A LITERATURE REVIEW ON COLOUR IMAGE COMPRESSION TECHNIQUES

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ABSTRACT

Image compressions algorithms eliminate or reduce local redundancy Standard methods of image compression are of several types. The most popular method currently used relies on eliminating high-frequency components of the signal by storing only the low-frequency Fourier coefficients. This method uses a Discrete Cosine Transform (DCT) and is the basis of the JPEG standard, which comes in many incompatible forms. Vector quantization uses a building block approach, which breaks up the image into a small number of canonical pieces and storing only a reference. Fractal image compression is a fairly nascent field of research. So in this paper we are studying about different image compression techniques.

Keywords: *DWT, FIC, MBTC*

LITERATURE REVIEW

DISCRETE WAVELET TRANSFORM FOR IMAGE COMPRESSION

Dimitriis A. Karras (2009) This paper suggests a novel MRI image compression scheme, using the discrete wavelet transformation (DWT) and an improved Bayesian restoration approach. The suggested methodology is based on preservation of important second order correlation ("textural") features of either DWT coefficients or image pixel intensities. While rival image compression methodologies utilizing the DWT apply it to the whole original image uniformly, the herein presented novel approach involves a sophisticated DWT application scheme. That is, different compression ratios are applied to the wavelet coefficients belonging in the different regions of interest, in which either each wavelet domain band of the transformed image or the image itself is clustered, respectively, employing textural descriptors as criteria. Restoration of the original MRI image from its corresponding regions of interest compressed images involves the inverse DWT and a sophisticated Bayesian restoration approach which does not require user defined parameters, since all parameters are subject to the same optimization process. An experimental study is conducted to qualitatively assessing all approaches in comparison with the original DWT compression technique, when applied to a set of brain MRI images.

Adnan Mohsin Abdulazeez Brifcani; Jwan Najeeb Al-Bamerny (2010) A fundamental goal of digital image compression is to reduce the bit rate for transmission or data storage while maintaining an acceptable fidelity or image quality. In this study a proposed coding (compression) scheme for grey scale image by combining discrete wavelet transform (DWT), multistage vector quantization (MSVQ) and Huffman coding is presented. These combinations are utilized to take the advantages provided by all of them to get high compression ratio with acceptable recovered image quality in term of Peak Signal to Noise Ratio (PSNR) instead of using each method

separately. First, the discrete wavelet transform is performed on the original image using bi-orthogonal 9/7 filter (bior4.4) resulting in number of sub-bands according to the decomposition level that can be one, two or three in the proposed scheme. Huffman coding applied on the approximation sub-band, and on the indices of the last level detail sub-bands that are vector quantized by two stages using LBG algorithm which forms the basis of most vector quantizer designs, other detail sub-bands set to zero if the decomposition level is greater than one to increase the compression ratio.

Khamees Khalaf Hasan; et.al (2013) In this paper, flexible hardware architecture of multi-level decomposition Discrete Wavelet Transform (DWT) is proposed for image compression applications to eliminate redundant information from the transmitted images or video frames over the wireless channel. This architecture of DWT is described and synthesized with the Very High Speed Integrated Circuit (VHSIC) Hardware Description Language (VHDL) based methodology. The design can be accommodated on any targeting Field Programmable Gate Array (FPGA) device with slight changes. It facilitates to images of size 64×64, 128×128, 256×256, and 512× 512 pixels and capable of seven levels of decomposition. In order to reduce computational complexities, Fast Haar Wavelet Transform (FHWT) is used. The reduction in the resource usage of this 2D DWT multilevel FPGA core can be used to counter severe hardware constraints of various wireless and mobile device applications.

V. Rajasekhar; et.al (2014) Designing Universal embedded hardware architecture for discrete wavelet transform is a challenging problem because of diversity among wavelet kernel filters. In this work, DWT is used for compression application. Wavelet transform divides the information of an image into approximation and details sub signals. The approximation sub signals shows the general trend of pixel values and other three detail sub signals show the vertical, horizontal and diagonal details or changes in the images. If these details are very small (threshold) then they can be set to zero without significantly changing the image. The greater the number of zeros the greater the compression ratio. If the energy retained (amount of retained by an image after compression and decompression) is 100% then the compression is lossless as the image can be reconstructed exactly. The design follows the JPEG2000 standard and can be used for both lossy and lossless compression. The High-performance and memory-efficient pipeline architecture which performs the one-level (2-D) DWT in the 5/3 and 9/7 filters.

Anjali Goel; Virendra P. Vishwakarma (2016) In this paper, a robust technique to construct feature vector for gender classification has been proposed. Discrete Wavelet transform is used in concatenation with Discrete Cosine transform to form the feature vector. Initially, multi-level Discrete Wavelet transform is applied to images to obtain the approximation coefficients of image. Discrete Cosine transform are then calculated for the obtained approximate image. Hybridisation of DWT and DCT reduces the feature vector size significantly. Using this feature vector as input, SVM classifies the images. 2-Fold cross validation dataset is used to learn the SVM optimal

parameter. Face images of three different databases i.e. AT@T, Faces94 and Georgia Tech databases are used to evaluate the efficiency of proposed technique for gender classification. Results show that the proposed technique performs better as compare to other state-of-art techniques.

K. N. Satone; et.al, (2017) Medical images are very much important in the field of medical science for the future reference of the patients, needs to be stored. These images require the process of compression before storing it. Compression is a process of encoding the image and to reduce the size of image, storage and transmission. In this paper comparative analysis of different medical images compression techniques and performance results has been discussed. However, the medical image compression has intense scope in future but it also has lot of difficulties and challenges to achieve necessities of the medical field**.**

C. Somasundar Reddy; C. Ravindra Murthy (2017) One of the main disadvantages of any communication system is "channel bandwidth" and "noise". This paper deals with the former one (i.e. channel bandwidth); the real time images from any source occupy large amount space in any storage device. Hence it consumes maximum bandwidth for transmitting it, there are so many methods to reduce the image size and hence the bandwidth of the signal. This paper deals with wavelet based compression methods. Discrete Wavelet Transform is powerful tool for analyzing the signals, with the help of a thresholding function it'll be more useful in compression; this method is considered as an existing method. This method has some disadvantages like selectivity and shift invariance, so a much better method is proposed. In the proposed method complex wavelets were introduced with custom thresholding for reducing the size of images with less mean square error (MSE) and peak-signal to noise ratio (PSNR).

Chuntao Wang; et.al (2017) Similar to conventional compression with the original, unencrypted image as the input, the recently-emerged compression on encrypted images generally exploits statistical correlation of natural images to improve compression efficiency. Most of these compression schemes in the literature leverage statistical correlation at the content-owner or service-provider side, which would either increase the computational burden on the content-owner or disclose statistical distributions to the service-provider and thus probably hinder their practical applications. Through analysis on properties of the compression system for encrypted data, we believe that it is more preferable to exploit statistical correlation of natural images at the receiver side with both encryption key and sufficient computational capability, which in turn would improve compression efficiency while achieving low computational complexity and sufficient security for the content owner and the service provider. In light of this, we use the Markov random field (MRF) to characterize binary images in the spatial domain and represent it with a factor graph. The constructed MRF representation of the binary image in the factor graph is then integrated seamlessly with the factor graph for LDPC (low-density parity check)-based

decompression, yielding a joint factor graph for binary image reconstruction. By deriving message update equations for the joint factor graph, we develop a new lossless compression scheme for encrypted binary images, which involves stream-cipher-based encryption, LDPC-based compression, and factor-graph-based image reconstruction. Preferable parameters for the proposed scheme are first determined numerically on a specific binary image and then applied to other binary images. Extensive simulations show that significant improvements in terms of compression bit rate (bpp) over the state of the art are achieved, demonstrating the feasibility and effectiveness of the proposed scheme.

Ryan Rey M. Daga (2017) Transmitting and storing digital images have bandwidth and disk space requirements. Reducing the file size of these images enables faster transmission of data and increases the number of images that can be stored in the same amount of disk space. Block truncation coding (BTC), one class of compression technique, is commonly used for its low computational complexity which make it suitable for multiple applications. A recently proposed compression technique, referred to as k-d Tree-Segmented Block Truncation Coding (KTS-BTC), was able to reduce the bit rate of the compressed image while maintaining image quality. In this study, we propose to improve KTS-BTC by implementing modifications: (1) implementation of Huffman Coding, and (2) encoding RGB values using shaved bit strings representing numbers that are divisible by a pre-defined power of 2.

ENCODING TECHNIQUES IN IMAGE COMPRESSION

Monica et al (2011) have proposed a resolution progressive compression scheme. The scheme proposed compression an encrypted image progressively in resolution such that the decoder would be able to observe a low resolution version of the image. The local statistics based on it can be studied and used to decode the next resolution level; the system was implemented using MATLAB. This resolution progressive compression scheme would be useful to compress encrypted images of both interframe and intraframe correlation.

Panel et al (2011) have presented a data encryption scheme that was based on arithmetic coding. The authors have named their method, Chaotic Arithmetic Coding (CAC). Here, a large number of chaotic maps was used for coding. The authors have also described Binary CAC (BCAC) with security Enhancement (SE) modes that can increase security of the scheme. The authors consider BCAC with SE to be an excellent choice for use in secure embedded multimedia systems.

Younggap & Hanbyeori (2009) have proposed a Fault Tolerant scheme that overcomes the problem of multi–pixel defects of Block cipher algorithm, caused by single bit error in an encrypted message. In this method, a three-dimensional data shuffling process is used. This disperses the error bits on several frames, causing sparsely isolated errors. The authors have found that averaging can tolerate the pixel defects of the intestine images without increasing the data volume for error correction.

Can et al (2011) have proposed a new image encryption algorithm that is based on scrambling chaotic sequence in contour let domain. Several sub band images were first obtained by using multiple level decomposition of contour let Transform. The authors have used Arnold scrambling to process the high order coefficients of low frequency sub-band. The authors report that the developed algorithm has the advantages of good encryption effects, big key space and consistency of the decrypted and original image. It was also found to resist the effect of noise and cropping.

MULTILEVEL BLOCK TRUNCATION CODING

H. B. Kekre; et.al (2013) Multilevel Block Truncation Coding for image classification. Feature vectors are extracted with four levels of Block Truncation Coding to classify the several categories of images for performance comparison in six different color spaces for the proposed methodology. Three databases out of which two are public databases and one is a generic database are considered for the experimentation. The two public datasets used are Coil Dataset and the Ponce Group 3D Photography Dataset respectively. The performance of the proposed classifier is tested on all three databases considered. In each of the considered color spaces improved performance is being observed with increasing levels of BTC and BTC level 4 is proved to be better as compared to other BTC levels. Overall Kekre's LUV color space has shown the best performance for BTC level 4 based image classification.

H. B. Kekre; et.al (2013) Image retrieval is useful to retrieve images from outsized image databases, which can be beneficial to plenty of image supporting applications. Colors of an image are easier for extraction. Block Truncation Coding (BTC) prominently used with many variations. This paper proposed a novel Block Truncation Coding Extended to Color Clumps for image retrieval purpose. Total of 24 variations, using four clumps and six color spaces are experimented on image database having 1000 images. Experimental results have shown better performance in YCbCr color space followed by YUV and LUV. The best image retrieval is by Extended Block truncation coding using 8 color clumps in YCbCr color space.

Sunwoong Kim; Hyuk-Jae Lee (2016) Frame memory compression is a widely used image compression technique that aims to reduce the size of the frame memory in display panels such as those containing LCD and OLED technologies. Recent LCD panels use the RGBW color domain to replace the traditional RGB domain in order to enhance the brightness of LCD panels with the addition of a white component. The additional component increases the size of the frame memory but necessitates an aggressive compression algorithm. This paper proposes a novel compression algorithm for RGBW components that improves the efficiency of block truncation coding (BTC), which is widely used for LCD overdrive. The proposed low-complexity adaptive multi-level block truncation coding (LAM-BTC) algorithm codes RGBW color data with a width of ten bits. It adaptively selects two-level BTC or four-level BTC to enhance the quality of the images, for which a low-complex level selection scheme is used.

Four-level BTC in the proposed algorithm codes two representative values (RV) in four RVs and infers the other two RVs using inter-color correlation. In spite of the reduced complexity, the average peak signal-to-noise ratio (PSNR) of the proposed algorithm is 0.54 dB higher than that of the previous AM-BTC at a compression ratio of eight.

CONCLUSION

In this paper we studied different image compression techniques discrete wavelet transform (DWT), Fractal image compression (FIC) and Multi block Truncation coding and each have advantages and limitations. Fractal theory is an important field of research in image compression and decompression for obtaining a high compression-ratio and a low loss-ratio. But it is limited by its tremendous computations, and then it has a bottleneck for the fractal code and the image decompression. The decompressed images by using this method are clear, and the compression-ratio is as good as the traditional PIFS method.

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