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CONTENT-BASED IMAGE RETRIEVAL USING ORDERED-DITHER BLOCK TRUNCATION CODING AND POLAR EDGE SAMPLING SIGNATURE

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***Abstract*-CBIR system which extracts an image feature descriptor from the compressed data stream. Edge feature is involved and going to use Polar Raster Edge Sampling Signature (PRESS) algorithm with ODBTC. The polar raster scanned into statedinterim in both radius and angle, using the Polar Raster Edge Sampling Signature algorithm. Number of edge points are identified and stored in feature library for all the database images by PRESS. The correspondence measure between the features existing in the feature database based on the Euclidean distance. Min distance point out the contiguous and specified number of best matched images is extracted. ODBTC compresses an image block into analogous quantizes and bitmap image. Three image features to index an image are colour co-occurrence feature (CCF), bit pattern features (BPF) and edge feature derived from the two ODBTC quantizes and bitmap by involving the visual codebook. Implementation of edge feature is increased the retrieval rate and efficiency.**

***Key Words:* Bit Pattern Feature, Color Co-occurrence Feature, Edge Feature, ODBTC, CBIR, PRESS**

I. INTRODUCTION

Image retrieval has been an area of interest for investigators during the past few decades. [8]An image retrieval system deals efficient way to access, browse, and retrieve a set of similar images in the real-time applications. There is a basic difference between content-based.Manual textual annotation was used initially to retrieve images. But this was observed to be a very difficult taskthis resulted in the image contents like color, shape and texture gaining greater importance. Since most of the images are recorded in the storage device in compressed format for decreasing the storage space requirement. [6]Namely Ordered Dither Block Truncation Coding (ODBTC) involves the low-pass nature of the Human Visual System (HVS) for succeeding an acceptable perceptual image quality. In encoding stage, the ODBTC scheme utilizes the dither array Look-Up-Table (LUT) to speed up the processing speed. The extreme values in ODBTC are simply obtained from the minimum and maximum value found in the image blocks. Theelasticity high efficiency and low computational complexity of the ODBTC.ODBTC compresses an image into a set of color quantizers and a bitmap image. The existing image retrieval system generates two image features, namely Color Co-occurrence Feature (CCF) and Bit Pattern Feature (BPF).

In this paper, shape features are extracted from the database images and the same are polar raster scanned into specified intervals in both radius and angle, using the Polar Raster Edge Sampling Signature (PRESS) algorithm. Subsequently, similarity measure is performed between the query image features and the database image features based on Euclidian Distance similarity measure and the database images that are relevant to the given query image are retrieved. PRESS algorithm has been successfully implemented and tested in a CBIR System developed.

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II. BACKGROUND

A. FUNDAMENTALS OF CONTENT-BASED IMAGE RETRIEVAL

The central moment can be normalized to be scale invariant

$$n_{p,q}= \frac{\mu_{p,q}}{\mu^{\gamma}_{0,0}} , \gamma= \frac{p+q+2}{2} \quad \textbf{(1.1)}$$

Based on these moments, a set of moment invariants to translation, rotation, and scale can be derived

$$\Phi_1= \mu_{2,0}+\mu_{0,2}, \quad \textbf{(1.2)}$$

$$\Phi_2= (\mu_{2,0}+\mu_{0,2})^2+4\mu^2_{1,1}, \quad \textbf{(1.3)}$$

$$\Phi_3= (\mu_{3,0}-3\mu_{1,2})^2+(\mu_{0,3}-3\mu_{2,1})^2, \quad \textbf{(1.4)}$$

$$\Phi_4= (\mu_{3,0}+\mu_{1,2})^2+(\mu_{0,3}+3\mu_{2,1})^2, \quad \textbf{(1.5)}$$

$$\Phi_5=(\mu_{3,0}-3\mu_{1,2})(\mu_{3,0}+\mu_{1,2})[(\mu_{3,0}+\mu_{1,2})^2-3(\mu_{0,3}+\mu_{2,1})^2]+(\mu_{0,3}-3\mu_{2,1}) (\mu_{0,3}+\mu_{2,1}) [(\mu_{0,3}+\mu_{2,1})^2-3(\mu_{0,3}+\mu_{2,1})^2], \quad \textbf{(1.6)}$$

$$\Phi_6= (\mu_{2,0}-\mu_{0,2})[(\mu_{3,0}+\mu_{1,2})^2-(\mu_{0,3}+\mu_{2,1})^2] +4\mu_{1,1}(\mu_{3,0}+\mu_{1,2})(\mu_{0,3}+\mu_{2,1}), \quad \textbf{(1.7)}$$

$$\Phi_7=(3\mu_{2,1}-\mu_{0,3})(\mu_{3,0}+\mu_{1,2})[(\mu_{3,0}+\mu_{1,2})^2-(\mu_{0,3}+\mu_{2,1})^2], \quad \textbf{(1.8)}$$

B. FEATURE EXTRACTION

Feature extraction is the process of interacting with images and performs extraction of meaningful information of images with descriptions based on properties that are inherent in the images themselves. Color information is the most intensively used feature for image retrieval because of its strong correlation with the underlying image objects.

C. SHAPE FEATURE

One of the significant basic features in content-based image retrieval is Shape. Shape based representations are broadly divided into two: Region based and Contour based. Contour based systems normally use the boundary of the objects for representation and retrieval. Since images are usually distinguishable by their contours, this approach gives better results.

III. METHODOLOGY

Content Based Image Retrieval (CBIR) is used to effectively retrieve required images from fairly large databases. CBIR extracts images that are related to the given query image, based on the features extracted from the contents of the image. Retrieval efficiency is also poor. In this paper, shape features are extracted from the database images and the same are polar raster scanned into identified intervals in both radius and angle, using the PRESSalgorithm. Counts of edge points lying in these bins are stored in the feature library. Similarity measure is performed between the query image features and the data-base image features based on Euclidian Distance similarity measure and the database images that are relevant to the given query image are retrieved.

Fig. 1 explains the block diagram of edge feature in image retrieval method, the explanation of the block diagram is below,

A. ODBTC

The ODBTC algorithm is generalized for color images in coping with the CBIR application. The main advantage of the ODBTC image compression is on its low complexity in generating bitmap image by incorporating the Look-Up Table (LUT), and free of mathematical multiplication and division operations on the determination of the two extreme quantizes.

B. COLOR CO-OCCURRENCE FEATURE (CCF)

Color Co-occurrence Feature (CCF) can be derived from the color co-occurrence matrix. CCF is computed from the two ODBTC color quantizes. The minimum and maximum color quantizes are firstly indexed using a specific color codebook. The color co-occurrence matrix is subsequently constructed from these indexed values.

C. BIT PATTERN FEATURE (BPF)

Another feature, namely Bit Pattern Feature (BPF), characterizes the edges, shape, and image contents. At the codebook generation stage, all code vector components may have intermediate real values between zero (black pixel) and one (white pixel) as opposed to binary values. The thresholding performs the binarization of all code vectors to yield the final result.

D. EDGE FEATURE

Canny algorithm is employed to detect the edges. The strong edges and the connected edges are identified using

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various techniques like double thresholding and edge tracking. The edge data in the boundary and the region are polar raster scanned in both radius and angle.Numbers of edge points identified are stored in the feature library for all the database images.When an image is queried, the system extracts shape feature for the image in the same way and then computes the similarity measure between the features of the query image and the feature existing in the feature database based on the Euclidean Distance method.Minimum distance indicates the closest match and specified number of best matched images are extracted.

```
BW ⟵ edge (mask,'canny'); //Finding the edges of the image
[imx,imy] ⟵ size (BW);
B ⟵ conv 2 (BW,msk);      //Smoothing the image
[x,y] ⟵ find (B ==1);
P =[x,y];
[qr,qt] = polartransfoem (p);
get count of edge points;
store radius bin count in vector r; //PRESS is used to extract shape features
store angle bin count in vector t;
normalize for sum of counts;
repeat for all images in the DB;
save them in feature DB;
```

Pseudo code of PRESS

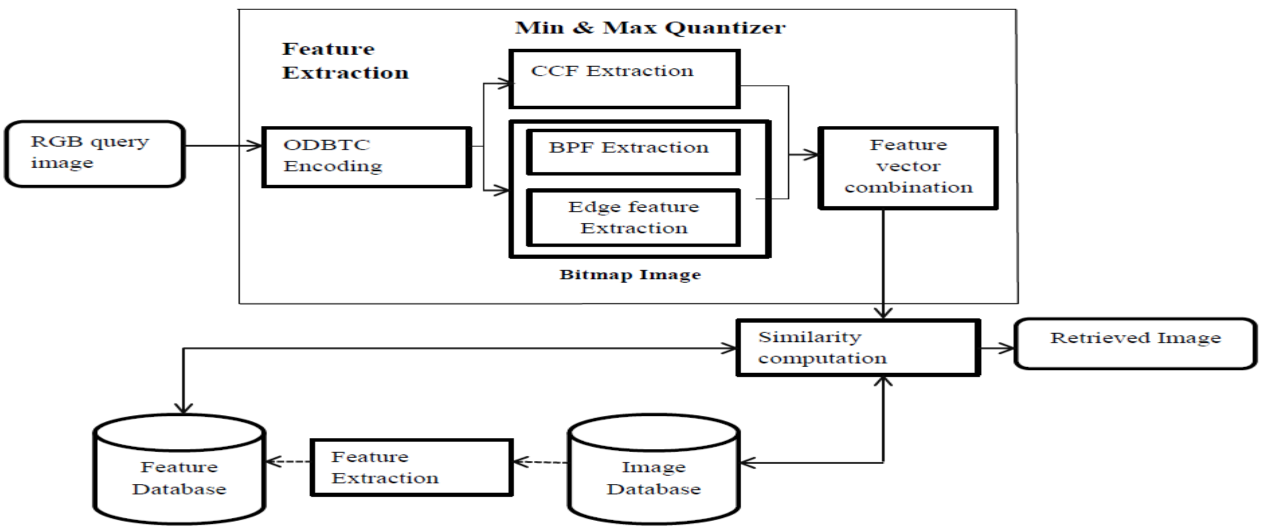

Fig. 1 Block diagram of EF in image retrieval method

In this pseudo code the PRESS algorithm is used for extracting the shape features of the image. The approach is that the final edge components extracted are polar raster scanned or binned into ten intervals in the Radius and the angle. Count of edge points lying in these bins are found and stored as two vectors rand t.

Initially, the image is segmented based on color, using the K – Means clustering algorithm. Canny algorithm is employed to detect the edges. The strong edges and the connected edges are identified using various techniques like double thresholding and edge tracking. The edge data in the boundary and the region are polar raster scanned in both radius and angle.

The ODBTC algorithm is generalized for color images in coping with the CBIR application. The main advantage of the ODBTC image compression is on its low complexity in generating bitmap image by incorporating the Look-Up Table (LUT), and free of mathematical multiplication and division operations on the determination of the two extreme quantizers.

ODBTC identifies the minimum and maximum values each image block as opposed to the former low and high mean values calculation, which can further reduce the processing time in the encoding stage. The ODBTC yields better reconstructed image quality by enjoying the extreme-value dithering effect.

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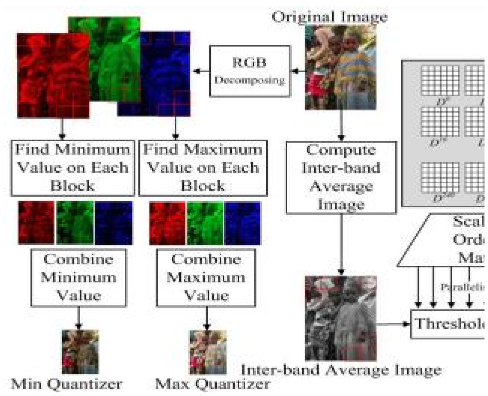

Fig. 2 ODBTC encoding for a color image

IV. ANALYSIS AND COMPARISION

A. RETRIEVAL OF IMAGE

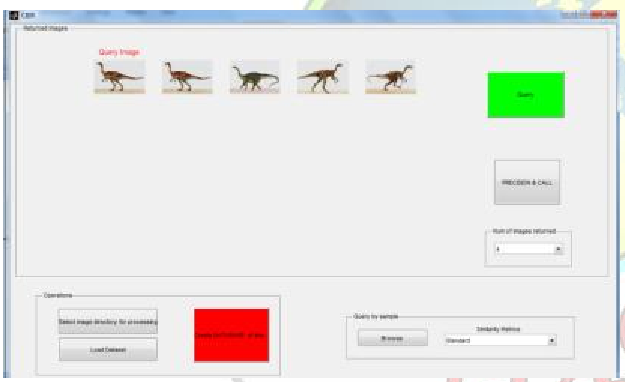

Fig. 4 Image Retrieved

Here the database containing 500 binary shape images. When an image is queried, the system extracts edge feature for the image and then computes the similarity measure between the features of the query image and the feature existing in the feature database based on the Euclidean Distance method.

B. PRECISION VS RECALL

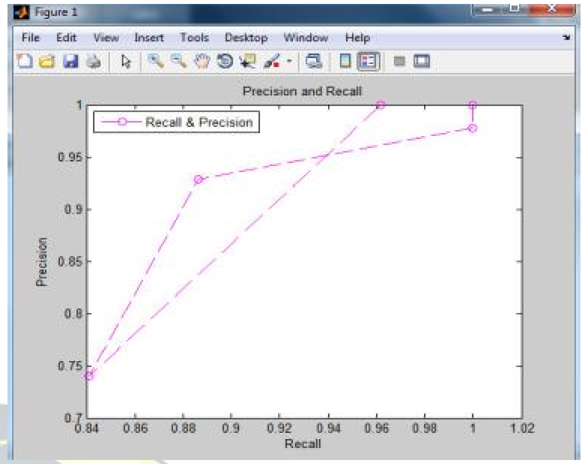

Fig. 5 Comparison between Existing and Proposed scheme

a. Precision and Recall

Precision is defined by the number of retrieved images that are also relevant to total number of retrieved images.

Precision = R/N,

Recall is defined by the number of retrieved images that are also relevant to total number of relevant images.

Recall = R/M,

N- Total number of relevant images.

M- Total number of retrieved images,

R- Number of retrieved images that are also relevant

V.CONCLUSION AND FUTURE WORK

The proposed technique rescues the query image using the Color Co-occurrence and Bit Pattern features and edge feature to retrieve relevant matches from the database. This proposed forms an effective shape signature by taking into account all the edge points, by gathering them in specified amount of radial and angular bins. Numbers of edge points recognized are stored in the feature library for all the database images. When an image is queried, Polar Raster Edge Samplingshape feature for the image is extracted and then the similarity measure between the features of the query image and the feature existing in the feature database are calculated based on the Euclidean Distance method.

Implementing the edge feature done by using MATLAB extensively continued by using Xilinx ISE Verilog HDL.

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