ENHANCED DCT COMPRESSION TECHNIQUE USING VECTOR QUANTIZATION AND BAT ALGORITHM

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Abstract: *The image compression is the technique which is applied to compress the pixels of the image to reduce size without compromising image quality. The work contains improvement in vector based bat algorithm compression technique to increase compression ratio.*
The vector quantization algorithm is used to analyze image features and bat algorithm is used to encode the image to generate final compressed image. The vector quantization algorithm will be replaced with DCT (discrete cosine transformation) algorithm for feature extraction and bat algorithm is used for encoding. The performance of proposed is implemented in MatLab.
The results shows better PSNR and compression ratio as compare to discrete cosine transformation.

Key Words: *Image compression, DCT, Vector quantization, Bat.*

1. INTRODUCTION:

Image processing is a technique to perform operations on an image, with a specific goal to get an enhanced image or to extract some helpful information from it. It is a kind of signal processing in which input is an image and output might be image or characteristics/features associated with that image. These days, image processing is among quickly growing technologies. It forms core research area within engineering and computer science disciplines as well [1]. It is a kind of signal dispensation in which input is image, similar to video frame or photograph and output might be image or characteristics associated with that image. Typically image processing system includes treating images as two dimensional signals while applying effectively set signal processing methods to them. The two sorts of methods utilized for Image Processing are Analog and Digital Image Processing. Analog or visual techniques of image processing can be utilized for the printed versions like printouts and photographs. Digital Processing techniques help in manipulation of the digital images by using computers [2].

Image compression is an application of data compression that encodes the original image with couple of bits. The objective of image compression is to reduce the redundancy of the image and to store or transmit data in an efficient form. The goal of such system is to reduce storage quantity, and the decoded image displayed in the monitor can be similar to the original image as much as anyone might imagine [3]. There are mainly two types of image compression techniques. Lossy image compression is the sort of image compression where there is a loss of information. In the event that the compressed image is decompressed then it won't be identical to original image yet close to it. Lossless image compression is the kind of image compression where there is no loss of information. In the event that the compressed image is decompressed then it will be identical to the original image [4].

In Image compression, there are different lossless image compressions methods are use discussed below:
1) **Lossless methods based on substitution Models:** The methods that were earlier used for compressing the images were mostly based on substitution techniques. The redundancy which exists in the data of an image is made use of by making it in relation with the adjacent pixels. Bitmap Compression and RLE (run length encoding) are the methods used [5].

2) Lossless methods based on statistical models: The redundancy of the pixels can be reduced in the statistical models. They are both static as well as adaptive in nature. The probability of occurrence in the image can be the reason for reduction of redundancy. Shannon-Fano Coding, Huffman Coding, and Arithmetic Coding are some of the most known methods[5].

3) Lossless methods based on dictionary models: The string of variables can be replaced by the code which is used by the dictionary technique models. The input pixels are processed by the encoder. The correspondence is also found out by the encoder by running through the dictionary. The pointer is set where the string is found. This is used as a code. If any match has not been found, the string is added to the dictionary [6].

4) Lossless methods based on spatial domain models: The spatial redundancy of an already existing image is removed using the models which are available in the space domain. The technique used can be implemented locally as well as globally. The statistical models of substitution are used for the coding process. The lossless JPEG standard is the most significant technique. The result of the prediction of a pixel is a value very close to zero or residual prediction error [7].

2. LITERATURE REVIEW:

Nejati M. et.al [8] exhibited a boosted dictionary learning structure to develop an ensemble of complementary particular dictionaries for sparse image representation. Based on the proposed ensemble model, another image compression calculation is built using boosted multiscale dictionaries known as a part of the wavelet domain. Our calculation is assessed for compression of natural images. The outcomes exhibit that the proposed calculation has better rate distortion execution as contrasted and a few contending compression strategies including explanatory and learned dictionary schemes.

Rathgeb C. et.al [9] explored that the feasibility and limitations of ear recognition affected by image compression which speaks to a ubiquitous kind of image distortion in forensic applications. Based on outcomes achieved for three different discovery algorithms and four feature extraction techniques this technique for recognition may be feasible within the sight of serious image compression relying upon a few factors.

Karami A. et.al [10] exhibited another lossy compression strategy for hyper spectral images that intends to optimally compress in both spatial and spectral domains and at the same time minimizes the impact of the compression on linear spectral unmixing execution. To accomplish this, a positive tucker decomposition is connected. This decomposition is a component of three measurement parameters. The proposed calculation achieves a superior execution (higher SNR variance and littler MSE) in comparison with two cutting edge compression algorithms, especially at high CRs.
Pal T. et.al [11] proposed a new CFA (NCFA) which is designed for solving the arising problems of the existing bayer CFA. The alternative columns of each of the macro blocks which are captured by the NCFA are dropped using this proposed method. The proposed scheme is much more efficient in terms of both energy efficiency as well as reconstruction quality according to the results.

Sikka N. et.al [12] proposed that the Haar wavelet and vector transform techniques are used to propose a new lossless technique in image processing. The proposed method helps in achieving 97% of the compression percentage. There are comparisons done based on the results of the proposed technique with the other existing techniques such as Integer-to-integer transform and Band-let image compression. There is a reduction in the SNR (Signal to Noise Ratio) values and the RMSE values are increased by the proposed system.

Rekha H. et.al [13] proposed there are various types of image compression techniques and they have their effects on WSNs. In terms of Peak Signal to Noise Ratio (PSNR), Mean Square Error (MSE), Structural Similarity Index Measure (SSIM), Compression Ratio (CR), etc. are used to determine the performance of this compression technique. For the resource constrained WSN the proposed method has proved to be more efficient as compared to the other techniques.

3. RESEARCH METHODOLOGY:

The image compression is the technique to reduce size of the input image. The image compression consists of two steps, the first step is feature analysis and second step is encoding to generate final compressed image. In the recent times various algorithms has been proposed for the image compression. The recent times, various algorithms have been proposed for the feature extraction and for the encoding to generate final compressed image. The vector quantization scheme has been proposed previously for the feature extraction and bat algorithm is been applied for the encoding to generate final compressed image. In this work, the improvement in the quantization based bat algorithm will be proposed to increase compression ratio. In the proposed scheme, the DCT algorithm has been used with the bat encoding scheme to generate final compressed image. The DCT scheme is the discrete coefficient transformation based scheme in which textual and color features of the image is extracted which is given as input to bat algorithm to generate final compressed image.

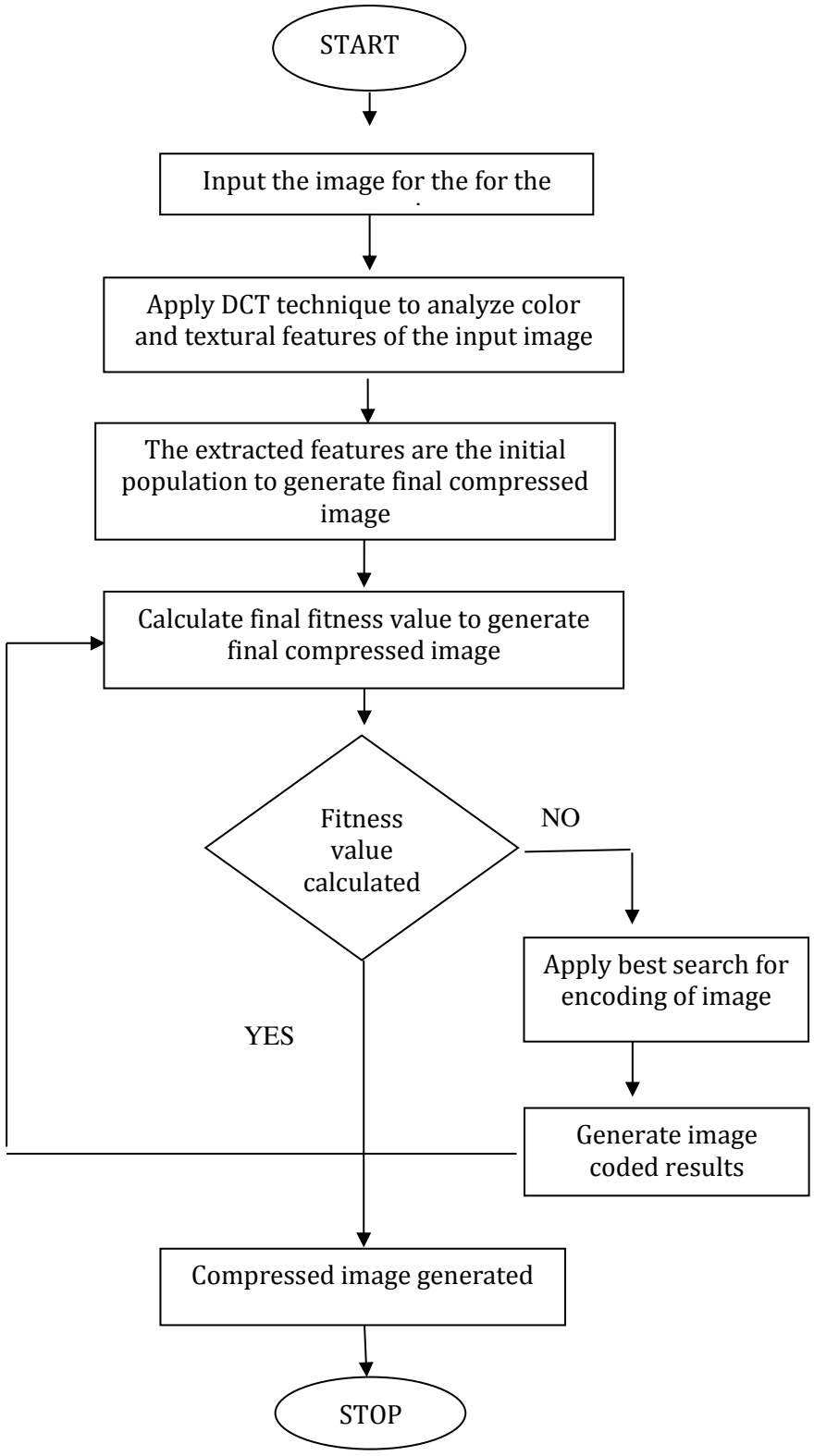

Figure 1: Flowchart of the research work.

4. RESULTS AND DISCUSSION:

To test the performance of the proposed algorithm, it is implemented in MATLAB which is the tool to perform complex mathematical computations. The dataset of 10 images are taken to test the reliability of proposed algorithm. The execution time, compression ratio are considered as the parameters for the performance analysis

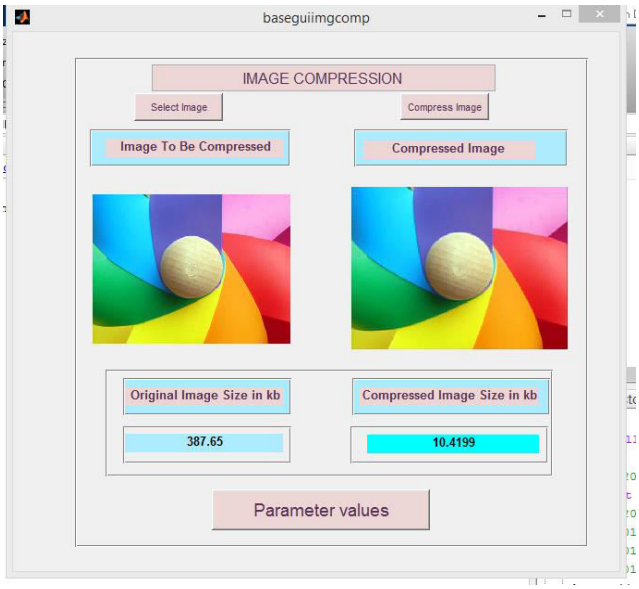

Figure 2: Tool for Image compression

As shown in the Figure 2, the tool is designed in MATLAB to analysis the performance of proposed algorithm. In the Figure it is displayed that size of the image is reduced to 18.91 Kb to 387.32 kb after image compression

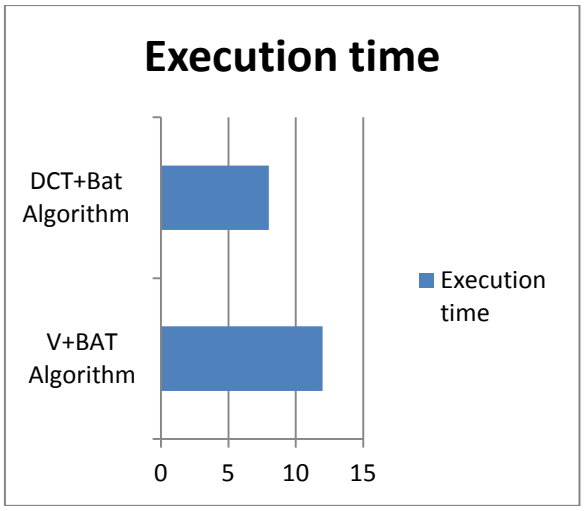

Figure 3: Execution time

As shown in Figure 3, the performance of proposed and existing algorithm is been compared in terms of execution time. The execution time of existing algorithm is 12 second which is reduced to 8 second in the proposed algorithm

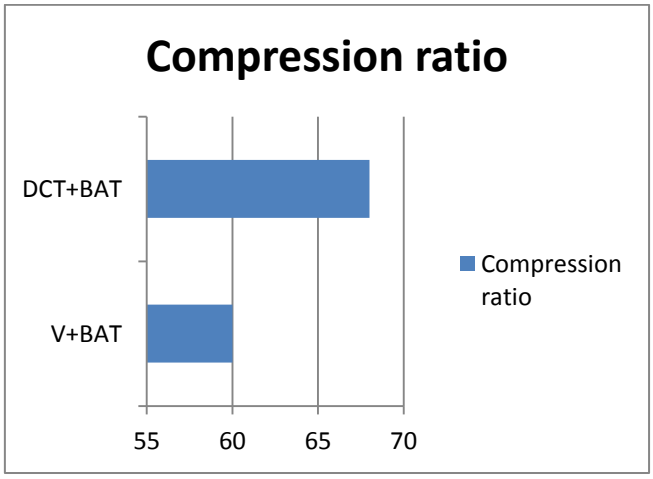

Figure 4: Compression ratio

As shown in Figure 4, the results of the proposed and existing algorithm is been compared in terms of compression ratio. The compression ratio is existing algorithm is 60 which is increased to 68 in the proposed algorithm.

5. CONCLUSION:

The image compression is the technique of image enhancement which are of two types, lossy and lossless type of compression. The vector quantization and bat algorithm is the lossless type of image compression technique. In this work, it is been concluded that improvement is required to increase compression ratio and reduce execution time. In this work, DCT algorithm is used with the bat algorithm for image compression. The simulation is been performed in MATLAB to test reliability of the proposed algorithm. It is been analyzed that execution time is reduced and compression is increase with the proposed algorithm

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