Performance Evaluation of Image Compression Technique Based on Fractal Wavelet Transform

Prachi Kolte
M Tech Scholar
REC Bhopal, India
E-mail- p.kolte1789@gmail.com

Prof. Murlidhar Vishwakarma
Department of CSE
REC Bhopal, India
E-mail- Murli.mtech@gmail.com

ABSTRACT
Image compression is an important area of computer security. Multimedia data compression is a challenging job for compression technique, due to the possibility of loss of data and required large amount of storage place. The minimization of storage place and proper transmission of these data needed compression. Now in these days various image compression techniques are used. Some compression technique is lossless and some compression technique is loss. The processes of lossless compression technique are slow and take more time for compression. Some authors used some other technique along with fractal transform function and produces lossless image compression technique. For the improvement of image compression technique used JPEG and FICGA image compression technique with some objective function optimization technique.

Keywords- Image Compression, JPEG, FICGA.

INTRODUCTION

Image compression plays a vital role in Image Security and computer vision which is considered as the obstruction in the development of image compression technology, Image compression has been the subject of intensive research and a wide variety of compression techniques has been reported in the last two decades. Pictures have been with us since the dawn of time. However, the way that pictures have been represented and displayed has changed greatly [4]. Originally every picture was unique, being both represented and displayed in a physical way, such as paint on a cave wall or etchings in stone. However, in recent times pictures have been dealt with electronically. One consequence of this is that the representation used for transmission or storage of the image can be separated from the means of display [6]. One example of this is traditional broadcast color television, where the representation that is transmitted does not relate directly to the intensities of the red, green and blue electron guns in a television set. By storing images in digital form, the possibilities for image representation increase dramatically.

An image can be stored in any representation, provided there is an algorithm that can convert it to a form usable by a display. This process of changing the representation of an image is called image coding and if the result uses less storage space than the original it is called image compression. Digital images are characterized by multiple parameters [10]. The first feature of a digital image is its color mode. A digital image can have one of three modes: binary, grayscale or color. Section II explores major contributions in the field of image compression review. A problem formulation in section III. Section IV describes the experimental process and result of some existing methods. Finally, concludes the paper in section V.

II RELATED WORK

This section gives an extensive literature survey on the existing image compression method. They study various research paper and journal and know about image compression method based on wavelet and block based algorithm. But some related work in the field of image compression method on the basis of wavelet transform.

[1] In this paper author design a highly efficient image encryption-then-compression (ETC) system, where both lossless and lossy compression are considered. The proposed image encryption scheme operated in the prediction error domain is shown to be able to provide a reasonably high level of security. We also demonstrate that an arithmetic coding-based approach can be exploited to efficiently compress the encrypted images. More notably, the proposed compression approach applied to encrypted images is only slightly worse, in terms of compression efficiency, than the state-of-the-art lossless/lossy image coders, which take original, unencrypted images as inputs.

[2] In this paper author designed a histogram based image compression technique is proposed based on multi-level image thresholding. The gray scale of the image is divided into crisp group of probabilistic partition. Shannon's Entropy is used to measure the randomness of the crisp grouping. The entropy function is maximized using a popular meta-heuristic named Differential Evolution to reduce the computational time and standard deviation of optimized objective value.

Some images from popular image database of UC Berkeley and CMU are used as benchmark images.

[3] In this paper author described about the improvement of compression ratio is done by applying the loss-less compression techniques on the parameters of the affine transformations of the fractal compressed images. The Modified Region Based Huffman and its variant are used for this purpose. The PSNR of images are remained same. The comparison of the compression ratio and time are done between fractal image compression with quardtree partitioning schemes, the same with Huffman coding and its proposed improved versions.

[5] In this paper author presents the application of contourlet Transform and Genetic Algorithm (GA) in a novel steganography scheme. They employ a genetic algorithm based mapping function to embed data in Discrete contourlet Transform coefficients in 4x4blocks on the cover image. The optimal pixel adjustment process (OPAP) is applied after embedding the message. GA employed to obtain an optimal mapping function to lessen the error difference between the cover and the stego-image and use the block mapping method to preserve the local image properties.

[6] In this paper author proposed new FIC scheme is based on the fact that the affine similarity between two blocks in FIC is equivalent to the absolute value of Pearson's correlation coefficient (APCC) between them. First, all blocks in the range and domain pools are chosen and classified using an APCC-based block classification method to increase the matching probability. Second, by sorting the domain blocks with respect to APCCs between these domain blocks and a preset block in each class, the matching domain block for a range block can be searched in the selected domain set in which these APCCs are closer to APCC between the range block and the preset block.

[8] In this paper author present a massively parallel compression system for medical volume images which runs on graphics cards. Image blocks are processed independently by separate processing threads. After pixel prediction with specialized border treatment, prediction errors are entropy coded with an adaptive binary arithmetic coder. Both steps are designed to match particular demands of the parallel hardware architecture.

[9] In this paper author presents an intra-frame prediction scheme designed for lossless coding using HEVC. The proposed coding method comprises a pixel-wise prediction based on original samples. It is realized as a separate intra prediction mode, which replaces the PLANAR mode. In order to perform the prediction, a four-sample template around the pixel that is to be predicted is compared to the respective template of a four-pixel neighborhood. For each reference template, the sum of absolute differences (SAD) is determined.

III PROBLEM FORMULATION

The problem is even more severe when a block crosses an image boundary. Here, they actually destroy valuable image information and the infamous blocky artifacts of the JPEG compression appear. A logical consequence in improving such algorithms is to be less blind. Therefore one uses semantic image information, the so called image features, like edges or corners, to decide which are the vital information contents of the image one wants to preserve in the compression step [8]. The problem of image compression based on wavelet packet is mentioned in following step.

- The parent child relationships of tree structures are difficult to define and the probability of zero trees are greatly reduced in the Wavelet Packet.
- Complex quantization process of zero trees.
- Bad PSNR in images of rich textures and higher visual quality in the region of texture area.
- Difficult to design adaptable size of coded blocks according to the level of wavelet packet decomposition.

IV EXPERIMENTAL PROCESS AND RESULT

For an experimental process we used data set of images using with using image compression techniques for the group of images such as Barbara image, Lena image, and Cameraman image etc. all these image are apply to image compression method and the number of compression ratio, elapsed time and PSNR value for each and every images and image compression method.

Figure 1: Barbara image set for the compression.

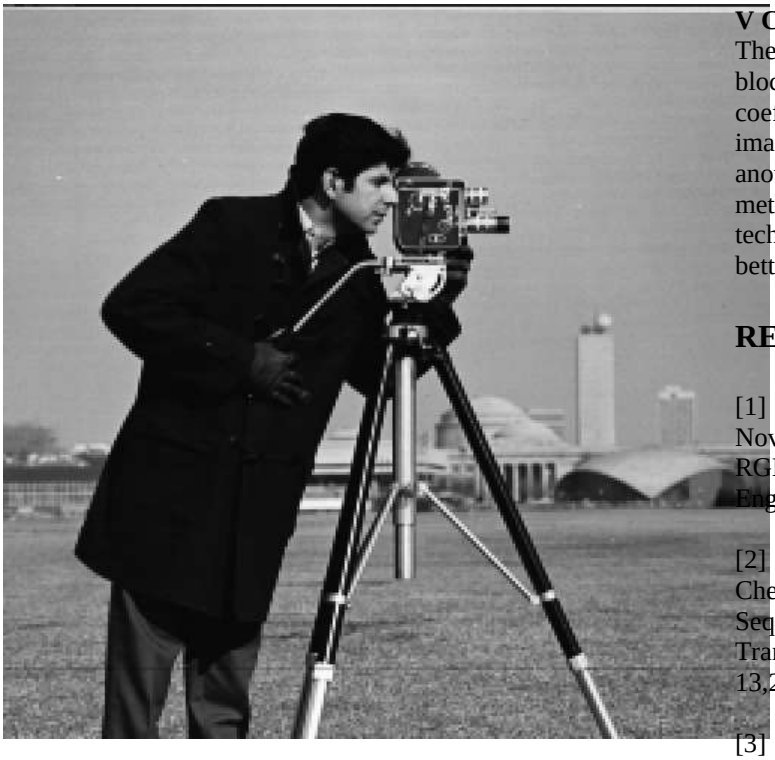

Figure 2: Cameraman image set for the compression

Method	Compression Ratio	PSNR
JPEG	0.4584	8.1333
FICGA	2.1586	18.1333

Table 1: Shows that the comparative study of various image compression algorithms for Barbara images, and the Comparative result of Barbara image for their PSNR and Compression Ratio.

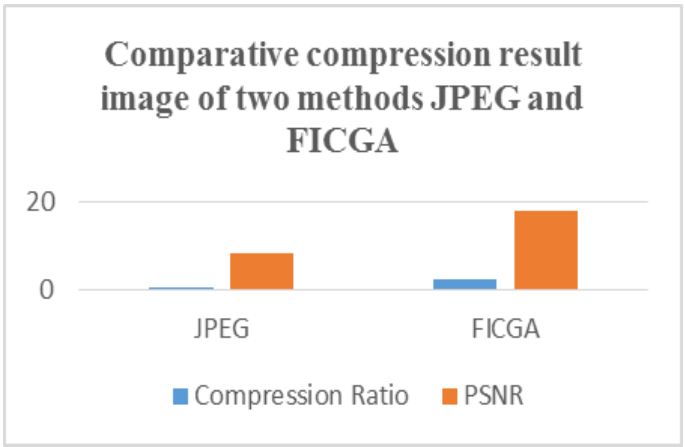

Figure 3. Shows that compressed image of Barbara based on JPEG method and FICGA method.

V CONCLUSION AND FUTURE WORK

The fractal wavelet transform function provides the facility of block symmetry property for the selection of block coefficient. We compare the various methods with different image compression methods of which are also performed another compression method such as JPEG and FICGA method. In future for the improvement of image compression techniques we used some optimization algorithm for the better performance and results.

REFERENCES:-

[1] C.S.Rawat, Seema G Bhateja, Dr. Sukadev Meher " A Novel Algorithm of Super-Spatial Structure Pre-diction for RGB Colour space" International Journal of Scientific & Engineering Research, Volume 3, 2012. Pp 1-5.

[2] Shaou-Gang Miaou, Fu-Sheng Ke, and Shu-Ching Chen"A Lossless Compression Method for Medical Image Sequences Using lPEG-LS and Interframe Coding" IEEE Transaction on Information Technology in Biomedicine, vol. 13,2009.

[3] S.E. Ghare, M.A.Mohd .AIi, K.Jumari and M.lsmail "An Efficient Low Complexity Lossless Coding Algorithm for Medical Images" in American Journal of Applied Sciences, 2009, Pp 1502-1508.

[4] Huang-ChihKuo, Youn-Long Lin, "A Hybrid A1gorithm for Effective Lossless Compression of Video Display Frames," IEEE Trans. On Multimedia, vol.l4, no.3, June 2012.

[5] T. R. G. Nair, V. Suma, S. Manas,"Genetic Algorithm to Make Persistent Security and Quality of Image in Steganography from RS Analysis" in Proc. of Swarm Evolutionary and Memetric Computing Conference (SEMCCO), Vishakhapatnam.

[6] E. Ghasemi, J. Shanbehzadeh, N. Fassih "High Capacity Image Steganography Based on Genetic Algorithm and Wavelet Transform" Intelligent Control and Innovative Computing, Lecture Notes in Electrical Engineering, 2012.

[7] P. Chen , H. Lin "A DWT Based Approach for Image Steganography" in Proc. of International Journal of Applied Science and Engineering, vol-4, 2006. Pp 275-290.

[8] Nagai-Man Cheung, Xiaopeng Fan, Oscar C. Au, and Man Cheung Kung "Video coding on multicore graphics processors "IEEE Signal Processing Magazine, vol-27, 2010. Pp. 79–89.

[9] F. Bossen, B. Bross, K. Sühring, and D. Flynn"HEVC complexity and implementation analysis" IEEE Trans. Circuits Syst. Video Technol., vol- 22, 2012. Pp. 1684–1695.

[10] T. Wiegand, J.-R. Ohm, G. J. Sullivan, W.-J. Han, R. Joshi, T. K. Tan, and K. Ugur "Special section on the joint call for proposals on High Efficiency Video Coding (HEVC) standardization" IEEE Trans. Circuits Syst. Video Technol., vol- 20, 2010. Pp. 1661–1666.

[11] G. Quellec, M. Lamard, G. Cazuguel, B. Cochener, C. Roux" Wavelet optimization for content-based image retrieval in medical databases" Med Image Anal, vol-14, 2010. Pp. 227–241.

[12] G. Quellec, M. Lamard, P. M. Josselin, G. Cazuguel, B. Cochener, C. Roux, "Optimal wavelet transform for the detection of microaneurysms in retina photographs," IEEE Trans Med Imaging, vol-27, 2008, Pp 1230–1241.

[13] M. A. Mazurowski, P. A. Habas, J. M. Zurada, and G. D. Tourassi "Decision optimization of case-based computer-aided decision systems using genetic algorithms with application to mammography" Phys Med Biol, vol-53, 2008, Pp. 895–908.

[14] G. Quellec, M. Lamard, G. Cazuguel, B. Cochener, and C. Roux "Adaptive nonseparable wavelet transform via lifting and its application to content-based image retrieval" IEEE Trans Image Process, vol-19, 2010, Pp 25–35.

[15] H. R. Sheikh and A. C. Bovik "A visual information fidelity approach to video quality assessment" in Proc. 1st Int. Workshop Video Process. Quality Metrics Consumer Electron. Jan. 2005, Pp 23–25.