A SURVEY: VARIOUS TECHNIQUES OF LOSSY IMAGE COMPRESSION

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Abstract—this paper is about various lossy image compression techniques. On the basis of analyzing the various image compression techniques this paper presents a survey of existing research papers. In this paper we analyze different types of existing method of lossy image compression. Compression of an image is significantly different then compression of binary raw data. To solve these use different types of techniques for lossy image compression. Now there is question may be arise that how to image compress and which types of technique is used. For this purpose there are basically two types are method are introduced namely lossless and lossy image compression techniques. In present time some other techniques are added with basic method.

Keywords- Image Compression; Lossy; technique;

I. INTRODUCTION

An image is an array, or a matrix, of square pixels (picture elements) arranged in columns and rows. There are some algorithms that perform this compression in different ways; some are lossless and lossy. Lossless keep the same information as the original image and in lossy some information loss when compressing the image. Some of these compression techniques are designed for the specific kinds of images, so they will not be so good for other kinds of images. In Some algorithms let us change few parameters they use to adjust the compression better to the image. Image compression is an application of data compression that encodes the original image with fewer bits. The objective of image compression [1] is to reduce the redundancy of the image and to store or transmit data in an efficient form. The compression ratio is defined as follows: Cr= N1/N2 where N1 is the data of the actual image and N2 is the data of compressed image in image compression.

II. TYPES OF IMAGE COMPRESSION

On the bases of our requirements image compression techniques are broadly bifurcated in following two major categories.

1. Lossless image compression
2. Lossy image compression

1) Lossless Compression Techniques:

Lossless compression compresses the image by encoding all the information from the original file, so when the image is decompressed, it will be exactly identical to the original image. Examples of lossless [2] image compression are PNG

2) Lossy Compression Techniques:

Lossy compression Techniques is the class of data encoding methods that uses in exact approximations content. These techniques are used to reduce data size for storage, handling, and transmitting content. Lossy compression is most commonly used to compress multimedia data (audio, video, and images), especially in applications such as streaming media and internet telephony.

III. LOSSY IMAGE COMPRESSION

Lossy compression as the name implies leads to loss of some information. The compressed image is similar to the original uncompressed image but not just like the previous as in the process of compression [9] some information concerning the image has been lost. They are typically suited to images. The most common example of lossy compression is JPEG. An algorithm that restores the presentation to be the same as the original image are known as lossy techniques. Reconstruction of the image is an approximation of the original image, therefore the need of measuring of the quality of the image for lossy compression technique. Lossy compression technique provides a higher compression ratio than lossless compression. Major performance considerations of a lossy compression scheme include:

- Compression ratio
- Signal to noise ratio
- Speed of encoding & decoding

Lossy image compression techniques include following schemes:

a) Scalar Quantization:

The most common type of quantization is known as scalar quantization. Scalar quantization, typically denoted as Y=Q (x), is the process of using a quantization function Q to map a scalar (one-dimensional) input value x to a scalar output value Y. Scalar quantization can be as simple and intuitive as rounding high-precision numbers to the nearest integer, or to the nearest multiple of some other unit of precision.

b) Vector Quantization:

Vector quantization (VQ) is a classical quantization technique from signal processing which allows the modeling of probability density functions by the distribution of prototype vectors. It was originally used for image compression. It works by dividing a large set of points (vectors) into groups having approximately the same number of points closest to them. The density matching property of vector quantization is powerful, especially for identifying the density of large and high-dimensioned data. Since data points are represented by the index of their closest centroid, commonly occurring data have low error, and rare data high error. This is why VQ is suitable for lossy data compression. It can also be used for lossy data correction and density estimation.

IV. LITERATURE SURVEY

In 2015 Fahima Tabassum , et al presents a" Simplified Image Compression Technique Based on Haar Wavelet Transform"[2]. In this paper they use main objective of source coding is to represent the symbols or messages generated from an information source in a suitable form so that the size of the data is reduced. In image compression we use JPEG where huge number of zero is generated in medium and high frequency region of transformed image using the combination of DCT (Discrete Cosine Transform) and quantization. This is done to take the advantage of 'run-length coding' to reduce the size of an image. The process is lossy compression but provide good illusion at a glance. In this paper they use Haar wavelet matrix instead of DCT to transform the image into frequency domain. Again instead of weighting matrix of quantization, they use mask of very few Is in DC and low frequency region to get huge number of 0 in each

block of transformed image. The image is recovered using of IDWT (Inverse Discrete Wavelet Transform) and the MSE (mean square error) and SNR (signal to noise ratio) are measured varying the percentage of zero per block or mask.

In 2015 Vikash Yadav, et al presents "A Hybrid Image Compression Technique for Medical Images"[3]. In this paper, they present a strategy to increase the compression ratio with simple computational burden and excellent decoded quality. Higher compression ratio is achieved by applying different compression thresholds for the wavelet coefficients of each DWT band (LL and HH) while DCT transform is applied on (HL and LH) bands with preserving the quality of reconstructed medical image. The retained coefficients are quantized by using adaptive quantization according to the type of transformation. Finally the entropy coding (variable shift coding) is used to encode the quantization indices. The Discrete Wavelet Transform (DWT) analyzes the signal at different frequency bands with different resolutions by decomposing the signal into an approximation and detail information. Image coded by DWT do not have the problem of blocking artifacts which the DCT approach may suffer.

In 2015 Dhara Shah et al presents "a Development of Lossy Image Compression Using CCSDS Standard Algorithm Using MATLAB"[4]. In this paper thy use Consultative Committee for Space Data System (CCSDS) image compression standard which is one of compelling compression strategy similar to JPEG20000/SPIHT. This standard encourages both lossy and lossless compression of gray scale images. It is in based on Discrete Wavelet Transform(DWT) and a Bit Plane Encoder to give progressive compression/ decompression. It is carried out in different stages, decompression is carried out in its invert way and every decompression stage's yield gives the closest of original image and last stage gives the original image with no misfortune. An outcome is produced for encoding performed to the low frequency substance of the DWT translated image because the human visual system is more delicate to the low frequency segment and encoding is carried out just on low frequency contains that gives lossy compression but accomplished high compression ratio.

In 2016 K.M.Aishwarya et al presents "Lossy Image Compression using SVD Coding Algorithm"[5].In this paper the method of SVD has been applied to mid-level digital image processing. SVD transforms a given matrix into three different matrices, which in other words, means refactoring the digital image into three matrices. Refactoring is achieved by using singular values, and the image is represented with a smaller set of values. The primary aim is to achieve image compression by using less storage space in the memory and simultaneously preserving the useful features of original image. The experiments with different singular values
are performed and the performance evaluation parameters for image compression viz. Compression Ratio, Mean Square Error, PSNR and Compressed Bytes are calculated for each
SVD coefficient. The implementation tool for the tests and experiments is MATLAB.

In 2016 Rachit Patel et al presents "A Fast and Improved Image Compression Technique Using Huffman Coding"[6]. The purpose of this paper is to analyze Huffman coding technique which is basically used to remove the redundant bits in data by analyzing different characteristics or specification like Peak Signal to Noise Ratio (PSNR), Mean Square Error (MSE) Bits Per Pixel (BPP) and Compression Ratio (CR) for the various input image of different size and the new method of splitting an input image into equal rows & columns and at final stage sum of all individual compressed images which not only provide better result but also the information content will be kept secure. An image compression technique has various advantages in the field of image analysis and also for the security purpose for the image.

V. CONCLUSION

This paper presents various techniques of lossy image compression. These are still a challenging task for the researchers and academicians. There are mainly many types of lossy image compression techniques exist. Comparing the performance of compression technique is difficult unless identical data sets and performance measures are used. Some of these techniques are obtained good for certain applications like security technologies. After study of all techniques in this different algorithm used for different types of image and its application .in all above CCSDS algorithm is better among all algorithm technique CCSDS standard is better than JPEG2000 and it give better results in terms of quality and compression ratio.

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