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A Review of Image Compression Using Fractal Image Compression with Neural Network

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***Abstract*- Generally the fractal image compression is a new process in the images compression. It is a block based image compression technique, which detects and decodes the existing similarities between different regions in the image. The main disadvantage of FIC is that the encoding time is comparatively very high, w here as the decoding time is very short. An artificial intelligence technique like neural network is used to reduce the search space and encoding time for the MRI images with an algorithm called as "back propagation" neural network algorithm. Initially, MRI image is divided into ranges and domains of fixed size. The best matched domain is selected for each range block and its range index and best matched domain index are produced, which acts as input to the expert system and which results reduced the sets of matched domain blocks. The neural network is then trained with these resultant values. This trained net is now used to compress other MRI images which lead to a very less encoding time. During the decoding phase, the transformation parameters are recursively applied to any random original image, which then converges to the fractal image after some changes. The simulation results show that the performance of this Neural Network based FIC is really. This paper shows the neural network based FIC which produces high development in encoding time without corrupting the image quality when compared to normal FIC.**

***Keywords*- Fractal Image Compression (FIC), Neural Network (NN), Back Propagation Neural Network (BPNN), Range Blocks, Neural Network (NN), Encoding Time (ET),Iterated Function System (IFS).**

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I. INTRODUCTION

Information transmission plays a very important role in transmission of data related to particular events like video conferences, medical data transfer etc, where much image data is to be transmitted. But we know that, the storage space of very big data can requires large memory. Hence to overcome this problem all the images are compressed and decompressed using several compression and decompression procedures. Image Compression plays a very important role in applications like medical imaging, remote sensing, tele-video conferencing and satellite image application. There are mainly two types of image compression

- lossless image compression and
- lossy image compression.

A. Lossless Image Compression

In this, type of compression, the original image can be actually recovered from the compressed data .It is generally used for discrete data, such as text, computer generated data, web Data and some kind of image & video information.

B. Lossy Image Compression

In this, type of compression, the original image cannot be accurately recovered from the compressed data. Due to some losses of information of data cannot be exactly recovered from compressed data. In this, much higher compression ratios are achieved in compare to lossless compression.

II. IMAGE COMPRESSION

The purpose of compressing image reduction, image irrelevance and redundancy to transmit mode data in efficient storage. Compression is obtained by removing one or more data from the three unnecessary bases :

(1) Encoding and redundancy present when the code words used.
(2) Pixel redundancy, between drifts gives pixel correlations of an image.
(3) Psycho-visual Redundancy, What Causes and Data is Ignored by Visual Human System.

III. IMAGE COMPRESSION APPLICATION

- Effective use of storage space.
- Reduce the transmission time of an image to be sent over the Internet or downloaded from websites.
- Image Archiving: Standard Data.
- Image Transmission: Web Data.
- Multimedia Application: Desktop Editing

The main aim of the image compression is to represent the image data in as few bits as possible and at the same time should maintain the high quality of the image necessary for an application. Image compression has two great purposes: reduction of time for image transmission and reduction of storage area. Image data redundancy is a key for image compression. Fractal image Compression (FIC) process is applied on images of different modalities like MRI, CT SCAN, X-rays, Ultrasound etc. This paper shows the neural network based Fractal image Compression (FIC) which produces high expansion in terms of encoding time without corrupting the image quality compared to the normal FIC which excludes exhaustive search.

A. Fractal Image compression

Fractal image compression lies in the category of lossy compression technique, which was invented by Michael Barnsley in 1988 and which is based on iterated function system through which better reconstructed image with good quality is obtained than the other image compressed methods. Fractal Image Compression (FIC) is a block based image compression, which detects and decodes the similarities between different regions of the images. The two major benefits of changing images to fractal data. The first one is that the fractal data occupies less size of memory than the amount of memory used to store the original data. The second benefit is that since the data is mathematical, the image can easily be scaled up or down a size without changing the detail of the image.

B. Image compression and coding method based on fractal dimension

The fractal dimension is the most important parameter to describe the fractal attribute structure.

The segmentation of images are of two types domain block and range block. Here, the domain block is the maximum and range block is minimum in size. For the first, use a fractal image encoding method based on iterative algorithm system is use the Discrete Cosine Transform (DCT) compression method and coding. Through the classification of image block, the index image block of the original image is displayed, and then up to the current data compression and IFS JPEG code the code. This type of image-based segmentation method based on visual characteristics has a high compression ratio.

IV. ARTIFICIAL NEURAL NETWORK

An artificial intelligence technique like neural network is used to reduce the search space and encoding time for the Magnetic Resonance Image (MRI) images. A algorithm called as “back propagation neural network algorithm” is used to increase the speed of the encoding time. At the initial stage MRI image is divided into ranges and domains of fixed size and twice size of the range size of the domain. A search is done to select the best matched domain for each range block and then its range index and best matched domain index are produced. This range block index is given as a input to the expert system which results reduced set of more or less matched domain blocks. Now the search is done only in resulted set of domain blocks and it produces set of Fractal codes as output.

A. Image compression and coding method based on Neural Network

A new technique has been adopted in this while initializing the load between input and unknown layer adopted as a substitute of randomizing the original weight. In this, the Back Propagation Algorithm is based on multi-layered feed-forward net and is the most versatile algorithm in which the first layer receives the input and it produces the output. This process is repeat again and again and many layers are produces its output which will act as a input for the upcoming layer. After giving the input data to the input layer, information passes through the network from the input layer to the output layer generally called as “forward propagation”.

V. LITERATURE SURVEY

The fractal Image Compression was firstly proposed in a paper by Jacquin. After Jacquin paper many more paper comes on this topic. Here the some paper describes the design of fractal image compression. Some of the papers are successful to give high compression ratio and some of these gave less encoding time.

Geoffrey Fellows et al [1] proposed that these temporary folders help forensic analysts to provide evidence for the files that have been viewed from the WinRAR archive. Such evidence will be very useful when user denies that the files were not accessed by him. WinRAR software furnishes encryption along with compression.

Wang et al [2] proposed a method in which related weights of confined features are added in both spatial and descriptor domain and this method is useful to retrieve images from database which contains large number of images. With very small computational overhead power of individual local features can be improved. Experimental results from benchmark tests show this method has greater performance with less computation and retrieval accuracy.

Stephen et al [3] made a comparative study of lossless and lossy radiography image compression and presented the challenges of using lossy methods for medical records by explaining fundamental concepts of radiologic imaging and then made a detailed study of current compression technique in the field of medical imaging and discussed regulatory policies and legal questions facing the use of compression in this field.

Khafaji et al [4] proposed an image compression scheme based on locally changing image characteristic. Derived

from this information an image is divided into blocks and then using polynomial approximation the image is decomposed into less compressed data. Finally performance rate is improved by Huffman encoding.

Mohammed S. Mahaboob Ismail.B Basha et al [5] said improved image fractal image compression (IFIC) method for color images made for the variable block size. The image here is divided into blocks considering the maximum and minimum range. Here, the fixed block size range of 4 x 4 iterations and other existing methods. This card reaches a compression ratio of up to 20 with a high peak signal-to-noise ratio (PSNR) of 30 dB.

M.K. Revathy Jayamohan et al [6] show that the computational complexity of fractal image compression is mainly due to a large number of comparisons needed to find a corresponding block corresponding domains corresponding to block ranges within the image. This article discusses the multi-way computational efficiency of tree research has been investigated for domain information storage. Cabin domains will be listed in a B ++ tree ordered in one or more selected local features of each domain.

VII. WORKING OF IMAGE COMPRESSION BASED ON FRACTALS AND BACK PROPAGATION NEURAL NETWORK

A fractal image compression algorithm proposed for MRI images, utilizes the self-similarity property of a MRI image and it comprises of three phases namely Training, Encoding and Decoding .The main aim of this compression technique is to reduce the search space and speedup the encoding time. These three phases are detailed in the following sub-sections.

A. Training Phase

In this phase, similar MRI images are taken as input images and each image is partitioned into range blocks and domain blocks separately. At the initial stage, the range block of one MRI image is compared with the domain blocks of the same MRI image to select the best matched domain block for that particular range block in an image and the fractal codes are given as output. Then the expert system has trained with the indices of range and its best matched domain blocks. The time taken in the training process will not be counted with the encoding time.

B. Encoding Phase

During the encoding phase, the expert system takes the index of the range block of MRI image one by one as its input and it produces a set of domain blocks for the parallel range block. Then the search will be done only in the resulted set of domain blocks Hence, the search space is reduced and speed of the encoding time is increased.

C. Decoding Phase

It is the reverse process of encoding is done in which the transformation parameters are applied to an initial image with mean value and it will then converge to the fractal image after fewer than ten iterations. Initially, the input MRI image is partitioned into fixed blocks of size are called Range Blocks (RB) and the block process operation is executed to reduce the recently formed image by averaging the intensities of four neighboring pixels and the resulted three vectors of encoding phase are considered now. A single block is extracted from the reduced image first. Then its corresponding best matched domain block index, scaling parameter and its offset values are retrieved from the vectors. The pixel values of the reduced domain block are then placed in the location in the range obtained by the orientation information after scaling and offsetting. All the range blocks constitute a single iteration. The decompressed image will be constructed after one to ten iterations.

VIII. CONCLUSION

This Review paper represents the Concept of Fractal Image compression using Neural Network. All compression techniques are useful and each day is developing a new compression technique that provides a better compression ratio. Image compression is one of the most important applications in the field of digital image processing. Due to the limited storage capacity and bandwidth, a medical imaging requires to storing the large quantities of digitized clinical data must be compressed before transmission and storage. But the main disadvantage of the fractal image compression is the high encoding time. A fractal image compression for MRI images introduce in this paper has reduced the search and encoding time in which the expert system has employed during the encoding process, to increase the speed of encoding process without severely affecting the image quality.

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