After this we find the entropy, standard deviation and local range of each image.When a test image is loaded we apply the procedure 2-7 to find combine feature of test image after that we determine the normalized Euclidean distance between query image and database image with indexing. The closest values are displayed on GUI as result.

IV. CONCLUSION

The paper proposed a method for image retrieval using histogram values and texture descriptor analysis of image.We first convert a true color image in to a gray level image. We then developed a mechanism for image retrieval based on the color histogram values. After extraction of color feature, texture features are extracted with the help of entropy, local range and standard deviation of image. When a query image is submitted, its color and texture value is compared with the color and texture value of different images stored in database. The images having closest value compared to query image are retrieved from database are displayed on GUI as result.

V. REFERENCES

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