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Gaining high performance in images using advanced fractal image compression

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Abstract-The exploit of digital images has increased in our day-to-day life. Photographs, printed text, and one-time hard copy converted into digital form. The quantity of data associated with visual information is consequently huge that its storage would need huge storage capacity. Similarly, significant degree of redundancy is present in the images and in many cases an image perceptually comparable but not equal to the original image. Image compression reduces the redundancy in images in order to store or transmit. The main aim of this paper is develop a high performance efficient new image compression algorithm using fractal image compression. However, fractal compression takes a large amount longer time to compress an image than to decompress it. During, encoding an image, for each range block the best matching domain block is searched with all domain blocks. This searching process is computationally expensive and takes long encoding time. To overcome this disadvantage a new proposed fractal image compression algorithm using biased distance method is used to improve the encoding time and improve its compression.

Index terms- fractal image compression, encoding time, search, and biased distance.

I. INTRODUCTION

Fractal image compression is a lossy compression method for digital images, using fractals [1]. The process is best suitable for textures and natural images, relying on the piece of information that parts of an image often be similar to other parts of the same image Fractal algorithms swap these parts into mathematical numbers called "fractal codes" which are utilized.

Deterministic fractals include the essential assets of having a tremendously high visual complexity which needs less number of bits for demonstrating given information [2]. They can able to described and generated by straightforward recursive deterministic algorithms. They are statistical objects with a high degree of redundancy in the Sense that they are recursively through of transformed copies of each or by its part.

II. FRACTAL IMAGE COMPRESSION

Encoding of image obtain a starting image and divide it into little, non-overlapping, rectangle blocks, normally called “parent blocks”. Divide all parent block into 4 each blocks, or “child blocks.” Balance each child block beside a subset of all probable overlapping blocks of parent block size [2]. Need to decrease the volume of the parent to permit the comparison to work. Determine which larger block has the lowest variation, according to a number of measures, among it and the child block. Compute a grayscale transform to equal intensity levels connecting large block and child block precisely. Normally an affine transform is used ($w*x = a*x + b$) to go with grayscale levels. It specifies upper left angle child block, very parallel to upper right parent block. Then calculate affine transform and store up location of parent block or transform block with affine transform components, and interrelated child block keen on a file. Repeat for every child block. Heaps of comparisons can calculations.256x256 original image.16x16 sized parent blocks 241*241 = 58,081 block comparisons.

The decoding of an image in fractal specifies read in child block and transforms block position, transform, and size in sequence. Exploit any blank starting image of identical size as an original image for both child blocks apply stored transform beside specified transform block. Overwrite child block pixel morals with transform block pixel values. Repeat until satisfactory image quality is reached.

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III. BIASED DISTANCE METHOD IN IMAGES

Biased distance fractal image compression method is developed to speed up the encoding step in fractal image compression. Encoding process in fractal image compression is slow because, most of the time is depleted in searching and neglecting of unrelated domain blocks [4]. Again, during this process, significant fraction of computational lost lies in the actual calculation of distances between domain and range blocks. The time required for the search is compact by improving the efficiency of these calculations [2][4]. Biased distance method is developed to attain reduction in encoding time. With this method, while discovery the best domain block for each range block, instead of calculating complete distance, only biased distance is found. If this biased distance is more than the previous value of distance, that field is discarded before finding the complete distance.

To compute numeric comparisons between images and in order to carry out the evaluation as part of the research in this thesis, numerical evaluation is done. The Peak Signal to Noise Ratio (PSNR) is computed to measure the quality of the images.

It is defined as

PSNR = **20** loglo(**b** / m s) ,

Where b is the largest possible value of the signal (b is **255** for $-bit digital image), and rms is the root mean square error between two images. The PSNR is given in decibels (dB) which measures the ratio of peak signal and the RMS difference between two images [4].

IV. PROPOSED ALGORITHM

The paper focuses on developing a novel algorithm based on fractal image compression using biased distance method. The idea behind using fractal image compression as it has been claimed that fractal coding might reach compression ratios up to 10000: 1 which is an exciting rate of compression but it suffers from effort such as expensive encoding time. So, fractal image compression is enhanced in order to acquire the impressive compression ratio and to decrease the encoding time based on biased distance. The fractal image compression also allows the images to be stored in the smaller processor memory. The planned algorithm is exposed in following steps:

1. Consider original image and calculate the Threshold Th of the image.

2. Partition the original image into non-overlapped range blocks of fixed size. Neighbouring range blocks are iteratively calculated the PSNR value to yield the best domain blocks.

3. Sequence of partitioning decrease the number of ranges. During this process in addition to maintaining a partitioning, an associated fractal code is also maintained. After each process, next fractal code is obtained by local modification of the previous one.

5. Revise Threshold for the image biased image and associated code is maintained

6. Pertain revised threshold Th on the range block using hard thresholding.

7. Consider new range block repeat the following process.

8. Compare new range block with complete domain blocks to get best match.

9. Encode the file.

The proposed new algorithm is as follows: Consider the input image. Calculate the threshold on the input image, th. Choose the amount of the range blocks and domain blocks such that

domain block size = *range block size* * 2

Partition the input image into non-overlapped blocks of ranges of cube sizes layer the whole image. Revise the beyond defined threshold using the equations:

$$th = th * 0.1$$

$$th_R = th / m$$

Where m is the mean of the ideals of the range block. Mean in fractal image compression decreases the encoding time. Perform hard with Thresholding on each variety block in order to obtain the new range block. Hard Threshold and calculate the PSNR value.

Where range(r,c) is the pixel charge of the range block. Separate the image into non-overlapping domain blocks and rescale the domain blocks to the size of the range blocks. Create the possible affine transformation of each domain block and compare each range block with the whole domain blocks to locate the best match [8]. Accumulate the location of the domain, finest transformation, contrast and equalize coefficients in the text file which is known as Encoded text file, which is used for transmission and the image is compressed. Continue to do the same for the rest of the range blocks awaiting it reach the last range block [3].

V. EXPERIMENTAL RESULTS

The proposed algorithm has been qualified qualitatively as well as quantitatively on gray scale images by using biased method. The performance of the proposed algorithm has been conducted on a number of test images. In this paper, there is use of fractal image encoding with thresholding and decoding for compression motive. The fractal image encoding with thresholding based compression decreases the encoding time as fine as provides higher compression ratio. Strong thresholding is used in the proposed method.
j X j and partitioning is performed for j=2, 4, 8. The domain considered for the initial fractal code consists of blocks of the uniformly partitioned image with block size 2j X 2j plus isometric versions [4].

Result 1:
Results for block size=2 for lenna image of size 256x256 fractal image compression based on Biased method.

Fig1. Image on fractal compression in block size =2

Fig2. Image on fractal compression based on biased distance method in block size=2

Table1. Results for block size=2 for lenna image of size 256x256

	Fractal compression		Fractal compression using Biased method	
	Enc.Time in sec	PSNR (in dB)	Enc.Time In sec	PSNR In dB
Block size =2	225	31.75	220	32.75
	360	29.5	300	30.2
	480	28.2	360	28.9
	625	26.5	460	27.5
	840	25.2	640	26.2

Result 2:

Results for block size=4 for lenna image of size 256x256 fractal image compression based on Biased method.

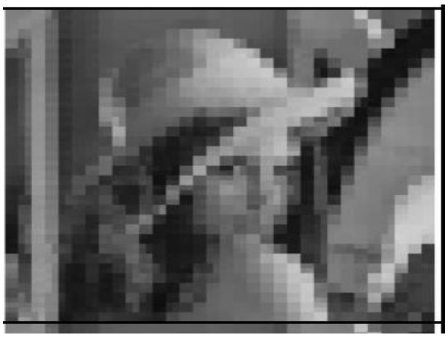

Fig3. Image on fractal compression in block size=4

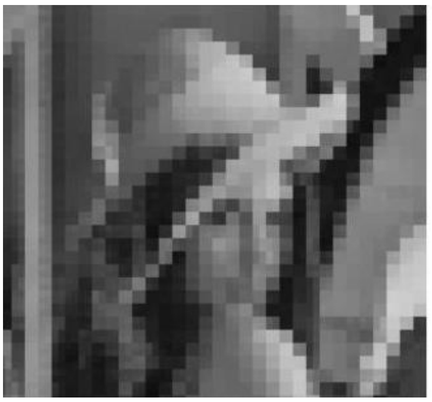

Fig4. Image on fractal compression based on biased distance method in block size=4

Table2. Results for block size=4 for lenna image of size 256x256

Block size =4	Fractal compression		Fractal compression using Biased method	
	Enc.Time in sec	PSNR (in dB)	Enc.Time In sec	PSNR In dB
	36	26.75	2 9	27.4
	40	26.5	3 2	27.2
	50	25.5	43	26
	5 3	24.5	49	25
	63	23.75	5 5	24.2

VI. CONCLUSION

A New advanced method for image compression has been developed which uses fractal image compression using Biased distance method for encoding with thresholding and then fractal decoding algorithm to get decompressed image.

By including fractal encoding algorithm, a new developed thresholding biased method is applied to the entire image and then revised threshold PSNR value is applied to the obtained range blocks with hard thresholding Decompressed image is obtained after applying fractal decoding algorithm. The proposed method is tested against image.

The fractal based image compressions have the disadvantage of having long encoding time with PSNR. The proposed method improves the encoding time and PSNR value provides higher compression ratio.

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