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IMPLEMENTATION OF GENERATION OF IMAGE CONTENT DESCRIPTOR USING CONTENT-BASED IMAGE RETRIEVAL

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Abstract:

A photograph obtaining or receiving system is a computer system for scanning, searching and obtaining photograph from a large database of digital images. Several established and common methods of image retrieval make use of some method of adding metadata such as legends, keywords, or descriptions to the pictures so that retrieval can be accomplished over the notation words. Manual picture notation is delayed, heavy and expensive; to address this, there has been a huge amount of research done on automatic image notation. In the existing system various algorithm is used such as Image Compression Algorithm, Image Hiding Algorithm for Watermarking, Block Truncation Coding, Clifford Algebra which is used to define colour alteration, Digital Image Processing, Block Optimization and Arithmetic Coding based on Histogram, BTC with Assorted colour space, VQ codeword search Technique. An image retrieval system provides a well organised way to entrance or retrieve a set of homogeneous images by directly computing the image features from an image as reported by using different kinds of techniques as well as algorithms. In case of proposed system, image retrieval is available by utilizing the ODBTC encoded data stream to create the image features, namely Colour Co-occurrence and Bit Pattern features. As recorded in the experimental results, the offered scheme can produce the greatest average accuracy rate compared to various former schemes in the literature. As a result, the proposed scheme can be considered as a very aggressive applicant in the coloured image retrieval application.

Keywords: Image Retrieval, Digital Halftoning, Image Compression Algorithm, EBTC, Adaptive Block truncation Algorithm, Image Hiding Algorithm for watermarking.

1. INTRODUCTION:

An image retrieval system yields a set of pictures from a group of images in the database to fulfil the user's requirements that will evaluates the features such as edge pattern correspondence, image content, colour similarity, shapes, size of images, etc. For real-time applications, image retrieval system gives a well organised way to browse, access and recovers a set of homogeneous images. Some approximates have been evolved to capture the details of image contents by immediately enumerating the image characteristics from an image as reported in the database.

1.1 Image Search:

Searching of an image is specialized information explore used to discover an images. For finding images, a user can give specific query word such as image link/file, keyword or click on some particular image, and the system will return images "similar" to the query word. This resemblance is used for searching criteria could be colour distribution in images, region/shape attributes, meta tags etc.

- *Image Meta search* – finding of pictures which is based on related Meta data such as shape, location, keywords, text, etc.
- *Content-Based image retrieval (CBIR)* – the use of computer sight to the obtaining images. CBIR focuses at keeping away from the utilization of textual descriptions and instead obtains images based on their similarities in contents (textures, colours, shapes etc.) to a user-specified query image or user-supplied query image features.
- *Image collection exploration* – search of images based on the use of novel exploration paradigms.

1.2 Data Scope:

In order to ascertain the convolution of image hunt system design, it is vital to understand the scope and nature of image statistics. The assortment of user-base and expected user traffic of search system and the design is also mainly influenced by the factors. The search data can be classified into the following categories along with this element:*Archives* – The structured or semi-structured identical information belonging to specific topics will include huge volumes.*Domain-Specific Collection* – the access furnished to the controlled users with very precise objectives in standard collection. The biomedical and satellite are examples for such collections.

Enterprise Collection – Within an organization's intranet for the assorted collection of images are accessible to the users. In different locations images can be stored.

Personal Collection – A huge standardized collection consists of size and it is small, primarily accessible to its owner and it is stored on a local storage media.

Web – In this, within an internet connection everyone can access images through World Wide Web. These are generally stored in large disk arrays and these image collections are non-homogeneous, semi-structured and immense in volume.

1.3 Objectives:

- To design a method for content based image retrieval (CBIR) method.
- To intend a new approach to manifest images in database using characteristics generated from the ODBTC compact data stream.

2. EXISTING SYSTEM:

Some approaches have been urbanized to confine the information of image contents by directly computing the image characteristics from an image. In "Colour image retrieval based on DCT domain vector quantization index histograms", the image feature is basically built in DCT domain. An improvement of image retrieval in DCT domain is presented in "Image indexing and retrieval in JPEG compressed domain based on vector quantization", in which the JPEG standard compression (excluding the entropy coding) is involved to generate the image feature.

2.1 **Existing** *Drawbacks*

- Low accuracy in retrieving the images. i.e., the retrieved images not belong to the query image class. Mismatch occurs.
- Retrieved image quality is low.
- Computational complexity is high.
- The features are extracted directly for the images.

3. PROPOSED SYSTEM

To intend a new approach to manifest images in database using characteristics generated from the ODBTC compact data stream. The manifesting technique can be comprehensive for CBIR. ODBTC reduced an image into a set of colour quantizers and a bitmap image. There are two image features which generates image retrieval system namely Colour Co-occurrence Features (CCF) and Bit Pattern Feature (BPF) from the colour quantizers and bitmap image correspondingly, by relating the visual codebook. There is a promising result in terms of recovery precision compared to the state-of-the-arts from the proposed CBIR. The proposed method is superior to the block truncation coding image rescue systems and the other earlier methods, and thus prove that the ODBTC scheme is not only appropriate for image density since of its minimalism and it offers a simple and effective descriptor to manifest images in CBIR system which shows in experiment.

3.1 Proposed System Advantages

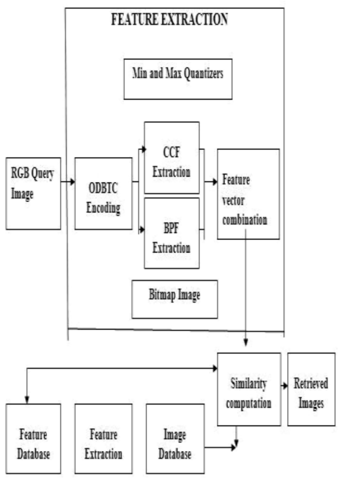
- The reconstructed image quality is high.
- In terms of natural scene classification it offers a promising outcome and outperforms the former existing technique.
- There is a better result in terms of the recovery exactness when compared to the formers technique.
- There is a low in Computational complexity.

3.2 Proposed System Technique

- Half-toning based Block Truncation Coding (HBTC)
- Ordered-Dithered Block Truncation Coding (ODBTC)

3.3 **Proposed** *System Block Diagram*

Feature Extraction



4. ALGORITHM:

ORDERED - DITHERING BLOCK TRUNCATION CODING (ODBTC)

ODBTC collapses an image block into consequent quantizers and bitmap image in the encoding step. Without performing the decoding process two image features are projected to manifestation an image, namely, colour co-occurrence feature (CCF) and bit pattern features which are generated directly from the ODBTC determined data streams

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There is a drawback in reconstructed image quality, in which the blocking effect and false outline are often occurred in decoded images in the BTC scheme.

One of the halftoning- based- BTC schemes, namely Ordered Dithered Block Truncation Coding (ODBTC), improves the renovated image quality by mitigating the blocking effect and diminishing the false contour problem while maintaining the low computation density with its inbuilt parallelism benefit. In ODBTC, each block is processed autonomously and it divides a given into numerous non-overlapped image blocks. The independent processing permits the corresponding benefit which is a unique feature in ODBTC scheme. The ODBTC is a very powerful method to substitute the typical BTC when compared to the variations of the BTCs. Thus there is an enhancement in the image quality significantly under a similar processing effectiveness.

For the image reclamation and categorization examine field the ODBTC scheme is applied. There is an efficient condense of image by decomposing an image into two quantizers and bitmap image by ODBTC.

5. METHODOLOGIES

5.1 Minimum And Maximum Quantizer Extraction

From the Red band, Green band and Blue band, the minimum quantizer is formed by combining the minimum pixel values are acquired. From the Red band, Green band and Blue band, the maximum quantizer is formed by combining the maximum pixel values are acquired. If the input is given as 256×256 the size was reduced to 64×64. Thus Downsampling is done. The clarity of the image remains the same even though the size of the images was condensed.

The minimum and maximum quantizers are in the RGB colour demonstration due to the RGB colour space is employed.

The minimum and maximum quantizers in the RGB colour depiction due to the RGB colour space are employed. ODBTC also transmits the two extreme colour quantizers (minimum and maximum quantizers) to the decoder.

The set of minimum and maximum quantizers from all image blocks is given as,

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

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

Where, *Xmin(i, j)* and *Xmax(i, j)* indicate the minimum and maximum values, respectively, over red, green and blue channels on the corresponding image block*(i, j)*. The subscript R, G and B denote the Red, Green and Blue colour channels, correspondingly. Herein, the minimum and maximum quantizers contain the RGB colour information for each image block. The two values can be properly formulated as,

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

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

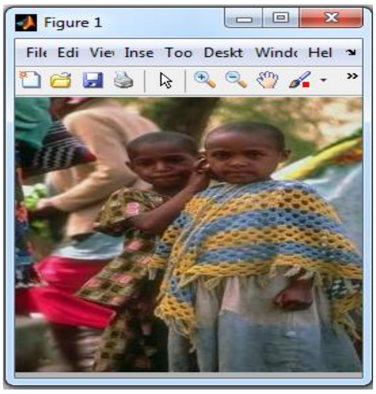


Fig. 5.1 Input Query Image

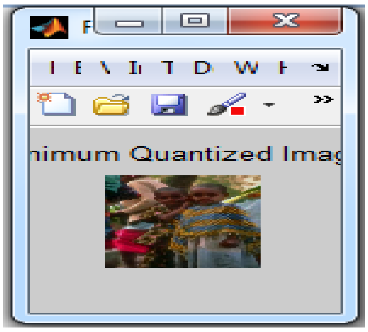


Fig. 5.2 Minimum Quantized Image

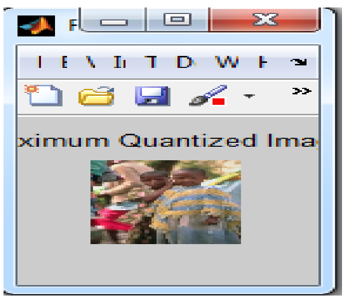


Fig. 5.3 Maximum Quantized Image

5.2 Bitmap Image

When considered in an image block, the classical

BTC resemble executes the thresholding operation with a single threshold value acquired from the mean value of the pixels. In a image block it turns to 1 (white pixels) to create the bitmap image illustration when a pixel of a smaller value is compared to the threshold and it's turned to 0 (black pixels).

For each image block to obtain the delegate bitmap image *bm* (*i. j*), the ODBTC executes the thresholding inter-band average image with the scaled version.

$$bm_{k,l}(i,j) = \begin{cases} 1; \text{if } \bar{b}_{k,l}(i,j) \geq \bar{b}_{min}(i,j) + D^d(k,l) \\ 0; \text{if } \bar{b}_{k,l}(i,j) < \bar{b}_{min}(i,j) + D^d(k,l) \end{cases},$$

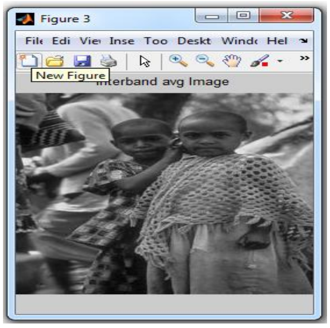
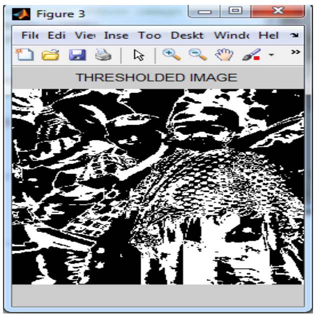


Fig.5.4 Inter-band Average image



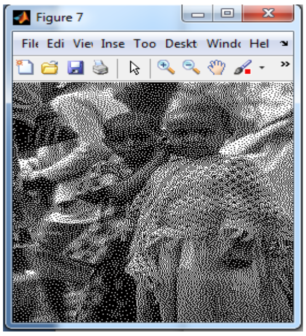


Fig. 5.5 Threshold Image **Fig. 5.6 Bitmap Image**

5.3 ODBTC Encoding

The image is firstly divided into multiple non-overlapping image blocks of size *mxn*, and each image block can be processed separately with given an inventive RGB colour image of size *M x N.*

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

The original image block *b(i, j)* is firstly transformed into the inter-band standard image by,

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

The inter-band standard computation is applied to all image blocks.

The conventional BTC resemble accomplishes the thresholding operation with a single threshold value obtained from the mean value of the pixels in an image block. A pixel of a smaller value compared to the threshold is turned to 0 (black pixel); otherwise it turns to 1 (white pixel) to build the bitmap image demonstration. consequently, the ODBTC performs the thresholding on the inter-band average image with the scaled edition of dither array for each image block to obtain the representative bitmap image *bm(i, j).*

Except for sending the image bitmap to the decoder.

The bitmap image, *bm*, the minimum quantizer, *Xmin*, and maximum quantizer *Xmax*, are obtained and measured as encoded data stream, which are then broad casted to the decoder module over the diffusion channel at the end of the ODBTC encoding. To rebuild the image the recipient decodes the encoded data stream. The elements of value 1 in the bitmap by the maximum quantizer and the decoder simply replace the elements of value 0 in the bitmap by the minimum quantizer.

When compared to the established BTC scheme it is clear that the ODBTC yield better reassembled image quality. In the ODBTC recreated image false contour and the blocking effect are reduced since the half-toning vision from the dithering scheme. The ODBTC condensed data stream, i.e., the bitmap image and two intense colour quantizers can be further deployed as an image descriptor except for the image firmness. In this paper the image attribute which is derived from the ODBTC encoded data stream by using a simple technique for CBIR task development.

5.4 Colour Co-occurrence Feature (CCF) Extraction

An image is degraded into a bitmap image in the anticipated technique which is engaged in the ODBTC and two colour quantizers which are consequently utilized for acquiring the image feature descriptor.

There are two image features which are introduced in the projected scheme to distinguish the image contents, i.e., Colour Co-occurrence Feature (CCF) and Bit Pattern

Feature (BPF). The BPF is derived from the Bitmap image and the CCF is obtained from the two colour quantizers

The colour division of the pixels in an picture contains enormous amount of data about the image contents. The characteristic of an image can be obtained from the image colour distribution by means of colour co-occurrence matrix. This matrix enumerates the occurrence possibility of a pixel along with its closest neighbours to assemble the definite colour information. The spatial information of an image represents the matrix form.

Colour Co-occurrence matrix can be obtained from the Colour co-occurrence feature (CCF). The two ODBTC colour quantizers can be executed using Colour Co-occurrence feature.

The minimum and maximum colour quantizers are initially indexed by means of a specific colour codebook. The colour co-occurrence matrix is consequently constructed from these indexed standards. At the end of computation, the colour C-occurrence matrix can be obtained by using Colour Co-occurrence Features, consequently. In general, the colour indexing process on RGB space can be defined as mapping a Red, Green, Blue pixel of three tuples into a finite subset (single tuple) of codebook index (the most representative code word). LBG vector quantization (LBG VQ) generates a delegate codebook from a number of preparation vectors.

Let us consider *Cmin={cmin1, cmin2,......cmin Nc}* and *Cmax={ cmax1, cmax2,.............cmax Nc}* be the codebooks which is generated from the minimum quantizer, *Xmin,* and maximum quantizer, *Xmax,* correspondingly. Herein, *cmin i, cmax i and Nc* indicate the code words from minimum quantizer, codeword from maximum quantizer and colour codebook size, correspondingly. The colour indexing method of the ODBTC minimum quantizer can be measured as the nearby identical between the minimum quantizer value of each image block *Xmin (i, j)* and the codebook Cmin. In the same way, the indexing for the maximum quantizer of each image block *Xmax (i, j)* with codebook Cmax is formally defined. After processing the colour indexing for minimum and maximum quantizers, the colour co-occurrence matrix i.e., CCF for a given image can be directly computed as,

$$CCF(t_1,t_2) = \Pr\left\{\tilde{i}_{min}(i,j) = t_1, \tilde{i}_{max}(i,j) = t_2 \middle| i = 1,2,\ldots,\frac{M}{m}; j = 1,2,\ldots,\frac{N}{n}\right\},$$

5.5 Bit Pattern Feature (BPF) Extraction

The bitmap image can be constructed using Bit Pattern Feature. Another attribute, namely Bit Pattern Feature (BPF), characterises the edges, the image content, size, shape and texture of image. The binary vector quantization constructs a illustrative bit pattern code book from a set of training bitmap images procures from the ODBTC encoding development. Let the *Q= {Q1, Q2 ...QNb}* signifies the bit pattern code book consisting Nb binary code words. These bit pattern books are obtained using binary vector quantization with soft centroids, and numerous bitmap images are occupied in the preparation stage. At the code book production stage, all code vector mechanism may have intermediate real values between 0 (black pixel) and 1 (white pixel) as conflicting to binary values. At the end of training stage, the hard thresholding executes the binarization of all code vectors to yield the final result. Thus BPF is defined as,

$$BPF(t) = \Pr\left\{\tilde{b}(i,j)=t \middle| i = 1,2,\ldots,\frac{M}{m}; j=1,2,\ldots,\frac{N}{n}\right\}$$
$$\text{for all } t = 1,2,\ldots N_b.$$

5.6 Texture Feature Extraction

Gabor wavelet transformation is used for extracting the texture features.

5.7 Database Feature Extraction (Training)

Similar to query feature extraction, the CCF, BPF and the texture feature are extracted for all the pictures present in the recorded file.

5.8 Similarity Computation

The resemblance between two images (i.e., a query image and the set of images in the database as objective image) can be measured using the relative distance measure. The similarity distance place is an important role for retrieving a similar set of pictures. The question image is firstly encoded with the ODBTC, yielding the subsequent CCF and BPF. The two features are later compared with the description of target images in the database. A set of similar images to the query image is returned and well-organized based on their similarity distance score, i.e., the lowest score represents the most related image to the query image. Officially the similarity quantity between two images is defined as follows,

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

Similar to Query features extraction, the texture features, BPF and the CCF are extracted for all the images there in the database.

5.9 Image Retrieval Using SVM

The anticipated technique performance is calculated with the quantity correct categorization (accuracy) from the adjacent neighbour classifier in the image classification task. The classifier assigns a class label of testing set by means of the similarity distance calculation as used in the image retrieval task. The similarity distance is computed and sorted in the ascending order between the query image queue and target images in the database, and then the first *L* pictures are returned as a set of retrieved images. In image retrieval research, all pictures are twisted as query image such that the performance estimation is conducted by averaging the values over all query images. Officially, the average precision *P(q)* and average recall *R(q)* measurements for describing the image retrieval performance are defined as below:

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

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

Where, *L*, *Nt* and *NR* indicates the number of retrieved images, the number of images in database, and the number of relevant images on each class, correspondingly. The symbols *q* and *nq (L)* represent the query image and the number of correctly obtained pictures among *L* retrieved images set, correspondingly.

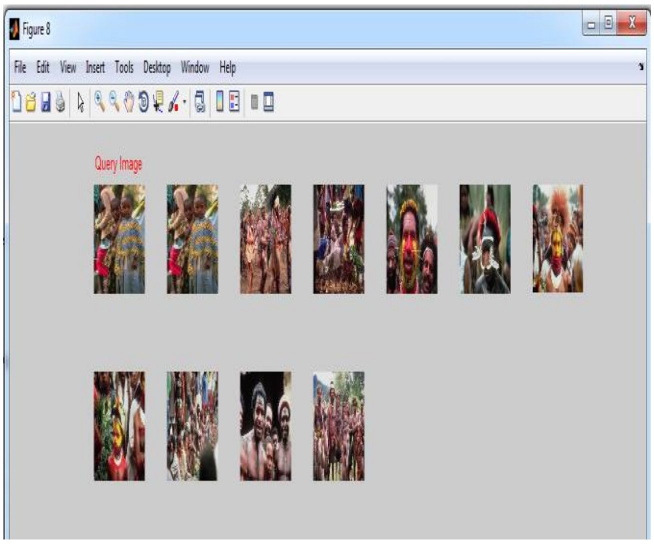


Fig. 5.7 Retrieved Images

Confusion Matrix:

4	0	0	1	0	0	0	0	0	0
0	4	0	0	0	0	0	1	0	0
0	0	5	0	0	0	0	0	0	0
0	0	0	4	0	0	0	0	0	1
0	0	0	0	3	0	2	0	0	0
0	0	0	0	0	5	0	0	0	0
0	1	1	0	0	0	3	0	0	0
0	1	0	0	1	0	2	1	0	0
1	0	1	1	1	0	0	0	1	0
1	0	1	0	0	0	0	1	0	2

Predicted Query Image Belongs to Class = 1

Fig. 5.8 Class result

6. APPLICATIONS:

- Certain elevated good organization and low computational convolution of the ODBTC, some of the fascinating applications have been urbanized based on it such as, watermarking schemes
- Consequently it provides high-quality solutions for application requiring privacy and ownership security.
- The anticipated system can be measured as a extremely reasonable aspirant in colour image retrieval application.

Reducing an image is a like compressing picture which is lossy type in Block truncation. The original image is separated into fixed-size of non-overlapping blocks of size MXN while in Block Truncation Coding. The block size preferred is typically small to keep away from the blocking effect and edge blurring. Each block is separately coded by means of a two level (1-bit) quantizer. The two values reserve the first and the second moment attribute of the original block. BTC does not provide a higher gain than any of the modern image compressing algorithms like JPEG or JPEG-2000, but it is much slighter complex. Digital half-toning is a technology of converting a continuous tone image to a two tone image.

7. CONCLUSION

In projected scheme, an image retrieval system is obtainable by utilizing the ODBTC encoded data stream to build the image description, namely, colour co-occurrence and bit pattern features. As acknowledged in the investigational result, the anticipated method can offer the best typical correctness rate compared to assorted earlier schemes in the literature. Since in a result, the proposed method can be measured as a incredibly aggressive aspirant in colour image retrieval application. Half-toning algorithm is effortless and improves the presentation of images as compared to other algorithms.

8. FUTURE ENHANCEMENT

We will implement the block truncation coding and show the comparison of the compressed bit map image using BTC and the compressed bitmap image using ODBTC.

Another feature such as Gabor Wavelet transform which comes under Texture Descriptor (TD) can be added along with BPF and CCF, to improve the retrieval the presentation.

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