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Fractal Image Compression-State of the Art

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Abstract: Fractal compression is a new technique in the compression of images. Related contract transformations support and use the existence of self-symmetry within the image. This method has attracted a lot of attention in recent years due to multiple Advantages such as high compression rate compression high speed decompression, high bit rate determination and independence. Fractal compression includes the operation of fractals and is a compression technique with data loss. The strategy is more suitable for textures and natural images, with the fact that the components of an image often resemble other identical image components. The Fractal algorithms convert these components into mathematical information called "fractal codes" that are usually recreated from the encoded image. The Fractal1compression differs from the pixel-based compression methods like MPEG, JPEG and GIF, in view of the fact that no pixels are put asides. A picture has been regenerated into fractal image code; the image may be recreated to fill any screen size while not losing the sharpness, that happens in typical lossy compression schemes. This paper presents an overview of fractal based compression and literature survey on the same.
Key words: Fractal, Image compression, compression technique, lossy image compression technique.

1. Introduction:

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 categories of image compression, i.e. lossless and lossy compression. Fractal compression using lies in the category of lossy compression technique. Fractal image compression was proposed by Jacquin [1], [2]. Fractal geometry is separate that can be a part of the part, each of which is duplicated all the small size, a property called self-similarity [3], [4], [1]. In this, the pattern repeats itself as it is called fractals. Fractal compression was sponsored by M. Barnsley, who launch a company based on fractal image compression technology but did not release details of its plan. The first public scheme was due to R. Boss and E.Jacobs in Oceani Naval Systems Center of San Diego that used regular partitions and classification of curve segments to reduce random fractal curves (i.e. political boundaries) into two dimensions. M. Barnsley and A. Jacquin was the first to publish such a fractal compression of scheme images [2].

Fractal Compression Image: Images a particular type of copiers that reduces the image to be traced by repeating 3 times and copying (see Figure 1) [5]. Once you exit this machine back as input 2 shows many iterations of this method in some inbound images. Since the copier machine reduces the input image, any primary image placed in the copier machine is reduced to a point where the machine repeatedly performs; In fact, it is only the reference place and the reference point that verify how the output image shows.

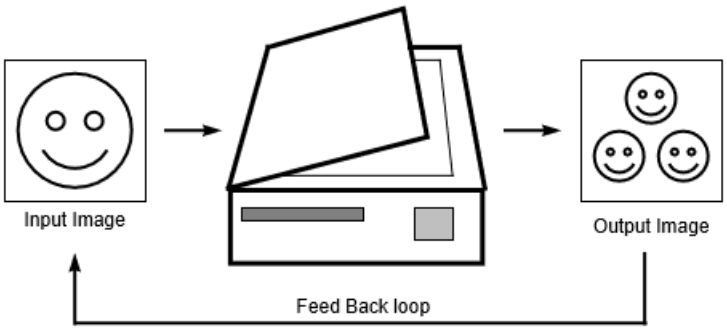

Figure 1- A copy machine that makes three reduced copies of the input image [3].

Jacquin propossed Fractal Image Compression with Partitioned Iterated Function System (PIFS). This is based on the fractal construction of iterated Function (IFS) system [4]. An IFS can be approximated by the original image. An

IFS is a set of constructive transformations, each of which is mapped to itself [6]. IFS codes similar transformations used to express the relationship between the different parts of the image. The following equation represent the said transformation [4]:

$$w_i \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} a_i & b_i \\ c_i & d_i \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} e_i \\ f_i \end{bmatrix} \qquad (1)$$

2. Image compression:

The Purpose of Compressing Image Reduction and Image Irrelevance and Redundancy to Transmit Mode Data in Efficient Storage. Compression is obtained by removing one or more data from the three redundant bases

(1) Encoding of that and redundancy present when the code words used (i.e., smaller length).

(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 (i.e., Information For Visually Non-Essential)

Image compression techniques are mainly of two types, as depicted figure.

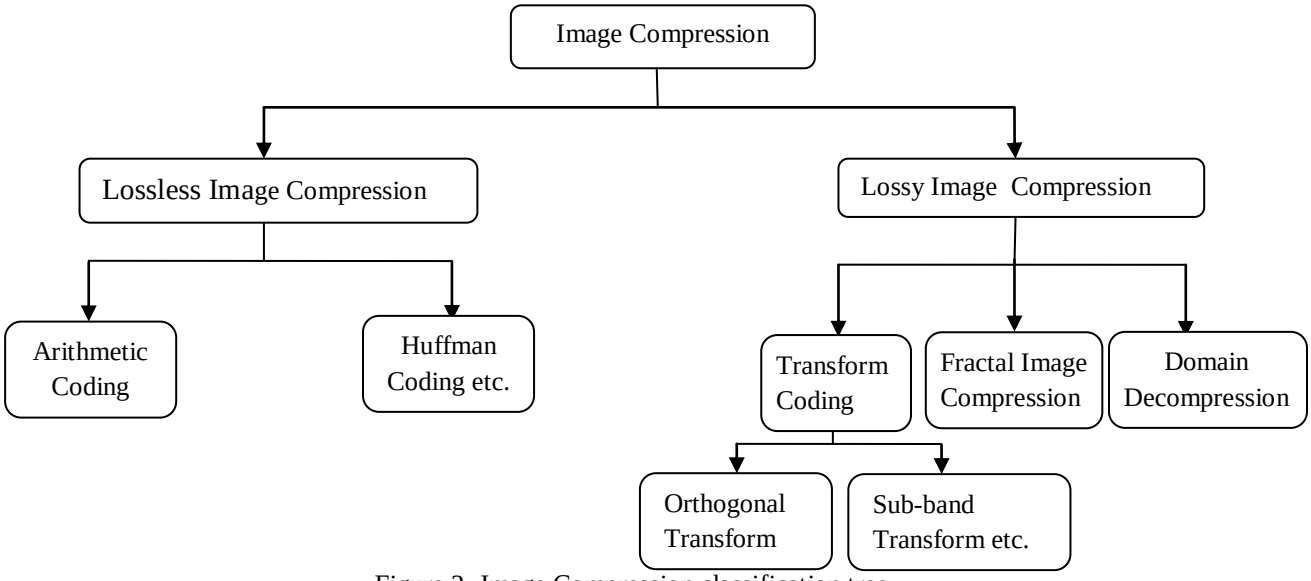

Figure 2- Image Compression classification tree.

Lossless Image Compression: In this, type of compression, the original can be exactly recovered from the compressed data [14]. It is generally used for discrete data, such as text, computer generated data, web Data and some kind of image & video information [6].

Lossy Image Compression: This involve some loss of information due to which data can not be exactly reconstructed from compressed data. Much higher compression ratios are achieved in compression to lossless compression [6].

2.1 Compression Applications:

- 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.

2.2 Image compression and coding method based on fractal dimension

The fractal dimension is the most important parameter to describe the fractal attribute structure [9]. Use on the basis of the fractal dimension to segment the image in two regions and split method: to have fractal traits and not having obvious fractal features and another way of segment image is domain block and second is range block. Here, 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; On the back, the DCT compression method and coding use [10], [11]. Through the classification image block, the index image block of the original image bitmap classification is displayed, and then up to the current data compression and IFS JPEG code [8] the code. This type of image-based segmentation method based on visual characteristics has a high compression ratio.

3. Fractal Image coding methods.

There are many different fractal image coding methods. These are explain as

1. Block Segmentation

Suppose that the size of an original digital image X r × r is divided into non-overlapping blocks with B × B pixels, and we indicate R_I. Therefore, the set of images is

$$P = \{R_i\}_{0 \le i \le N} \qquad (2)$$

N is the number of R_i , image transform τ :

$$\tau = \sum_{0 \le i \le N} \tau_i \qquad (3)$$

Here, τ_i is the compressive code of every range block, each of them contains two parts:0geometry model and gray model [12], that is;

$$\tau_i = T_i + S_i \qquad (4)$$

S_i is that0the geometrical remodel of some domain blocks, the size of domain block D_j is D×D (usually let D=2×B.), using S_i as within the vary of D_j will get a compressive block with the constant size of R_i:

$$S_i\left(D_j(\bar{x}_{n,m})\right) = \frac{x_{l,k} + x_{l+1,k} + x_{l+1,k+1}}{4(0 \le n,m \le B-1, k \le D-1)} \qquad (5)$$

So, the fractal compression and encoding process of R_i will be completed as finding a domain block, which has minimum distortion after the transformation. $\tau_i$is that least amount distortion is the fractal compression encoding [13].

A. Compression Ratio

Compression Ratio is the ratio between size of file when compress and size of file before compress. For any algorithm compression Ratio ought to be higher [7].

$$Compression\ Ratio = \frac{Size\ of\ image\ after\ Compression}{Size\ of\ image\ before\ Compression}$$

B. Compression Factor

The compression factor is the reverse of the compression ratio. It is the ratio between file size before compression and file size after compression [8].

$$Compression\ Factor = \frac{Size\ of\ image\ before\ Compression}{Size\ of\ image\ after\ Compression}$$

4. Literature Review:

The fractal Image Compression was firstly proposed in a paper by Jacquin. After Jacquin paper many more paper comes on this topic FIC. Here the paper selected 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.

Reza Hashemian and Satyendra Marivada [2] says that improving image compression by using fractal block encoding is a rule-based technique that can be used to reconstruct a picture image of limited image iterative. This technique greatly reduces memory requirements and accelerates reconstruction. After the implementation process to achieve the result is a reduction ratio of about 58% of memory consumption is reached. This card shows less data to decode the reconstruction procedure even faster at the receiving site. The result shows that the compression ratio of about 1:30 to 45 dB SNR is easily reachable.

And Mohammed S. Mahaboob Ismail.B Basha [3] 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 and [4] 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.

B. Bhuvaneswari, M. A. and B. Venkatalaksmi Muthiah [5] indicate that the modular buoys architecture is highly dynamic depending on the type of boom. In this work the interconnection between the image acquisition system approach and the transmission of buoys data modules described. This is the development of a low power interface system compress the image that we successfully encode image compression algorithms using the fast fractal image. This encrypted file is then applied to the data compression algorithm and gets flashing in the ADSP BF527 low power processor used.

G.V. Mahalakshmi [6] said of fractal image compression (FIC) may be a new compression technique in the space domain. It is compatible with image compression based image detection technology and encodes similarities between completely different regions within the image. The biggest disadvantage of FIC is that time encryption is relatively high, while decompression is extremely fast. The encryption method is to find an applicable block domain for each variation block. And to reduce the search area and time for encryption, a FIC algorithm device associated with magnetic imaging technique using backward neural propagation network is projected.

During the encryption process, a magnetic resonance image is divided into blocks and variable domains. Then the index of each block variant is input to the trained system and this purpose in a more appropriate domain block group. A full search is complete to remove the most effective block for all domain matching variation blocks and this leads to a block index and variable index variable block domain. The neural network is then trained with these resulting values. This enabled on the Internet is currently used to compress different magnetic resonances that result in much a smaller amount encoding time. Throughout the decoding partition, the transformation parameters are recursively applied to any arbitrary original image, which then converges to the fractal image after some iteration. The replication results show that the performance of this neural FIC network is largely based.

5. Conclusion:

This paper represents the Concept of Fractal Image compression and various technologies used with Fractal image compression used by various author. All compression techniques are useful in the related industry and each day is developing a new compression technique that provides a better compression ratio. In this review article gives a clear idea about basic compression techniques.

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