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Content-Based Picture Retrieval through Color, Texture and Shape Factors

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Abstract: The objective of this paper is to depict the retrieval of pictures from a database using texture, shape and color factors of a picture. The size of an output picture is reduced to (64x64) from the input size is of (256x256) through minimum and maximum quantifier. Color Co-occurrence Feature (CCF) is used to extract the color factors. Error Diffusion Block Truncation Coding (EDBTC) and Bit Pattern Feature (BPF) are used to extract the shape of the picture. Gabor wavelet is used to extract the texture of the picture. Pictures are retrieved using similarity measures through Euclidean distances. The accuracy 97% is achieved through the above methods.

Keywords: Color Histogram Feature, Color Co-Occurrence Feature, Error Diffusion Block Truncation Coding, Bit Pattern Feature, Gabor Wavelet, Euclidean Distance.

I. INTRODUCTION

In previous frameworks, the picture characteristics are outlined through the block truncation coding compact stream data. To get to a relative set of pictures they utilized two procedures, indexing and searching. In indexing, the extraction is done on all the pictures that are stored in database further it is put away as factor vector. In searching, first the qualities of picture are retrieved later it is utilized to analyze on coordinating the traits of query picture with all the pictures in the database. Based on the matching texture and color trait, the pictures are retrieved as a yield pictures.

The main aim of the design is to extract the picture characteristics by using EDBTC to reduce the size of data stream without altering the quality of the picture.

A. Content-Based Picture Retrieval

We use color quantifiers andbitmap picture to build picture attribute descriptor. The edges and textural data of the picture are described from bitmap picture by designing the bit design histogram attribute. The comparability amidst two pictures perhaps is effortlessly measured from the BHF and CHF esteems utilizing a particular distance metric computation. Exploratory outcomes exhibit the prevalence of the designed attribute descriptor contrasted with the extant systems in picture retrieval errand beneath natural and surface pictures. The EDBTC strategy compress the picture productively, in the meantime, its comparing compacted data stream can gives a viable element descriptor to performing picture retrieval and characterization. Subsequently, the proposed design perhaps considered as a successful possibility for vital picture recovery application.

B. EDBTC Color Pictures

The EDBTC design performs well in those zones with promising outcomes; since it gives preferred recreated picture quality over the BTC conspire. In this paper, EDBTC is taken into account in which the space is taken from the picture attribute descriptor will be built through the EDBTC packed stream data. In the design, the packed stream of data that saved in database is a bit much decoded to get the picture attribute descriptor. This descriptor is directly gained from color quantifiers and bitmap picture through EDBTC in packed space area including the vector quantization (VQ) as shown in fig.1.

C. Picture Retrieval

A picture retrieval framework restores from the collection of pictures in the database to take care of client's demand with comparability assessments, for example, picture content likeness, edge design closeness, color similitude, so forth. A picture recovery framework offers a proficient approach to get to, peruse, and recover an arrangement of comparable pictures in the constant applications. A few methodologies have been created to catch the data of picture contents by

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straightforwardly processing the picture attributes from a picture. Content-Based Picture Retrieval (CBPR) is the backbone of present picture recovery frameworks. As a rule, the motivation behind CBPR is to introduce a picture adroitly, with an arrangement of low-level visual components.

D. Picture Content Descriptor
Large portion of the trials have been done to secure the visual picture content, some of them are managing the MPEG-7 Visual Content Descriptor, alongside the color, shape and texture descriptor to frame in worldwide approved for the CBPR assignment. Thus it gives an incredible favorable position in the CBPR look into field, in which some imperative perspectives, for example, sharing the picture characteristics for benchmark database, similar review between a few CBPR assignments, so on., turn out to be generally simple to be directed utilizing these standard element

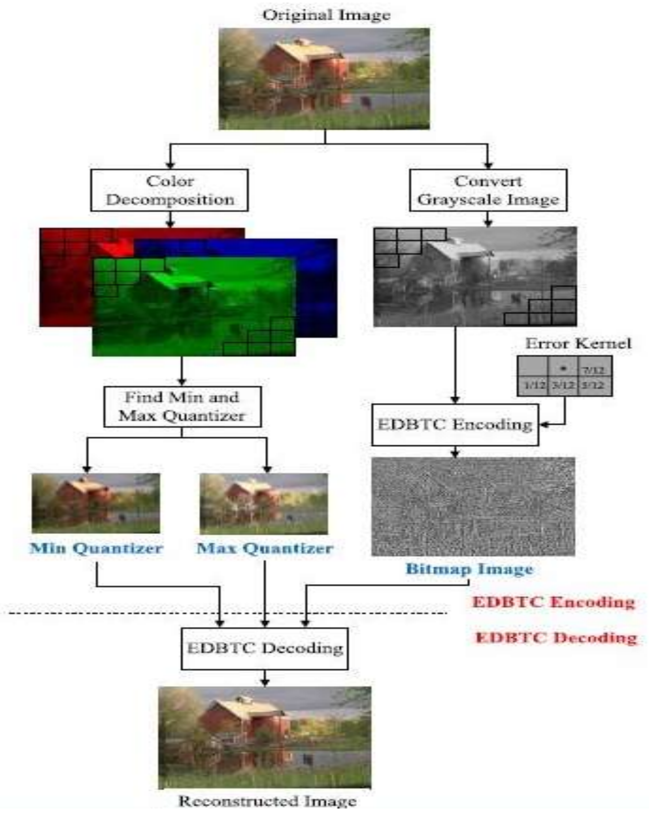

Fig.1. EDBTC for color picture

II. LITERATURE SURVEY

Earlier designs [8] have been proposed to update the recuperation precision in the form of content based picture recuperation structure. Among them one is to use picture attributes gained from compacted stream of data. Inversely the built up depicts that without first executing the deciphering method, expels a photo descriptor from the main picture this recuperation plot clearly make picture qualities from the decreased data stream. This kind of recuperation prompts reduce in time estimation for picture qualities extrication as most of the sight & sound pictures are starting at now changed over to compacted space afore they are stored in any of the storage devices.
Without doing the interpreting systems [4], the metadata of the picture are worked from the BTC or halftoning-based BTC minimized information stream. To gain the relative pictures from the database these pictures are acquired through two stages, indexing & seeking. The picture properties are separated from the pictures that are put away in database which is additionally put away as attribute vector in the indexing stage. In seeking stage, the recovery framework gets the factors of picture from the input picture, further it is used for achieving relative coordinating by the component vectors & placed in database. Finally, pictures which are matching to the component vectors will be accessed.

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

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To produce the characteristics of the picture [7], the YCbCr coloration is used in indexing of the picture strategy is employed. At first stage, a picture with RGB coloration area is converted to the YCbCr color space; finally, for Y color area, the encoding using BTC is achieved. Using VQ, pictures functions are produced through a YCbCr picture. 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 pictures. In particular, the BTC packs a picture into another domain by partitioning the user picture into different non-overlay picture elements; this will be then calculated using two extreme quantifiers & bitmap picture. Two sub pictures built by the two quantifiers & the relating bitmap picture will be delivered toward the completion of encoding step, which are later sent to the decoder module. To produce the bitmap picture, the BTC plot conducts thresholding utilizing the mean estimation of every picture element with the end goal that a pixel esteem more noteworthy than mean esteem is viewed as 1 which are white cells in a picture & conversely.

III. SYSTEM DESIGN

The proposed strategy packs a picture productively, & in the meantime, its comparing compacted information stream can give a viable element descriptor to performing retrieving of pictures & indexing. Thus, the purposed plan can be considered as a viable contender for constant picture recovery applications. The picture attribute descriptor is built from three methods of techniques, for example, color or shading quantifiers, bitmap picture & 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 picture, while the BPF built from a bitmap picture describes the picture edges & textural data. The closeness amongst trained & testing pictures 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 picture retrieving undertaking under original & textural pictures. Subsequently, the proposed plan can be considered as a powerful contender for retrieving applications of real-time picture.

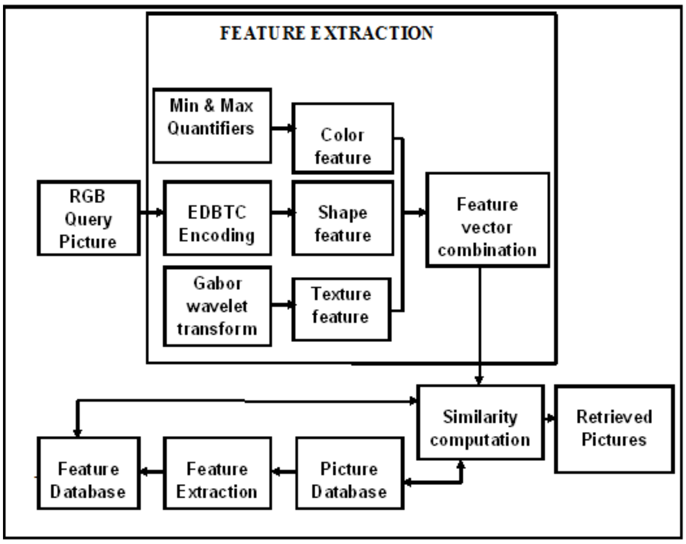

Fig.2: Proposed System Block Diagram

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 pictures.

Minimum quantizer is stated as:

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

Maximum quantizer is stated as

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

this is applied on all three channels of the picture:

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$$x_{Min}(i,j) = \left[\underset{\forall k,l}{Min}\, b_{k,l}^{red}(i,j), \underset{\forall k,l}{Min}\quad b_{k,l}^{green}(i,j), \underset{\forall k,l}{Min} b_{k,l}^{blue}(i,j)\right] \ldots..(3)$$

$$x_{Max}(i,j) = \quad \left[\underset{\forall k,l}{Max}\, b_{k,l}^{red}(i,j), \underset{\forall k,l}{Max}\, b_{k,l}^{green}(i,j), \underset{\forall k,l}{Max} b_{k,l}^{blue}(i,j)\right] \ldots\ldots (4)$$

ii. Bitmap Picture (Shape):
Given an aboriginal RGB colored of M × N size picture. This picture is split to many non-overlay picture m × n sized blocks, & every block can be processed solitarily.

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

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

$$\overline{b}_{(k,l)}\,(i,\ j) = \frac{1}{3}\left[b_{k,l}^{red}(i,j) +\ b_{k,l}^{green}(i,j) +\ b_{k,l}^{blue}\ \ (i,\ j)\right];$$
$$k = 1, 2, . . . , m;\ \ l = 1, 2, . . . , n. \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

iii. Inter-band Average Picture:
The interband median calculation is applied to all blocks of the picture.
An element of picture 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 picture portrayal. To find mean esteems of the interband average picture element:

$$x_{Min}\ =\ Min_{\forall\, x,y}\, \overline{f}\,(x,y) \ldots\ldots\ldots\ldots\ldots.. (7)$$
$$x_{Max}\ =\ Min_{\forall\, x,y}\, \overline{f}\,(x,y) \ldots\ldots\ldots\ldots\ldots.. (8)$$
$$\overline{x} =\ \sum_{x=1}^{m} \sum_{y=1}^{n} \overline{f}(x,y) \ldots\ldots\ldots\ldots\ldots\ldots (9)$$

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

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

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

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

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.
i. 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.

ii. Color-Co-Occurrence Factor Extrication:
The Color Cooccurrence factor (CCF) & Bit Pattern Factor (BPF) are used to extract attributes of the picture.The C.C.F is acquired through the two color quantifiers, & the BPF through bitmap picture.

iii. Bit Pattern Factor Extrication:
The surface, shape & other characteristics of the picture 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 pictures, 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

$$BPF\,(t) = Pr \begin{Bmatrix} \widetilde{b}\,(i,j) =\ t \mid i = 1, 2, \ldots, \frac{M}{m}; \\ j = 1, 2, \ldots, \frac{N}{n} \end{Bmatrix} \ldots (13)$$
$$\text{For all } \ t = 1, 2, . . . N_b.$$

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iv. 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.

v. Database Factor Extrication:
Similar to Query attribute extrication, the CCF, BPF & the texture factors are extricated for every pictures present in the storage.

vi. Similarity Computation:
The resemblance among the pictures is computed utilizing: $\delta\,(\text{query}, \text{target})$

$$= \alpha_1 \sum_{t=1}^{N_c} \frac{|CCF^{query}(t) - CCF^{target}(t)|}{CCF^{query}(t) + CCF^{target}(t) + \varepsilon} + \alpha_2 \sum_{t=1}^{N_b} \frac{|BPF^{query}(t) - BPF^{target}(t)|}{BPF^{query}(t) + BPF^{target}(t) + \varepsilon} \quad \ldots\ldots..(14)$$

vii. Performance Analysis
The average exactness P(q) & the mean review R(q) estimations for portraying the picture retrieval execution is characterized as underneath:

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

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

Where L, Nt, & NR indicate the quantity of recovered pictures, the quantity of pictures in storage database, quantity of important pictures on every class, solitary. The q & nq (L) signify the user given picture & quantity of effectively recovered pictures amid L recovered pictures set, solitary.

IV. EXPERIMENTAL RESULTS

Table I Comparison between existing and designed system

S.No	Existing System [2]	Designed System
1	profound learning factors for pictures grouping and acknowledgment is utilized which is very intricate	Bolster vector machine calculation is utilized for grouping which is not all that complex
2	Veracity is 80%	Veracity is 97%
3	GLCM feature is applied; energy and standard deviations are calculated for picture 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 II 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

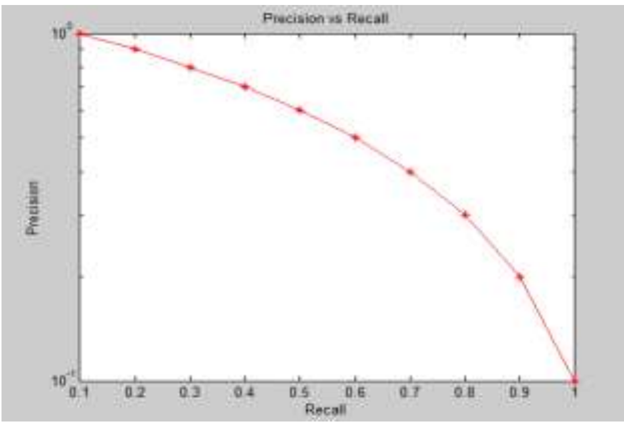

Fig.3. Precision Vs. Recall

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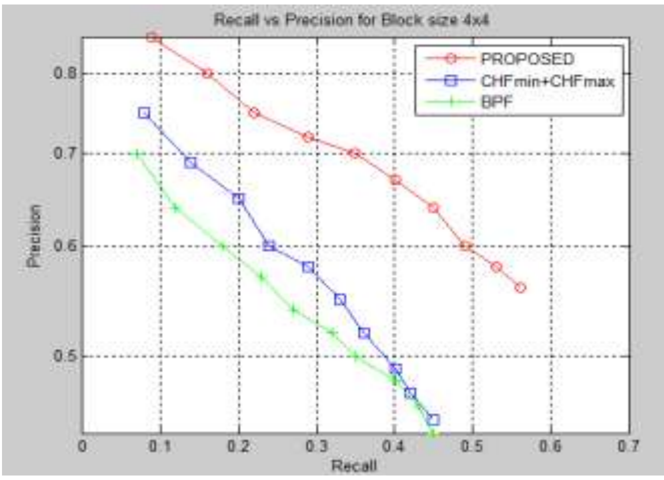

Fig.4. Recall Vs. Precision for Block size 4X4

Fig.5. Input Query picture

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

2. Retrieved Pictures

Fig.6. Retrieved pictures

V. CONCLUSION

The new strategy is intended in this project for indexing of color picture through EDBTC technique. An element descriptor acquired through a color picture is developed through the EDBTC encoded information by consolidating the

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VQ. C.C.F viably speaks to the color dissemination in the picture, while the BPF describes the picture edge & surface. From the experimental analysis we can say that the intended strategy is superior to the previous BTC-based picture indexing systems but also to the prior existing methods in the literary works based on the CBPR. To accomplish a higher retrieval precision, color based element acquired from the color spaces, for example, YCbCr, hue–saturation–intensity, lab & surface indexing plan.

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