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OPTIMIZATION OF IMAGE COMPRESSION USING DWT METHOD

[1]Nandigam Poornima Deepthi, [2] Bala Krishna Konda,

[1]M-Tech(DECS), Department of Electronics & Communication Engineering, Eluru College of Engineering & Technology, Eluru, AP, India

[2] Assistant professor, Department of Electronics & Communication Engineering, Eluru College of Engineering & Technology, Eluru, AP, India

Email: [1]nandigampoornimadeepthi@gmail.com, [2]kbalu.crm23@gmail.com

Abstract:

The overall objective of this paper is to review various image compression techniques. Image compression has become very important tool in digital image processing. The main objective of the compression is to reduce the amount or unwanted data while retaining the information in the image. The goal behind is to save the amount of memory required to save the image(s) or to utilize network bandwidth in efficient manner. Transform-based compression is extensively used for image compression. But transform based methods introduce blocking artifacts in the output image The appeal of using genetic algorithms is explained by the massive search to find a close fraction that is reduced to short quotient. DWT method showed a considerable compression ratio when the least significant bits of each byte are altered, hence, the image quality is preserved while achieving high compression ratio.

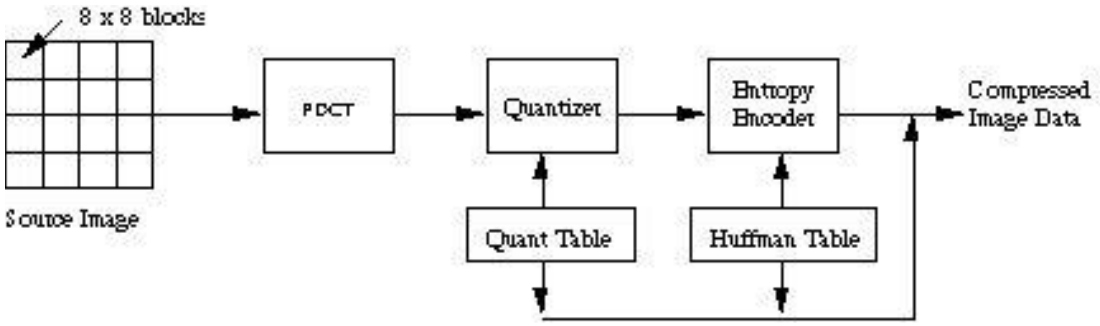
Keywords: Image Compression, Genetic algorithm, wavelet transform

Introduction

Image compression is use to condense the number of bits vital for representation of an image and consequently, reduce the required bit rate to powerfully broadcast image signal in excess of communication network. It is minimize the size in bytes of a graphics file without mortifying the value of the image to an undesirable point[1]. The decreases in file size allow more images to be stored in a given quantity of disk or memory space in basic block. It also

reduces the time necessary for images to be send over the Internet or downloaded from Web pages

Basic block



The decreases in file size allow more images based on compressed

There are more than a few diverse ways in which image files can be compressed. For Internet use, the two mainly familiar compressed graphic image formats are the JPEG format and the GIF format[3]. The JPEG method is more frequently used for photographs, while the GIF method is usually used for line fine art and other images in which numerical shapes are comparatively easy. Additional techniques for image compression comprise the use of fractals and wavelets[6][2]. These methods have not gain common approval for use on the Internet as of this text. on the other hand, both methods present secure as they suggest higher compression ratio than the JPEG or GIF methods for various types of images[4]. Another original method that may in time restore the GIF format is the PNG format.

Compression

Image compression is the process of encoding or converting an image file in such a way that it consumes less space than the original file[7][5]. It is a type of compression technique that reduces the size of an image file without affecting or degrading its quality to a greater extent.

Types of compression

Lossless Compression:

In lossless compression, the algorithm does not lose any part of data. It means exact source data should be generated after decompression[8]. We use lossless compression for text/ data based data information. Lossless compression should be used to compress executable programs. The major purpose, as well as challenge, for lossless algorithm is to compress data as much as possible and get back the original data by taking minimum time.

Lossy Compression:

In lossy compression, the algorithm does some loss of data achieve higher compression. You do not get exact original data back in lossy compression. These compression works on those data, in which some fidelity in acceptable[9]. Picture, audio or video format data are usually compressed with lossy compression algorithm because among these some loss of data can be tolerated.

Methods of compression: compressed either as lossless or lossy method depending on the requirement.

Previous Method

Neural Nets Image Compression

The Adaptive Vector Quantization theory (AVQ) is one of the most recent techniques used in the domain of image compression. In the AVQ image compression-based approach, the input image is divided into equal size sections (sub images)[9], where each section of n^2 pixels is considered as a vector in the encoding space N^{nxn} As shown in Fig. 1(a), the neural net clusters the sub images into classes of similar sub images. Each class has a representative vector, the centroid that represents any of its member sub images. All centroid representatives for an image

are to be tabled in a lookup table or codebook. Then, each sub image is compressed into (i.e., encoded as) the index of its corresponding class representative in the codebook. Thus, the compressed image is a set of representative indices that represent (in order) its original sub images of fig-1(b) [10].

The compression is realized because the byte size of the original sub image (n^2) is an order of Magnitude larger than its corresponding centroid bit index.

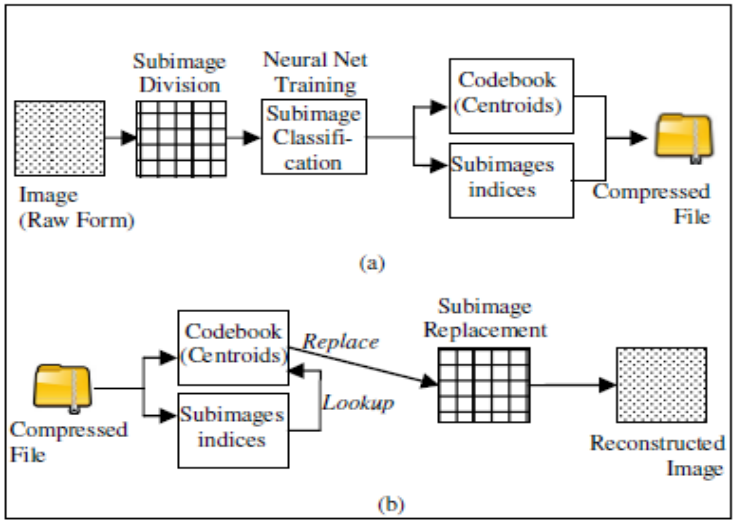


Fig. 1 : Neural net based image compression (a) Compression (b) Decompression

Proposed Method

DWT (Discrete Wavelet Transform)

A wavelet transform decomposes a pointer into its sub-band mechanism of non – uniform bandwidth and can be realize by a filter bank. Like the Fourier transform is relevant to both continuous as well as discrete signals. We can characterize a variety of functions in the appearance of its wavelet expansion[14]. If the signal, scaling functions and wavelets are discrete in time signal is called DWT. DWT of a digital image consist of two sequence expansions: one matching to the estimate(low-pass filter), and the additional linked to the information of the image(high-pass filter) in fig 2. The 2D DWT can be implemented with two divide applications

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of the one-dimensional decomposition in the straight and perpendicular instructions. The low and high pass filters are useful to the image by the side of rows and columns separately, and the filter outputs are sub-sampled by2, resulting in three full sub-images: horizontal high-pass sub-image (HL), vertical high-pass sub-image (LH), and crosswise high-pass sub-image (HH); and one estimated low-pass sub-image (LL). The decomposition method is then frequent on the low-pass sub-image LL to make the next level of the decomposition. In this way, the creative image is decomposed into a chain of command of three octave resolutions resultant in ten sub-images:LL3,and (HLi; LHi; HHi), i ¼ 3; 2; 1, where LL3 is the lowest resolution low-pass sub-image at layer3 of the chain of command.

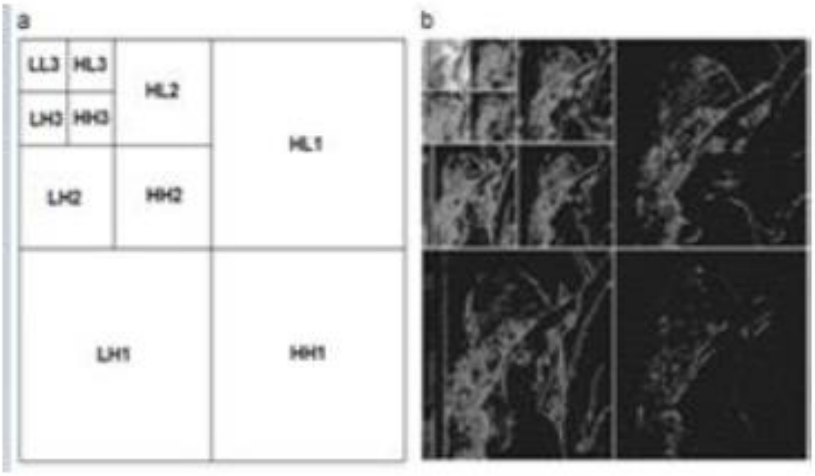

Fig-2 Applying DWT for 3-levels

The DWT transformation equations:

$$f(u,v) = \frac{2c(u)c(v)}{N} \sum_{m=0}^{N-1} \sum_{n=0}^{N-1} f(m,n)\cos\left(\frac{2m+1}{2N}ux\right)\cos\left(\frac{2n+1}{2N}vx\right)$$

Where u = 0,1,2……..N-1, v = 0,1,2,……N-1

Where c(k) = $1/\sqrt{2}$ for k=0

=1 otherwise

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GA (Genetic Algorithm)

GA are adaptive heuristic search algorithm based lying on the evolutionary thoughts of usual collection and inheritance[12]. As such they stand for a bright development of a random investigates used to explain optimization problems. The basic technique of the Ga's are planned to stimulate process in usual system essential for progress ,particularly those go after the standard laid down.GA are based on an similarity with the genetic structure and performance of chromosomes within a population of those. In the genetic algorithm crossover and mutation operators are used for to generate the optimized production in the crossover which represents the mate among those.

And mutation which represent random modification, selection operator provide liking to better individuals, allow them to pass on their genes to the next generation[13]. The honesty of all individual depends leading its fitness. In crossover operator main famous factor of GA from extra optimization techniques.

Let us suppose we have the chromosome**:**

$$C = x+y^{*}y-x/y$$

And the appliance of mutation operator affect the genes .Then a new obtained chromosome can be**:**

$$C = x+x^{*}y+x/y$$

The value of the gene corresponding to the third position has been changed from y to x and the value of the gene corresponding to the i th p iti n ("-") has been changed t the al e "+".

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Simulation Results:

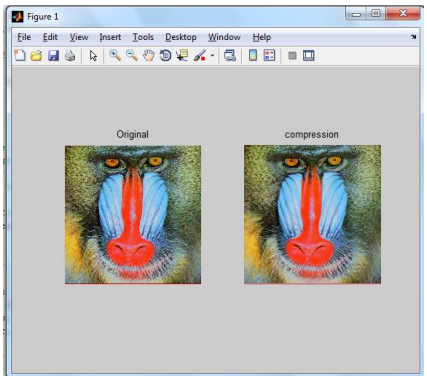


Fig-3(a) previous method

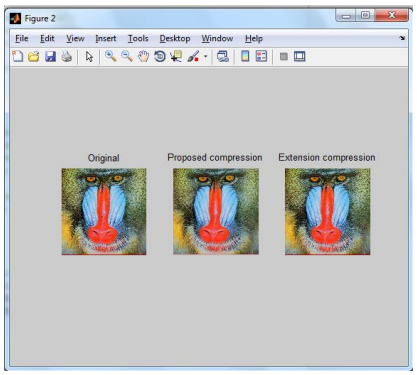
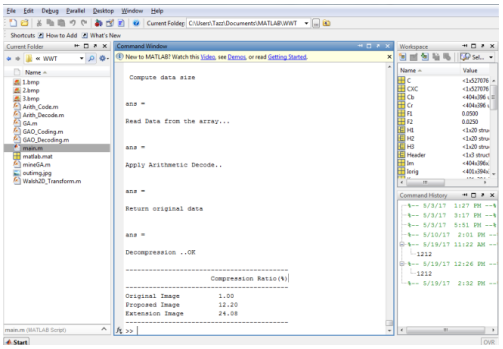
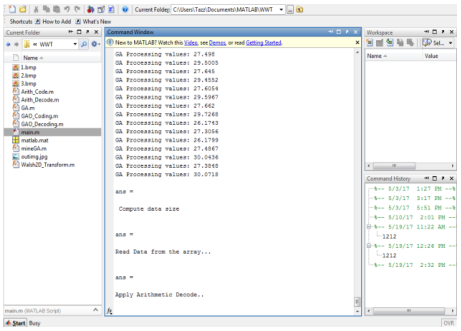


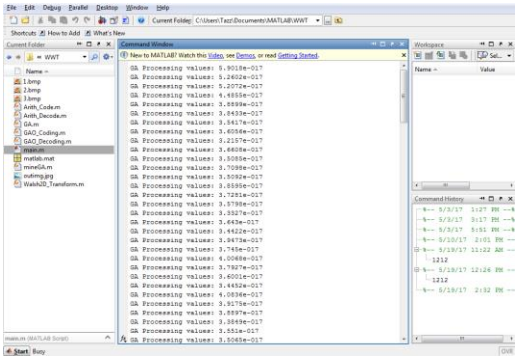
Fig-3(b) proposed method



Comparesion between ratio of Compression



genrating of optimization bit lines



Vareing the optimization of image Compression values

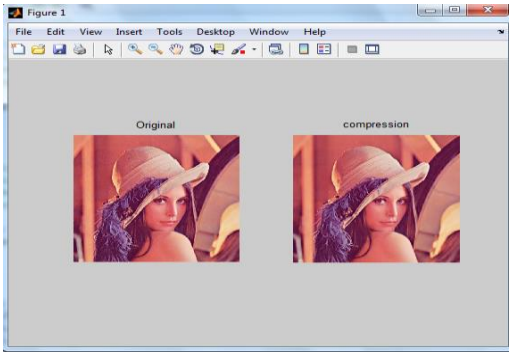


Fig-4(a) previous method

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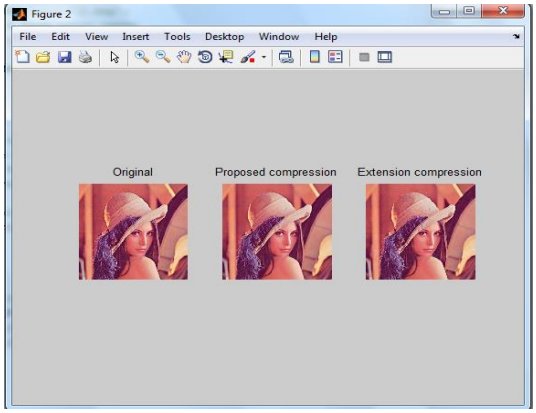

Fig-4(b) proposed method

Conclusion

Multimedia compression is in the rise recently especially with the huge mass of images and videos that migrate in the Internet between users. Fractal image compression is widely used in the domain of lossy compression due to its simple way of quantizing sub-frames inside an image. In this paper, we proposed a new compression idea that is based on reducing rational numbers into nominator-denominator form. Moreover, our technique utilizes the efficiency of genetic algorithms to enhance the time search in order to find better rational numbers with shorter reduced form Method of DWT. Our preliminary result show very promising achievements compared to the peer image compression techniques. As a future work, we will investigate the possibility of classifying sub images based on their corresponding rational numbers' characteristics in terms of great common divisors in GOA genetic optimization algorithm method

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