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Color Coding Features Based Image Retrieval Using SVM Classifier

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Abstract- The Image retrieval system has been implemented previously on various parameters likewise an image retrieval system returns a set of images from a collection of images in the database image content similarity, edge pattern similarity, color similarity, etc. In the existing system various algorithm is used such as Block Truncation Coding, which is used to define color alteration, and Arithmetic coding based on Histogram. An image retrieval system specifies an efficient way to retrieve a set of similar images by directly getting the image features from an image. In case of proposed system, image retrieval is presented by exploiting the SVM & EDBTC encoded data stream to construct the image features, namely Colour Co-occurrence and Bit Pattern features. This method is extremely fast and the image quality achieved is comparable to the previous method.

Keywords: Support Vector Machine, image indexing, color feature similarity.

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. An image retrieval system returns a set of images from a collection of images in the database to meet users' demand with similarity evaluations such as image content similarity, edge pattern similarity, color similarity.

Block Truncation Coding (BTC) is a lossy image compression technique which uses moment preserving quantization method for compressing digital gray scale images. The image features are directly constructed from the typical Block Truncation Coding (BTC) or half-toning based BTC compressed data stream without performing the decoding procedure. These image retrieval schemes involve two phases, indexing and searching, to retrieve a set of similar images from the database based on the query image using EDBTC.

II. PROPOSED SYSTEM

A technique for content-based image retrieval (CBIR) for the generation of image content descriptor. In the encoding step, compresses an image block into corresponding quantizers and bitmap image. Two image features are proposed to index an image, namely, color co-occurrence feature (CCF) and bit pattern features (BPF).The CCF and BPF of an image are simply derived from the two quantizers and bitmap,

respectively. The EDBTC scheme is not only suited for image compression, because of its simplicity, but also offers a simple and effective descriptor to index images in CBIR system.

The color feature is one of the most widely used visual features in image retrieval. It is relatively robust to background complication and independent of image size and orientation. In image retrieval, the color histogram is the most commonly used color feature representation. Statistically, it denotes the joint probability of the intensities of the three color channels.

1. Color Co-Occurrence Feature (CCF):

The color distribution of the pixels in an image contains huge amount of information about the image contents. The attribute of an image can be acquired from the image color distribution by means of color co-occurrence matrix. This matrix also represents the spatial information of an image. Color Co-occurrence Feature (CCF) can be derived from the color co-occurrence matrix.

2. Bit Pattern Feature (BPF):

Bit Pattern Feature (BPF) characterizes the edges, shape, and image contents. The binary vector quantization produces a representative bit pattern codebook from a set of training bitmap images and used for indexing images.

Color Co-occurrence Feature (CCF)

Color Co-occurrence Feature (CCF) can be derived from the color co-occurrence matrix. In the proposed scheme, CCF is computed from the two EDBTC color quantizers. The minimum and maximum color quantizers are firstly indexed using a specific color codebook. The color co-occurrence matrix is subsequently constructed from these indexed values. Subsequently, the CCF is derived from the color co-occurrence matrix at the end of computation. In general, the color indexing process on RGB space can be defined as mapping a RGB pixel of three tuples into a finite subset of codebook index. The CCF calculation is simple, making it more preferable for CBIR task.

Bit Pattern Feature (BPF)

Another feature, namely Bit Pattern Feature (BPF), characterizes the edges, shape, and image contents. The binary vector quantization produces a representative bit pattern codebook from a set of training bitmap images obtained from the ODBTC encoding process. Let Q = {Q1, Q2. . .QNb } be the bit pattern codebook consisting Nb binary code word. These bit pattern codebooks are generated using binary vector quantization with soft centroids, and many bitmap images are involved in the training stage.

SVM Classification

The purpose of SVM is to map feature vectors into a higher dimensional feature space, and then creating a separating hyper-plane with maximum margin to group the GLCP features. Support vectors (SVs) contain highlighted pixels that help to create the margins or boundaries in an image. The higher dimensional space is defined by a kernel function.

Vector quantisation

Vector quantisation (VQ) represents a mapping that assigns to each input vector a codebook vector achieving compression by setting the size of the codebook small relative to the possible gamut of input vectors. In

particular, in terms of VQ image compression, an image is divided into a set of L-dimensional vectors I by splitting it into image blocks where each block forms a vector.

III. SYSTEM IMPLEMENTATION

The EDBTC encoding is used to extract features from the images stored in the database. The EDBTC encoding uses two color quantizers and a bitmap image. Two features are extracted namely, Color Co-occurrence feature and Bit pattern feature. These features are stored as feature vectors and processed using vector quantization. These features are classified using support vector machine.

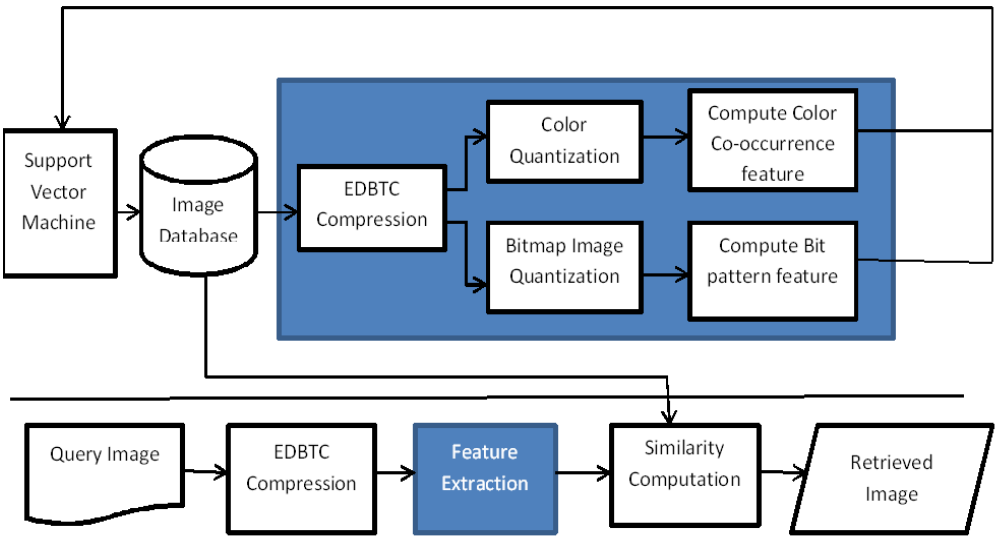

Fig.1 Schematic diagram of proposed image retrieval framework

The similarity between the features extracted from database image and query image is measured using Manhattan distance and Euclidean distance. The minimum and maximum values are determined from color quantizers. The color quantizers are used to reduce the input image which has a range of 256 colors into 64 colors RGB color. This RGB color is converted into indexed images. The colors are quantized in HSV color space.

The mean and standard deviation for each RGB color is calculated. The confusion matrix is plotted using the desired output and computed output values. The values that are identical are plotted using confusion matrix. A low pass filter is constructed for allowing pixels with the given cut-off frequency.

The similarity between two images (i.e., a query image and the set of images in the database as target image) can be measured using the relative distance measure. The similarity distance plays an important role for retrieving a set of similar images. The similarity is measured using Manhattan and Euclidean distance.

Manhattan distance:

$$\boldsymbol{d(x, y) = (x2 - x1) + (y2 - y1)}$$

Euclidean distance:

$$d(x,y)=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

The inter-band average value can be computed as

$$f(x,y)=\frac{1}{3}(fR(x,y)+fG(x,y)+fB(x,y))$$

The mean value of the inter-band average pixel can be computed as

$$x'=\sum_{x=1}^{m}\sum_{y=1}^{n}f(x,y)$$

The bitmap image $h(x,y)$ is generated using the following rule:

$$h(x,y)=\begin{cases}1, & if\ f(x,y)\geq x'\\ 0, & if\ f(x,y)<x'\end{cases}$$

The query image is firstly encoded with the EDBTC, yielding the corresponding CCF and BPF. The two features are later compared with the features of target images in the database. A set of similar images to the query image is returned based on their similarity distance score, i.e. the lowest score indicates the most similar image to the query image.

IV. RELATED WORK

In block truncation coding (BTC), the original image is divided into fixed -size non overlapping blocks of size M×N. The block size chosen is usually small to avoid the edge blurring and blocking effect. Digital Half-toning is a technology of converting a continuous tone image to a two tone image. A continuous tone image and a half toning image are similar when the low-pass nature of the Human Visual System (HVS) is the perceived device. There are many kinds of half toning techniques, including ordered dithering, error diffusion, and dot diffusion.

The dot diffusion method for half-toning, is an attractive method which attempts to retain the features of error diffusion while offering substantial parallelism. Support Vector Machines have their roots in Statistical Learning Theory. They have been widely applied to machine vision fields such as character, handwriting digit and text recognition. The extent to which CBIR technology is currently in routine use is clearly still very limited. texture classification algorithm using Grey Level Co-occurrence Probabilities (GLCP) method is being used to extract features from texture image and support vector machines.

V. RESULT

The image retrieved from the database are similar to the query image is as follows

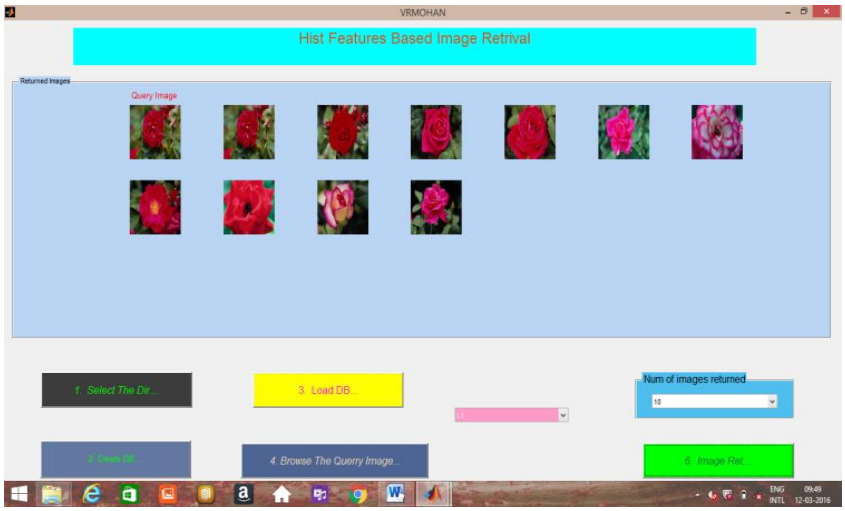

Fig. 2A Image retrieval result

VI. CONCLUSION

A new method is proposed in this paper for retrieving the images using SVM classifier. Using EDBTC for indexing images takes large amount of memory space and retrieval time. So SVM is used for classifying images according to the pixel values. The main functions performed by the proposed method are: Constructing feature vectors from the image based on its content and storing it in the database, Similarity comparison and classification, retrieving the images based on the feature vectors. The proposed image retrieval scheme can be applied to video retrieval.

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