Hybrid coding for image compression

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Abstract— Image compression take a important part in digital world. Storing and transmitting digital image with high quality is a complex task. There are many methods for compressing digital images. In this paper, the following method is adapted. The digital image is divided into low and high intensity images. Discrete Cosine Transform (DCT) technique is applied to high intensity part of the image and fast Fourier transform (FFT) method is applied for low intensity pixels. The proposed method is tested with benchmark images and the results are compared with JPEG 2000 (Joint Photographic Experts Group 2000). It provides better results than JPEG 2000.

Keywords— JPEG 2000, Lossless, Lossy compression, Discrete Cosine Transform, Fast Fourier transform, VBS

I. INTRODUCTION

With the advent of computers, the work of person is simplified, but it results in large amount of digital data in various fields. The challenge lies in storing and retrieving this huge volume of data. Image compression is used to reduce the number of bits required to represent an image. It is also used to reduce the storage space and transmission amount. The very big images can be compressed into smaller one, so that the memory engaged by the image is also reduced. All the compression methods should have the property of compressing different kind of images provides good Compression Ratio (CR), small Mean Square Error (MSE), Bits Per Pixel (BPP) and elevated Peak Signal to Noise Ratio (PSNR). Image compression algorithms can be differentiated into two types: lossy and lossless compression [1-3]. The lossy compression means some of data is losses through the process of decompression. Lossless method decompression image is accurately same as the input data. In this paper, both the methods are used. An image consists of low and high intensity pixels. The impact of low intensity pixels in compression is studied in this paper. Hence, some segmentation based image compression algorithms are studied.

Section I contains the introduction of image compression , Section II contain the related work of Hybrid compression, Section III contain the some measures of proposed methodology, Section IV contain the architecture and essential steps of proposed system, section V describes results and Section VI concludes research work with future directions.

II. RELATED WORK

Ranganathan et al [4] proposed the variable block size segmentation. It is used to segment the image into variable size blocks. Encode the blocks based on the pixel characters in the block. It provides better result than other lossless compression schemes such as the Huffman, the arithmetic, the Lempel-Ziv and the JPEG. The block-based Maximum Posteriori (MAP) segmentation for image compression was introduced by Chee sun won [5]. Instead of segment the image block into edge, monotone & texture blocks, it will segment the image based on priori probability. Vector quantization presented by Krishna Ratakonda et al.[6] is a lossy image compression technique. The original image is divided by predetermined size of block. It is known as training set. It also creates a code book. The image is reconstructed by using training set and coding book. The multi scale segmentation for image compression is presented by N.Ahuja [7]. SU.H.C.Hsin et al.proposed wavelet based tree classification [8]. Bradley et al. provides distributed source coding theorem [10]. It is based on Region of Interest image compression method. JPEG image compression explained in [11-12]. It is a lossy compression technique. One of the compression techniques is Quad tree. It was developed by Kawai et al.[13]. A tree-like structure is used in quad tree. In a tree, leaf node terminates by useful information. Branches are subdivided into four sub-level quad trees [14]. Main aim of this algorithm is an image is divided by blocks and restores the same. Original image is divided based on the two threshold value and two stacks. The quality of the compression ratio is affected by threshold

values [15]. The proposed method uses the benefits of various methods to reduce redundancy present in low intensity and high intensity pixels. The results of the proposed method are compared with JPEG and other recent methods.

III. METHODOLOGY

The content of each pixel with 8 bits has been divided into two parts. The LSB and MSB, consists of low and high intensity values respectively. DCT technique is applied only to high intensity pixels. FFT method is applied only to low intensity pixels. Since the impact of low and high intensity values during compression is to be studied, it is decided to apply some of existing compression algorithm to high and low intensity values of pixels and observe the results.

The following stages are adopted to carry out the work.

A. *Stage 1: segment the image in to high and low intensity values of pixels.*

B.   *Stage 2: Apply DCT algorithms for high intensity values of pixels.*

 Stage 3: Apply FFT algorithms for low intensity values of pixels.

IV. SYSTEM ARCHITECTURE

Fig 1 illustrates the algorithmic steps where an input image is splitted into two parts. High and Low intensity pixels. High intensity pixels (MSB) are processed by DCT and the low intensity pixels are processes by FFT. Finally the compressed image compared with JPEG2000.
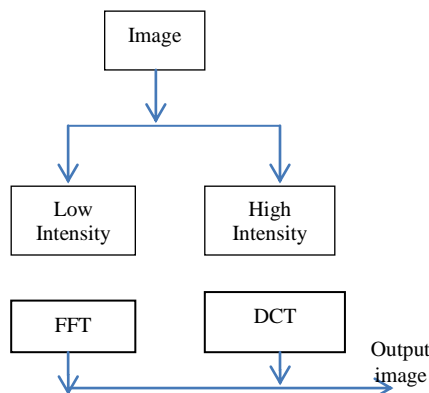

Figure 1: Architecture diagram

V. RESULTS AND DISCUSSION

The proposed method is tested with bench mark images. The proposed method is compared with JPEG and recent methods such as VBS, BMF in terms of PSNR, SNR, CR and BPP.

Figure 2 (a)   Figure 2 (b)

Type	: Tiff	Type	: Tiff
Dimensions	: 256X256	Dimensions	: 256X256
Size	: 64.2KB	Size	: 35.7 KB

Figure 2 (a) (b) *original images and their respective reconstructed images*

Table 1 : Performance comparison with the state of the art lossless coding scheme (bits/pel)

Image	*VBS	*BMF	*TMW	JPEG-LS	JPEG 2000	Proposed
Camera	3.949	4.060	4.098	4.314	4.535	**0.5762**
Baboon	5.663	5.714	5.738	6.037	6.107	**0.8226**
Barb	3.181	3.959	4.084	4.691	4.600	**0.2107**
Peppers	4.199	4.241	4.251	4.513	4.629	**0.2005**
Lena	4,280	4.314	4.300	4.607	4.684	**0.1935**
GoldHill	4.207	4.238	4.266	4.477	4.603	**0.1582**

*Variable Block Size
*Bayesian Compression
*Two way Mixing Model

Table1 shows the comparison of results between the performances of the recent schemes. Among these methods the proposed one provides the better result than others.

VI. CONCLUSION

Image compression plays a important role in storage and transmission. Lot of compression methods are introduced to improve the compression efficiency. JPEG 2000 is one of the best compression method for all kind of image set. This paper considered both low and high intensity pixels in compression and analysis is carried out in two stages. The LSB & MSB are measured alone for various algorithms. It is found that the hybrid method provides better result than JPEG 2000.

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