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New Approach on Hybrid Image Compression

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Abstract: ***Digital images are used in many applications. Large amount of data is necessary to represent the digital images so the transmission and storage of such images are time-consuming and infeasible. Hence the information in the images is compressed by extracting only the visible elements. Normally the image compression technique can reduce the storage and transmission costs. During Image compression, the size of a graphics file is reduced in bytes without disturbing the quality of the image beyond an acceptable level. Several methods such as Discrete Cosine Transform (DCT), DWT, Etc. are used for compressing the images. But, these methods contain some blocking artifacts. In order to overcome this difficulty and to compress the image efficiently, a combination of DCT and fractal image compression techniques is proposed. DCT is employed to compress the color image while the fractal image compression is employed to evade the repetitive compressions of analogous blocks. Analogous blocks are found by using the Euclidean distance measure. Here, the given image is encoded by means of Huffman encoding technique. The implementation result shows the effectiveness of the proposed scheme in compressing the color image.***
Keywords: Image compression, DCT, hybrid image compression, quantization, zigzag scanning, Huffman coding.

I. INTRODUCTION

Digital image processing is a quickly developing field with widespread use in the domain of mobile technology. An increasing number of products like cellular phones, laptop computers and cameras used in surveillance transmit and receive videos and images by means of portable wireless devices. The demand for efficient techniques that can store and transmit visual information has been increased by the increasing use of color images in the continuous growth of multimedia application. Because of this demand, image compression has become a crucial factor and the requirement for efficient algorithms that can yield large compression ratio with low loss has increased. Consequently, downloading image files from the internet can be an extremely time consuming task. In multimedia communication, a major portion of the communication bandwidth is occupied by image data because they are the major portion of the multimedia data. Hence, formation of efficient techniques for image compression has become reasonably important. Image compression is a method that decreases the quantity of digital information required to store visual images electronically. Image compression reduces the size in bytes of a graphics file without deteriorating the quality of an image beyond tolerable limits. It also, decreases the time taken to send images via the Internet or downloaded from web pages. Image compression is performed by decreasing repetition between adjacent pixels and maintaining features like edges and contours of the original image, image compression [8]. Transformation, quantization and encoding are the three basic steps employed in each one of the several still image compressing methods. Lossless and lossy image compression, are the two types into which the diverse image compression techniques available today can be classified. Lossless compression techniques allow exact reconstruction of the original, but the achievable compression ratios are only of the order approximately 2:1. A widely used form of lossy image compression process is the JPEG. The extensively used JPEG process based on Discrete Cosine Transform (DCT) is a form of lossy image compression. Operates by splitting images into differing frequency parts. Since, part of compression really happens during a step called quantization, where the less important frequencies are removed, it is called “lossy”. A series of finitely several data points are expressed by a kind of Image Transform called DCT in terms of a sum of cosine functions oscillating at diverse frequencies. Disintegrating the images into segments is the fundamental operating principle of DCT. A better signal approximation with fewer transform coefficients are provided by DCT which is a real value unlike Discrete Fourier Transform. In several practical image compression systems the invertible linear transform called 2D DCT is extensively used because of its compression performance and computational efficiency. Data (image pixels) is converted into sets of frequencies, by DCT. The frequencies in the set are arranged in ascending order of significance. On the basis of tolerable resolution loss, the least meaningful frequencies can be discarded. Quantizing the image’s DCT coefficients and entropy coding the quantized coefficients are the two techniques on which DCT-based image compression depends in order to decrease the data necessary for representing the image. In addition the functioning of these algorithms is estimated for diverse sizes of transform block, number of coefficients transmitted from each block and number of bits used to signify each pixel coefficient. The image obtained after converting the representation of the colors in the original image from RGB to YCbCr by means of standard JPEG encoding is divided into 8×8 blocks and the blocks are transformed from the

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spatial to the frequency domain by means of the DCT transform. Later, all the DCT coefficients are divided by their matching constant in a standard quantization table and rounded down to the nearest integer. From the lowest (upper left corner) to the highest (lower right corner) frequencies 64 DCT coefficients are constructed in each block. All DCT pixels are decoded by using a constant number of bits. But, the importance (the ratio between an upper left corner pixel and the one in the right bottom corner) is not the same for all the pixels in a DCT. In DCT, 8×8 or 16×16 or bigger blocks are formed by segmenting the images. The problem with this block results as these blocks become visible when the image is reduced to higher compression ratios. This is known as the blocking effect. Computation time is another problem with the DCT. When used on grey scale images, a better performance is exhibited by the Sub Band-DCT (SB-DCT). DCT (relative to the DFT) has the benefits of real-valued; better energy compaction (requires only a few coefficients to signify much of the signal energy), experimentally proven good performance and almost uncorrelated coefficients. So, Huffman coding when combined with technique of reducing the image redundancies using DCT helps in compressing the image data to a very good extent. In our proposed method, the given color image can be compressed using DCT and to avoid compression on similar blocks of the image using Fractal image compression. The self-similarity of the image blocks can be calculated using Euclidean distance. Then effectively encode the image using Huffman encoding.

II. PROPOSED METHOD

Image Compression using DCT and fractal based quad tree approaches are the proposed methods. The proposed methods are separate as first; the input image is partitioned into a number of disjoint non-overlapping blocks of size B×B called range blocks and a number of blocks of size 2B×2B called domain blocks. Second; then apply DCT to every blocks of the partitioned image. Third; then the DCT coefficients of each block are quantized. Fourth; the zero coefficients are prevented by scanning the block values in a zig-zag manner; zig-zag scanning improves the compression efficiency and extracting the nonzero
Coefficients. Fifth; the resulting image is partitioned using fractal based quad tree approaches. Lastly; the image encoded using Run length encoding technique. The entire procedures as Image is partitioned into a number of disjoint non overlapping blocks of size 4×4 called range blocks and a number of blocks of size 8×8 called domain blocks. The DCT apply to every blocks of the partitioned image (range blocks and domain blocks) for quantized the DCT coefficients. The entire DCT quantized coefficients are rearranging in a zigzag manner to prevent zero coefficients and improves the compression efficiency. A list of non-zero tokens for each bock proceeded by their count will be obtained. Fig. 1 shows the zigzag scanning.

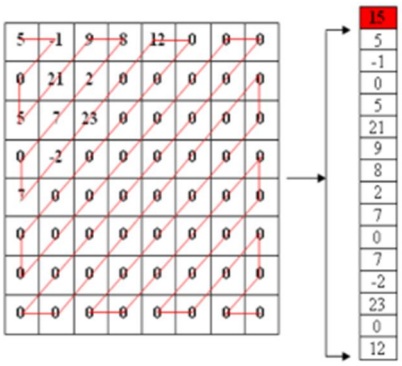


Fig.1.ZigZag Scanning

Image compression based on fractal used the property of self-similarity of fractal objects. Some of the blocks obtained by dividing the color image into several 8×8 blocks are similar. The concept of fractal image compression is used to prevent performing repetitive compression on the similar block. Fractal image compression used before encoding the quantized image blocks. Similar blocks in a given input image are identified using fractal image compression i.e., the matched domain blocks for each range block in an image. This process is repeated until best matches are not found. The quantized values are further compressed by Run length encoding technique to give a better overall compression. It is very simple compression technique and achieves best results with images containing large area of color and especially monochrome images. In this process represents a string by replacing each sequences of consecutive identical characters with (char; length). This method works us when the characters repeat often [24], [25]. The decompression process is easy. The compressed image is decompressed by reversing the entire procedures. Figs. 2 and 3 show the entire compression and decompression processes respectively.

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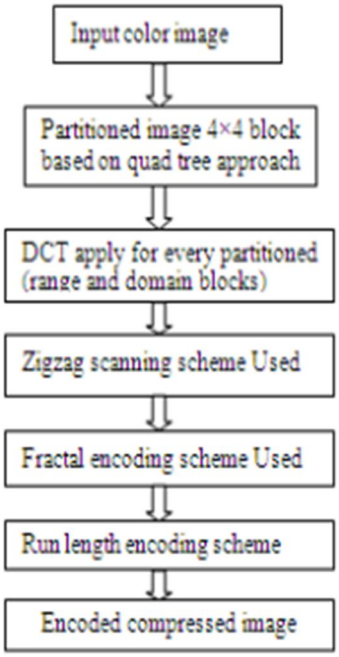


Fig2.proposed compression method

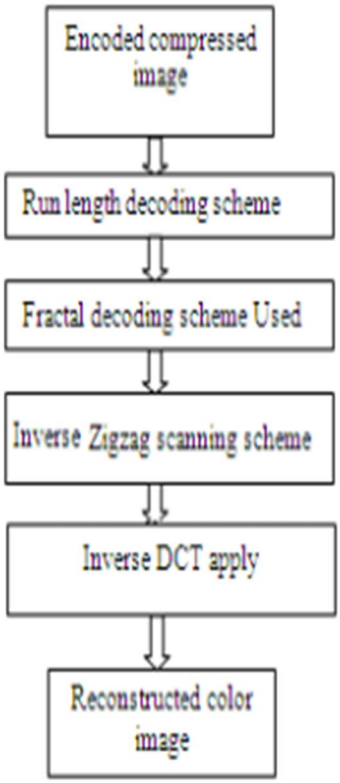


Fig.3.proposed decompression method

The proposed method was implemented using Mat lab and result was evaluated for deferent images.

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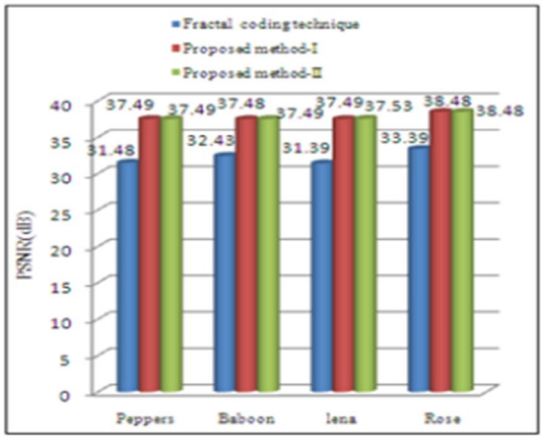


Fig-4 Compression of PSNR value for deferent images.

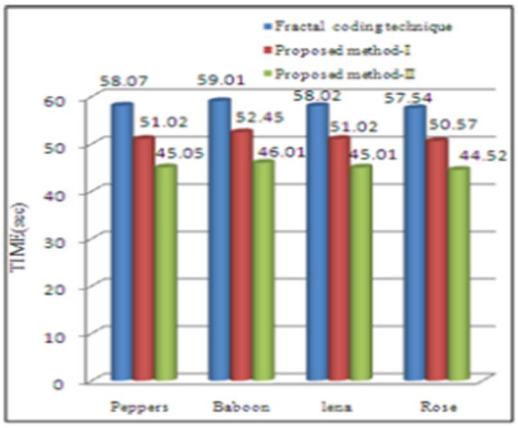


Fig-5 Compression of encoding time for deferent images.

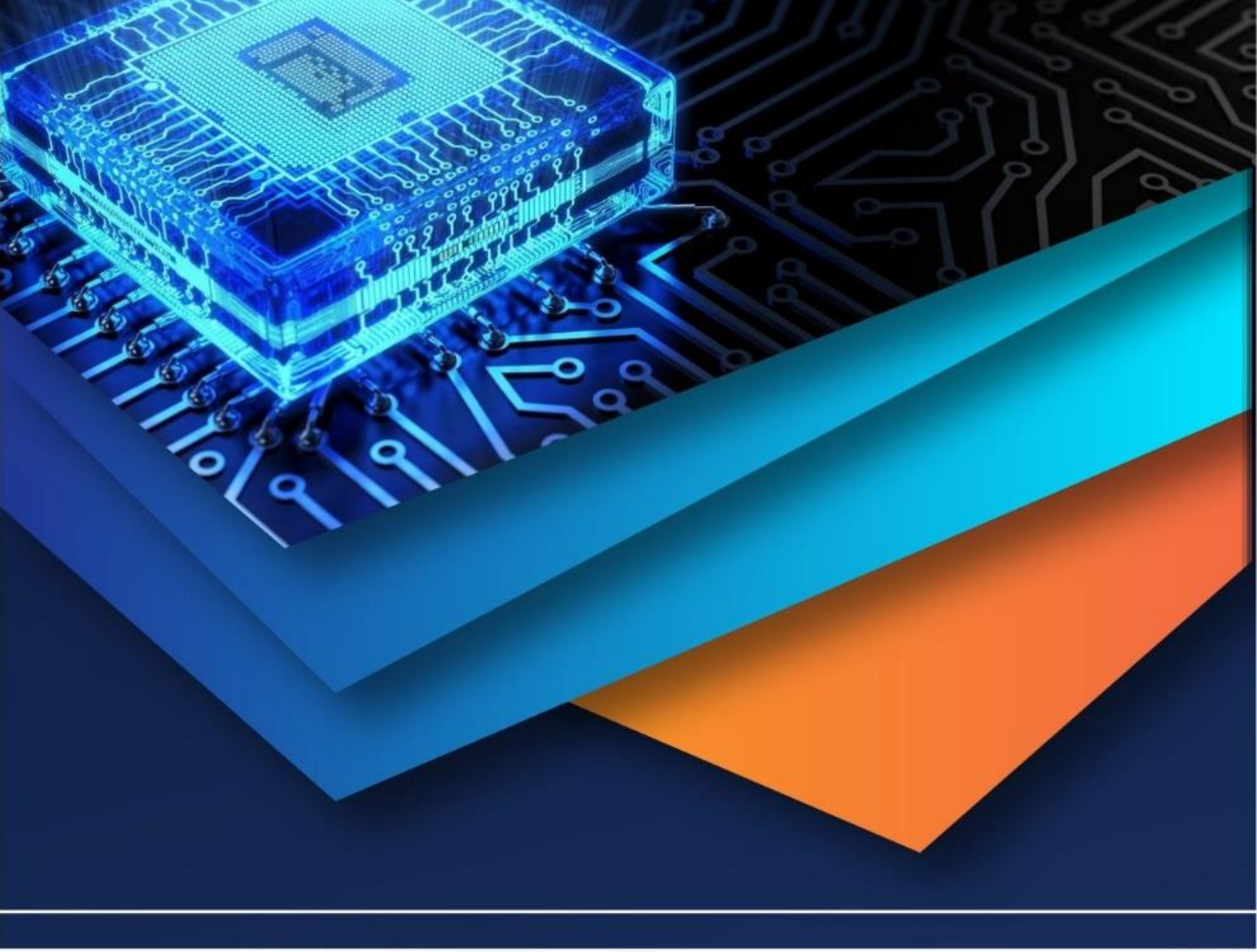
III. CONCLUSION

The main goal of this paper is to propose a new hybrid fractal coding scheme and it shows some merits of the proposed methods. It has been observed that fractal coding alone does not provide best results compared to method-I and method-II. Hybrid coding scheme provide the best result compared to others existing scheme and also provide high processing speed and high quality image with high compression ratio.

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