A Review on Ordered Dither Block Truncation Coding for Content Based Image Retrieval using Relevance Feedback

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Abstract— now a days, content based image retrieval (CBIR) is the mainstay of the image retrieval systems. CBIR system is used in various areas like medical, academic, art, fashion, Entertainment .This project uses ordered-dither block truncation coding (ODBTC) for CBIR which have relevance feedback mechanism. In this project features of an image are extracted using ODBTC for the generation of image content descriptor. ODBTC offers a simple and effective descriptor to index images in CBIR system. ODBTC compresses an image block into minimum quantizer, maximum quantizer and bitmap image. The proposed image retrieval system generates two image features namely Color co-occurrence feature (CCF) and bit pattern feature (BPF) from the minimum quantizer, maximum quantizer and bitmap image respectively by involving the visual codebook. To be more profitable, relevance feedback technique can be applied into CBIR such that more precise results can be obtained by taking users feedback into account. The proposed method is superior to the block truncation coding image retrieval system and the other earlier method.

Index Terms— Bit pattern feature, Block Truncation Coding,color co-occurrence feature, Content Based Image Retrieval, Image Retrieval,Ordered dither block truncation coding, relevance Feedback.

1 INTRODUCTION

THE most promising computer technique i.e. content based image retrieval is used to solve searching problem for digital image in the huge database. In content based image retrieval, various image features such as colour, texture and shape are considered for retrieving an image. For getting these features, FeatureExtraction technique is projected. An image retrieval system returns a set of images from a collection of images in the database to meet user's demand with similarity evaluations such as image content similarity, edge pattern similarity, colour 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.

2 LITERATURE REVIEW

In CBIR system an image features are extracted using different techniques. In paper [2] the Block Truncation Coding (BTC) technique is given which requires simple process on both encoding and decoding stages. The BTC compresses an image in a simple and efficient way [2].The first CBIR system which uses BTC can be found in [12]. The method exploits the nature of BTC to generate the image feature in which an image block is merely represented using two quantized values and the corresponding bitmap image. In the early work [12], two image features have been proposed which are namely block color co-occurrence matrix and block pattern histogram, to index a set of images in database. The paper [12] uses the RGB color space, whereas the image indexing scheme in [14] employs the YCbCr color space for the generation of image feature. In [14], an image with RGB color space is firstly converted into the YCbCr color space, subsequently, the BTC encoding is performed only for Y color space. By employing VQ, two images features (contrast and visual pattern co-occurrence matrix and color pattern co-occurrence matrix) are generated from aYCbCr image. In paper [14] the methods yields a better result in terms of the retrieval accuracy compared to that of the former methods as reported in [14]. Some improvements on the BTC-based image retrieval system can also be found in [13] and [15], in which both methods utilize the RGB color space for the extraction of the image feature descriptor. In [13], the BTC encoding is performed on each color space (red, green, and blue) separately. A different approach for CBIR system incorporating the color moments and K-means clustering can be found in the BTC-based indexing method [15]. As reported in [12], [13], [14], [15], the BTC has demonstrated its efficiency and ability in the compression domain.

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Several improvements and enhancements in the BTC scheme have been reported in literature [3],[4],[5],[6],[7],[8],[9],[10],[11] to further reduce the computational complexity, improve image quality, and achieve a higher compression ratio. HBTC is an extended compression technique derived from BTC scheme, in which the BTC bitmap image is replaced with the halftone image.

The HBTC quantizers are obtained by very simple method i.e. from the minimum and maximum values found in an image block. The example of HBTC is dithering-based BTC in which the bit pattern configuration of the bitmap is merely generated from the dithering approach. The dithering-based BTC, namely Ordered Dither Block Truncation Coding (ODBTC) [8], [9], involves the low-pass nature of the Human Visual System (HVS) for achieving an acceptable perceptual image quality. It is based on the fact that the continuous and halftone images are perceived similarly by human vision when they are viewed from a certain distance. In encoding stage, the ODBTC scheme utilizes the dither array Look-Up-Table (LUT) to speed up the processing speed. The dither array in ODBTC method substitutes the fixed average value as the threshold value for the generation of bitmap image. The extreme values in ODBTC are simply obtained from the minimum and maximumvalue found in the image blocks. Given the high efficiency and low computational complexity of the ODBTC, some interesting applications have been developed based on it such as watermarking schemes [10], [11]. Thus, it offers a good solutionfor application requiring privacy and ownership protection.

3 PROPOSED SYSTEM

In this project, a new approach is proposed to index images in database using features generated from the ODBTC compressed data stream. This indexing technique can be extended for CBIR. ODBTC compresses an image into a set of color quantizers and a bitmap image.The proposed image retrieval system generates two image features namely Color co-occurrence feature (CCF) and bit pattern feature (BPF) from the minimum quantizer, maximum quantizer and bitmap image respectively by involving the visual codebook. To be more profitable, relevance feedback technique can be applied into CBIR such that more precise results can be obtained by taking users feedback into account. The proposed method is superior to the block truncation coding image retrieval system and the other earlier method.

Architecture:

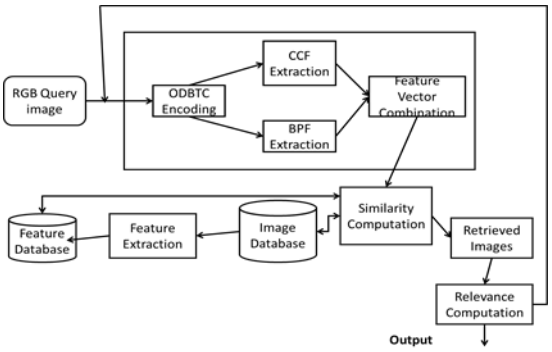

Fig. 1. Block Diagram of proposed system.

As shown in Fig.1 the RGB color image is an input to the system. First the ODBTC encoding is performed on that image. The output of ODBTC encoding is bitmap image, maximum quantizer & minimum quantizer. Then Color co-occurrence features are extracted using codebooks & quantizers. Then bit pattern features are extracted which uses LBG-VQ algorithm. Then similarity is calculated using following formula

d(query,target)=

$$\alpha 1 \sum_{t=1}^{Nc} \frac{\left| CCF^{query}(t) - CCF^{target}(t) \right|}{CCF^{query}(t) + CCF^{target}(t) + \varepsilon} + \alpha 2 \sum_{t=1}^{Nb} \frac{\left| BPF^{query}(t) - BPF^{target}(t) \right|}{BPF^{query}(t) + BPF^{target}(t) + \varepsilon}$$

Where $\alpha 1$ and $\alpha 2$ denote the similarity weighting constants, representing the percentage contributions of the CCF and BPF in the proposed image retrieval system. A small number ε is placed at the denominator to avoid the mathematic division error. Notably, the CCF and BPF are from different modalities such that combining these features and determining the similarity weighting constants can be carried out through the experiments. According to similarity distance the most similar images to the query image are retrieved and displayed to the user. If user is not satisfied then user feedback is taken into account so that more relevant images are retrieved to the user.

4 Conclusion

In this project, the Ordered Dither Block Truncation Coding (ODBTC) is proposed to solve the problems which occurred due to BTC. BTC causes severe perceptual artifact in high compression ratio applications. The LUT-based dither array approach is proposed which significantly reduce the complexity of the BTC.

In this project, an image retrieval system is presented by exploiting the ODBTC encoded data stream to construct the image features Color Co-occurrence and BitPattern features. Proposed scheme can provide the best average precision rate compared to various former schemes in the literature. As relevance feedback is added in the system, user satisfaction is improved in proposed system. As a result, the proposed scheme can be considered as a very competitive candidate in color image retrieval application.

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