Research article Available online www.ijsrr.org ISSN: 2279–0543

International Journal of Scientific Research and Reviews

Firefly Algorithm with Improved Sorting Mechanism of Blocks in Fractal Image Compression

S.keerthika[1]

[1]Department of Information Technology, KG College of Arts and Science, Coimbatore, Tamil Nadu 641035, India Email: keerthikabca@gmail.com

ABSTRACT

The researchers are extremely developed in doing lots of work in the part of image compression. The cause of image compression is to reduce in significance and redundancy of the image data in order to be able to store or transmit data in a capable form. Image compression is reducing the quantity in bytes of a file without modifying the feature of the image to an undesirable level. Study advances in Firefly algorithm which focuses on computationally efficient and effective algorithm. It is a lossy compression method with asymmetric method in which it takes additional time in compression of an image than decompression. In this paper new technique is implemented to increase the speed of fractal image compression. The method using quick search strategies using proposed Firefly with sorting mechanism of blocks for fractal image compression is implemented. The purpose of the work is to overcome the drawback of fractal image compression which is the improved encoding time, the various speed up terms like compression ratio (CR), peak signal to noise ratio (PSNR), and encoding time. The test outcome on color and RGB images indicates a definite decrease in computational time and also achieving a faster encoding process. The investigational work done in this effort proves that the proposed improved algorithm gives approximating solutions to all types of problems.

KEYWORDS: Encoding, Firefly, Fractal image compression, Compression ratio, PSNR.

*Corresponding author

Ms. S. Keerthika,

Assistant professor,

Department of Information Technology,

KG College of Arts and Science, Cbe,

Email: Keerthika.s@kgcas.com.

I. INTRODUCTION TO IMAGE COMPRESSION

Image compression is useful to enhance an image representation while reducing the quantity of memory essential as much as possible to encode the image. Compression methods try to remove uniformity, thus producing an added dense code that conserve the fundamental and correct information controlled in the original image. If all pixel value represents a preferred and imperative part of information, it would be composite to compress an image. The data compressing a digital image or series of images are commonly redundant and irrelevant.[1] Redundancy relates to the geometric properties of images, while irrelevancy relates to an image.

Digital images are very large in size and hence engage larger storage space. Due to their larger size, they take better bandwidth and more time for upload or download throughout the Internet. This makes it complex for storage as well as file sharing. To challenge with this problem, the images are compressed in size with special techniques. This compression not only helps in reduction storage space but also enables easy sharing of files. Image compression applications lessen the size of an image file without causing major degradation to the quality of the image.

Redundancy can be divided into three types-Spatial redundancy is appropriate to the correlation between adjacent pixels in an image. Spectral redundancy is due to the correlation between planes or spectral bands. Temporal redundancy is due to the correlation linking neighboring frames in a sequence of images[1 2].

II. FRACTAL IMAGE COMPRESSION

Fractal image compression is a lossy compression process for images in digital form, based on fractals. The development is best corresponding for textures and natural images, relying on the information that parts of an image often be associated to other parts of the similar image. Fractal algorithms change these parts into arithmetic data called "fractal codes" which are used to restructure the encoded image.[3]

The word fractal was first used by Benoit B. Manderlbrot to allocate objects that are self-similar at different scales as shown in Figure1 Fractals. Such objects have in order at every scale. Unfortunately, a good definition of the term fractal is indefinable. It is the maximum to examine a fractal as a set that has a property such as those listed below, rather than to look for an correct definition.

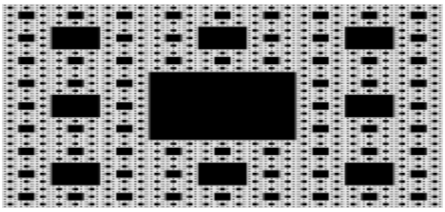


Figure1. Fractals

If we consider a set F to be fractal, it will have a quantity of the following properties: F has aspect at every scale. F is (exactly, roughly, or statistically) self-similar. The 'fractal dimension' of F is better than its topological dimension. There is a simple algorithmic clarification of F. The most significant advantages of fractal image compression are: High reconstruction quality at low coding rates, fast decoding, Resolution independence i.e.; an encoded image may be decoded at a higher resolution than the original.

III. FIREFLY ALGORITHM WITH SORTING MECHANISM OF BLOCKS

The firefly algorithm (FA) is a met heuristic algorithm, inspired by the alternating behaviour of fireflies. The main idea for a firefly's flash is to act as a signal classification to attract other fireflies. All fireflies are unisexual, so that one firefly will be concerned to all other fireflies, Attractiveness is comparative to their brightness, and for any two fireflies, the less clear one will be attracted by the brighter one; however, the clarity can decrease as their distance increases. If there are no fireflies brighter than a given firefly, it will move accidentally. The brightness should be connected with the objective function. Firefly algorithm is a nature-inspired meta-heuristic optimization algorithm.

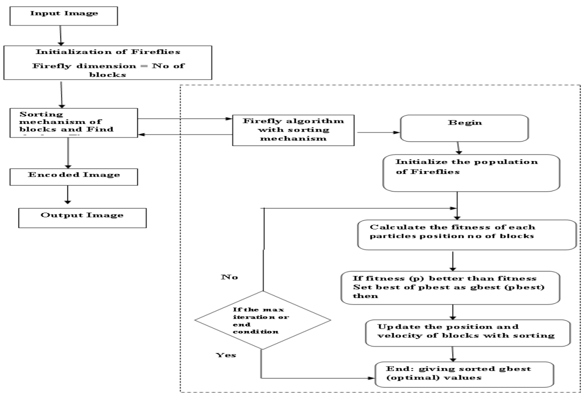


Figure2. Flow chart for firefly algorithm with sorting mechanism of blocks

IV. PERFORMANCE METRICS

Compression ratio

Data compression ratio is defined as the ratio fixed involving the uncompressed size and compressed size. The data compression ratio can serve as a compute of the complexity of a records set or signal; in particular it is used to estimate the algorithmic complexity.[8]

Peak signal-to-noise ratio

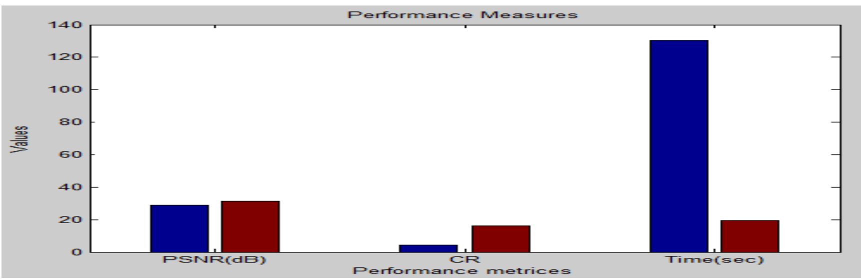
The PSNR chunk computes the peak signal-to-noise ratio, in decibels, between two images. This ratio is often used as superiority between the original and a compressed image. Advanced the PSNR value the enhanced the quality of the compressed or reconstructed image.

The Mean Square Error (MSE) and the Peak Signal to Noise Ratio (PSNR) are the two error metrics used to compare image compression quality. The MSE represents the rising squared error between the compressed and the exclusive image, whereas PSNR represents a measure of the peak error. Lower the value of MSE, the lesser the error.[8]

V. RESULTS AND DISCUSSION

In this section, the encoding time, PSNR value, Compression ratio in terms for the existing and planned situation by using MATLAB R2013a is calculated. The results are described that the planned scenario yields superior result for programming of images. The investigational results executed in MATLAB R2013a on Intel (R) Core (TM) 2Duo CPU @ 2.00 GH_Z with 3.00 GB RAM along with 32 bit Windows 10 Pro Operating System. The experiment images used in the experiments is Boat image, Barbara image and Mandrill Image. [11]

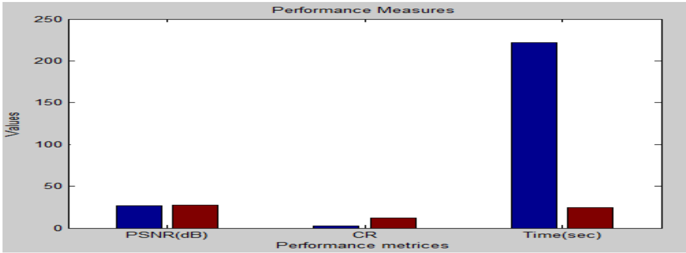
Figure 3. Boat imageFigure 4. Outcome of Boat Image



Graph 1. Performance of Boat image

Figure 5. Barbara image Figure 6. Outcome of Barbara Image



Graph 2. Performance of Barbara Image

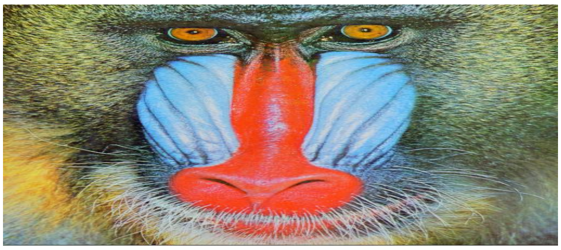
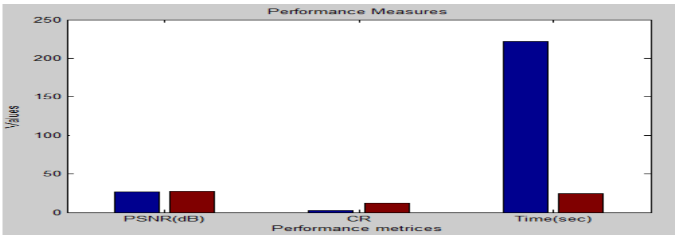
 

Figure 7.Mandrill Image Figure 8. Outcome of Mandrill Image



Graph 3. Performance of Mandrill Image

VI. CONCLUSION

Fractal image compression is an asymmetric lossy compression method which includes combination of computations in it. The proposed Firefly algorithm with sorting mechanism algorithm on images indicates a definite drop in computational time and also achieving a faster encoding process. The investigational work done in this work proves that the proposed better algorithm gives the best performance.

REFERENCES

1. Gokilavani.A , Image compression: Huffman and LZW Technique, International Journal for Research in Applied Science & Engineering Technology (IJRASET), 2017;5(IX): ISSN:2321-9653.
2. Chong Fu, Zhi-liang Zhu, A DCT-based Fractal Image Compression Method, International Workshop on Chaos-Fractals Theories and Applications, 2015 .
3. Preedhi Garg, Richa Gupta and Rajesh K. Tyagi, Adaptive Fractal Image Compression Based on Adaptive Thresholding in DCT Domain, Information Systems Design and Intelligent Applications, Advances in Intelligent Systems and Computing 433, Springer India 2016.
4. Edward R. Dougherty (Editor), Digital Image Processing Methods, Marcel Dekker, Inc., New York, 1994.
5. Anil K. Jain, Fundamentals of Digital Image Processing, PHI, New Delhi, 1995
6. Yuval Fisher (Ed.), Fractal image Compression Theory and Applications, Springer-Verlag, New york, 1995.
7. M.F. Barnsley, Fractals Every Where , Academic Press, San Diego, California, 1988.
8. Mohammed Omari, Nasreddine Karour, and Souleymane Ouled Jaafri, Fractal Image Compression based on Polynomial Interpolation , IEEE 2016.
9. Utpal Nandi, Jyotsna Kumar Mandal, Sahadeb Santra, Suman Nandi, Fractal Image Compression with Quadtree Partitioning and a new Fast Classification Strategy, IEEE 2016.
10. A.E. Jacquin, Image Coding Based On A Fractal Theory of Iterated Contractive Image Transformations, IEEE Transactions on Image Processing, 1992; IP- 1(1):18- 30.
11. Lester Thomas and Farzin Deravi, "Region Based Fractal Image Compression using Heuristic Search", IEEE Transactions on Image Processing, 1995;4(6): 832-838.
12. Yang, X. S. Nature-Inspired Metaheuristic Algorithms. Luniver Press, 2005; ISBN 1-905986-10-6.