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Content Based Image Retrieval in Art Collection Using Edbtc

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Abstract

Image retrieval has been one of the most interesting and vivid research areas in the field of computer vision. Content-based image retrieval (CBIR) systems are used in order to automatically index, search, retrieve and browse image databases. Color and texture features are important properties in content-based image retrieval systems. Content Based Image Retrieval is an important technique which uses visual contents to retrieve images from large database. Many traditional methods have been employed to retrieve images. Significance feedback is often a critical component when designing image databases. Relevance feedback interactively determines the user's query by asking the user whether image is relevant or not. The project depicts the retrieval of images from a database using texture, shape and color features of a image. The size of an output image is reduced to (64x64) from the input size is of (256x256) through minimum and maximum quantifier. CCF is used to extract the color factors. EDBTC and BPF are used to extract the shape of the image. Garbor wavelet is used to extract the texture of the image. Images are retrieved using similarity measures through Euclidean distances. The main purpose is to extract the image factors using EDBTC to reduce the size of data stream without altering the image quality and offers indexing of images.

Key Words: *CHF- Color Histogram Feature, CCF- Color Co-Occurrence Feature, EDBTC- Error Diffusion Block Truncation Coding, BPF- Bit Pattern Feature.*

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1. INTRODUCTION

Content based image retrieval(CBIR), also known as query by image content(QBIC).This paper presents a new approach to derive the image feature descriptor from the Error-diffusion based block truncation coding (EDBTC) compressed data stream. The image feature descriptor is simply constructed from two EDBTC representative color quantizers and its corresponding bitmap image. The color histogram feature (CHF) derived from two color quantizers represents the color distribution and image contrast, while the bit pattern histogram feature (BHF) constructed from the bitmap image characterizes the image edges and textural information.The similarity between two images can be easily measured from their CHF and BHF values using a specific distance metric computation. This CBIR technique can be implemented on Art Collection. Here all painting of an artist is stored as a database one painting is selected as query image. Same query image is given for recognition, it will recognize the artist of that painting. Also it displays other paintings of that artist.

1.1 EDBTC

The low-pass nature of human visual system is employed to access the reconstructed image quality, in which the continuous image and its halftone version are perceived similarly by human vision when these two images viewed from a distance. The EDBTC method divides a given image into multiple non-overlapped image blocks and each block is processed independently to obtain two extreme quantizers. Some applications have been proposed in the literature triggered by the successfulness of EDBTC, such as image watermarking, inverse halftoning, data hiding, image security, and halftone classification.

The EDBTC scheme performs well in those areas with promising results, since it provides better reconstructed image quality than that of the BTC scheme. In this paper, the concept of the EDBTC compression is catered to the CBIR domain, in which the image feature descriptor is constructed from the EDBTC compressed data stream. In this scheme, the compressed data stream that is already stored in database is not necessary decoded to obtain the image feature descriptor. The descriptor is directly derived from EDBTC color quantizers and bitmap image in compressed domain by involving the vector quantization (VQ) for the indexing.

1.2 IMAGE RETRIEVAL

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, etc. An image retrieval system offers an efficient way to access, browse, and retrieve a set of similar images in the real-time applications. Several approaches have been developed to capture the information of image contents by directly computing the image features from an image.

Content-Based Image Retrieval (CBIR) is the mainstay of current image retrieval systems. In general, the purpose of CBIR is to present an image conceptually, with a set of low-level visual features such as color, texture, and shape.

2 LITERATURE SURVEY

Many former [8] schemes have been developed to improve the retrieval accuracy in the content-based image retrieval (CBIR) system. One type of them is to employ image features derived from the compressed data stream. As opposite to the classical approach that extracts an image descriptor from the original image, this retrieval scheme directly generates image features from the compressed stream without first performing the decoding process. This type of retrieval aims to reduce the time computation for feature extraction/generation since most of the multimedia images are already converted to compressed domain before they are recorded in any storage devices.

Without doing the interpreting systems [4], the metadata of the image are worked from the BTC or halftoning-based BTC minimized information stream. To gain the relative images from the database these images are acquired through two stages, indexing & seeking. The image properties are separated from the images that are taken from the database which is additionally put away as feature vector in the indexing stage. In seeking stage, the retrieve framework gets the factors of images from the input images, further it is used for achieving relative coordinating by the component vectors & placed in database. Finally, images which are matching to the component vectors will be accessed.

G. Qiu [9]**,** The CBIR framework is developed first utilizing the BTC can be found here. Utilizing two quantifiers & a bitmap image, the BTC is utilized to create the components of the image in which the image blocks are presented. The set of images are kept in order in a database, in the previous works they utilized components of two images, to be specific block pattern-histogram & the chunk cooccurrence pattern.

To produce the characteristics of the image [7], the YCbCr coloration is used in indexing of the image strategy is employed. At first stage, a image with RGB coloration area is converted to the YCbCr color space; finally, for Y color area, the encoding using BTC is achieved. Using VQ, images functions are produced through a YCbCr image. The approach produces a superior outcome as far as the retrieval precision.

The idea behind the BTC [10] is searching for a sample vectors to restore the first images. In particular, the BTC packs a image into another domain by partitioning the user image into different non-overlay image elements; this will be then calculated using two extreme quantifiers & bitmap

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image. Two sub images built by the two quantifiers & the relating bitmap image will be delivered toward the completion of encoding step, which are later sent to the decoder module. To produce the bitmap image, the BTC plot conducts thresholding utilizing the mean estimation of every image element with the end goal that a pixel esteem more noteworthy than mean esteem is viewed as 1 which are white cells in a image & conversely.

3 SYSTEM DESIGN

The proposed strategy packs a images productively, & in the meantime, its comparing compacted information stream can give a viable element descriptor to performing retrieving of images & indexing. Thus, the purposed plan can be considered as a viable contender for constant images recovery applications. The images attribute descriptor is built from three methods of techniques, for example, color or shading quantifiers, bitmap images & texture or surface descriptor of Gabor wavelet transform. The shading cooccurrence include (CCF) taken from two shading quantifiers that represents the shading appropriation & the contrasts in images, while the BPF built from a bitmap images describes the images edges & textural data. The closeness amongst trained & testing images can be measured from their CCF & BPF, Mean Amplitude & Mean Square Energy esteems utilizing a particular distance metric calculation. Exploratory outcomes show the prevalence of the proposed attribute descriptor contrasted with the previous existing plans in images retrieving undertaking under original & textural images. Subsequently, the proposed plan can be considered as a powerful contender for retrieving applications of real-time images.

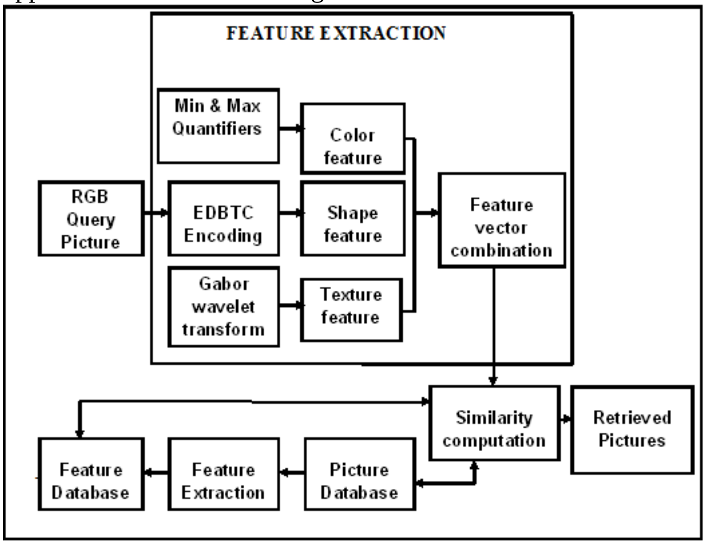

Fig.2: Proposed System Block Diagram

A. Proposed Methodology

i. Minimum and Maximum Quantizer Extraction (Color):

EDBTC rely on the two extraordinary color quantifiers to the decoder that concentrate the least & most noteworthy pixels into two images.

Minimum quantizer is stated as:

$$X_{Min} = \{x_{Min}(i,j);\ i = 1,2,\ldots,\tfrac{M}{m};\ j = 1,2,\ldots,\tfrac{N}{n},\} \text{.. (1)}$$

Maximum quantizer is stated as

$$X_{Max} = \left\{x_{Max}(i,j);\ i = 1,2,\ldots,\tfrac{M}{m};\ j = 1,2,\ldots;\tfrac{N}{n},\right\}$$

………………………………………….. (2)

this is applied on all three channels of the images:

$$x_{Min}(i,j) = \left[\min_{\forall k,l} b^{red}_{k,l}(i,j), \min_{\forall k,l} b^{green}_{k,l}(i,j), \min_{\forall k,l} b^{blue}_{k,l}(i,j)\right]$$

….. (3)

$$x_{Max}(i,j) = \left[\max_{\forall k,l} b^{red}_{k,l}(i,j), \max_{\forall k,l} b^{green}_{k,l}(i,j), \max_{\forall k,l} b^{blue}_{k,l}(i,j)\right]$$

…… (4)

ii. Bitmap Image (Shape):

Given an aboriginal RGB colored of M × N size images. This images is split to many non-overlay images m × n sized blocks, & every block can be processed solitarily.

$$B = \left\{b(i,j);\ i = 1, 2,\ldots,\tfrac{M}{m};\ j = 1, 2,\ldots,\tfrac{N}{n}\right\}\ldots (5)$$

The user images chunk b (i, j) is first translated into the interband median images by

$$\bar{b}_{(k,l)}(i,j) = \tfrac{1}{3}\left[b^{red}_{k,l}(i,j) + b^{green}_{k,l}(i,j) + b^{blue}_{k,l}(i,j)\right];$$

k = 1, 2, . . . , m; l = 1, 2, . . . , n. ……………… (6)

iii. Inter-band Average Image:

The interband median calculation is applied to all blocks of the images.

An element of images of a smaller esteem contrasted with the limit is swung to 0 (dark pixel); else it will be 1 (white pel) to develop the bitmap images portrayal. To find mean esteems of the interband average images element:

$$x_{Min} = \min_{\forall x,y} \bar{f}(x,y)\text{……………..} (7)$$

$$x_{Max} = \min_{\forall x,y} \bar{f}(x,y)\text{……………..} (8)$$

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$$\bar{x} = \sum_{x=1}^{m} \sum_{y=1}^{n} \bar{f}(x,y) \ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Bitmap images h(x,y) is produced using below method:

$$h(x,y) = \begin{cases} 1, \text{if } \bar{f}(x,y) \geq \bar{x} \\ 0, \text{ if } \bar{f}(x,y) < \bar{x} \end{cases} \ldots\ldots (10)$$

The esteem f(x, y) of not processed pixels are rejuvenated using the below method.

$$\bar{f}(x,y) = \bar{f}(x,y) + e(x,y) * \varepsilon \ldots\ldots (11)$$

Where 'e' is the error core to disseminate the quantization continued to its nearby elements that aren't been processed through EDBTC thresholding.

$$\left(\frac{1}{16}\right) \begin{bmatrix} & * & 7 \\ 3 & 5 & 7 \end{bmatrix} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

This * in above matrix indicates convolution progression.

iv. Gabor Wavelet Transform (Texture):

We can also calculate texture factors such as Mean-squared energy & Mean Amplitude from Gabor wavelet transform for every scale & orientation is returned.

v. Color-Co-Occurrence Factor Extrication:

The Color Cooccurrence factor (CCF) & Bit Pattern Factor (BPF) are used to extract attributes of the images. The C.C.F is acquired through the two color quantifiers, & the BPF through bitmap images.

vi. Bit Pattern Factor Extrication:

The surface, shape & other characteristics of the images are extricated utilizing Bit Pattern Factor.

Let Q = {Q1, Q2, . . . , QNb } be bit design code word that includes Nb the binary code words. From training images, the bit design codebook is produced utilizing binary vector quantization with soft centroids.

Toward the finish training stage, the binarization of all code vectors to yield the last outcome by performing the hard thresholding. Accordingly BPF is characterized through

$$BPF(t) = Pr\left\{ \begin{matrix} \bar{b}(i,j) = t \mid i = 1, 2, \ldots, \frac{M}{m}; \\ j = 1, 2, \ldots, \frac{N}{n} \end{matrix} \right\} \ldots (13)$$

For all t = 1, 2, . . . N_b.

vii. Texture factor Extrication:

We can also calculate texture characteristics such as Mean-squared energy & Mean Amplitude from Gabor wavelet transform for every scale & orientation is returned.

viii. Database Factor Extrication:

Similar to Query attribute extrication, the CCF, BPF & the texture factors are extricated for every images present in the storage

ix. Similarity Computation:

The resemblance among the images is computed utilizing: $\delta\,(query, target)$

$$= \alpha_1 \sum_{t=1}^{N_c} \frac{|CCF^{query}(t) - CCF^{target}(t)|}{CCF^{query}(t) + CCF^{target}(t) + \varepsilon}$$

$$+ \alpha_2 \sum_{t=1}^{N_b} \frac{|BPF^{query}(t) - BPF^{target}(t)|}{BPF^{query}(t) + BPF^{target}(t) + \varepsilon} \ldots\ldots\ldots (14)$$

x. Performance Analysis

The average exactness P(q) & the mean review R(q) estimations for portraying the images retrieval execution is characterized as underneath:

$$P(q) = \frac{1}{N_t L} \sum_{q=1}^{N_t} n_q(L) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (15)$$

$$R(q) = \frac{1}{N_t N_R} \sum_{q=1}^{N_t} n_q(L) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (16)$$

Where L, Nt, & NR indicate the quantity of recovered images, the quantity of images in storage database, quantity of important images on every

class, solitary. The q & nq (L) signify the user given images & quantity of effectively recovered images amid L recovered images set, solitary.

3 EXPERIMENTAL RESULTS

Table 1: Comparison between existing and designed system

S.NO	Existing System [2]	Designed System
1	profound learning factors for images grouping and	Bolster vector machine calculation is utilized for grouping which is not all

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	acknowledgment is utilized which is very intricate	that complex
2	Veracity is 80%	Veracity is 89%
3	GLCM feature is applied; energy and standard deviations are calculated for images retrieval.	Factor values such as CCF, BPF, mean & standard deviation values of all three color channels are examined
4	Time consumption is high	Time taken is high only, not low, but contrasted to the previous work, computational time is better

Table 2: Comparison between existing and designed system

S.NO	Existing System [2]	Designed System
1	Veracity is 80%	Veracity is high (above 90%)
2	Precision total positive rate) value is below 0.8	Precision value is 0.9

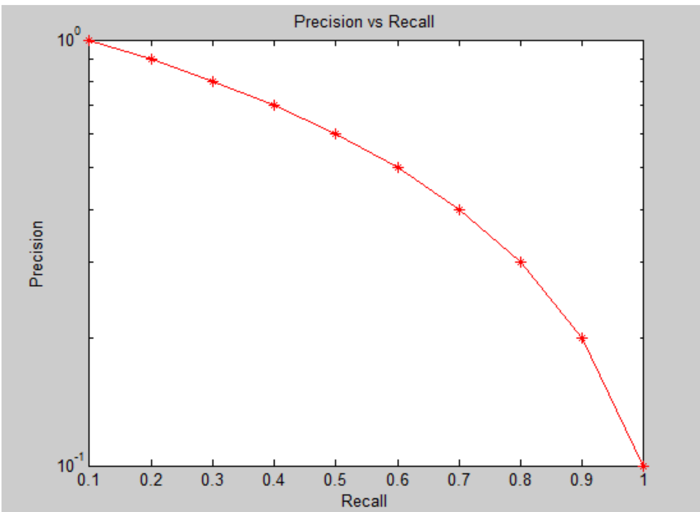

Fig.3. Precision Vs. Recall

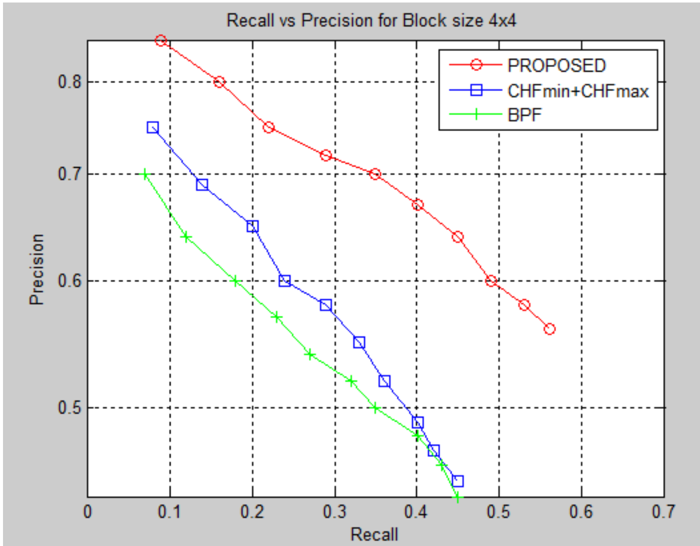

Fig.4. Recall Vs. Precision for Block size 4X4

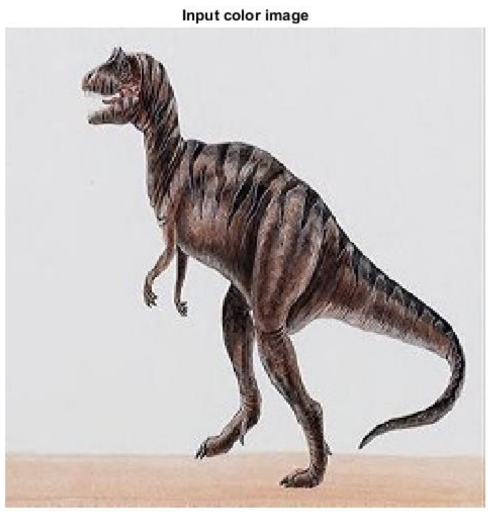

Fig.5. Input Query image

The images of size is (256X256) is taken as an input as a user-query images to retrieve related images in (64X64) size as output images.

2. Retrieved Images

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Fig.6. Retrieved images

4 CONCLUSION

A new method is proposed in this paper for color image indexing by exploiting the simplicity of the EDBTC method. A feature descriptor obtained from a color image is constructed from the EDBTC encoded data (two representative quantizers and its bitmap image) by incorporating the VQ. The CCF effectively represents the color distribution within an image, while the BPF characterizes the image edge and texture. The experimental results demonstrate that the proposed method is not only superior to the former BTC-based image indexing schemes but also to the former existing methods in the literature related to the CBIR. To achieve a higher retrieval accuracy, color based feature derived from the color spaces such as YCbCr, hue–saturation–intensity, and lab and texture based feature derived from Gabor wavelet transform can be added into the EDBTC indexing scheme.

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