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A Survey on Compression of an Image Using Wavelet Transform

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Abstract: In the data bases application such as storage and transmission, image compression is found to be very essential. The main purpose of image compression is to reduce the communication bandwidth and the storage requirement. In this paper, we have included a review on image compression mechanism using wavelet transform algorithm. The objective of this paper is to focus the advantage of wavelet transform comparing to today's techniques and to analyze the implementing of compression technique on a stable image using wavelet functions. By using wavelet transform algorithm, many works have been doing to reduce or completely remove the noise from the image and many profitable results has gained out of work researched.

Keywords: compression, mapper, quantizer, lossy and lossless compression, transform coding, wavelet transform, image.

I. INTRODUCTION

Compression of the data is worthy because the data which is uncompressed such as audio, video and graphics requires large transmission bandwidth and storage capacity. Image compression is also a type of compression technique which is used to reduce the size of graphics in terms of bytes to inhibit an acceptable quality of an image. [1] Due to compression, the file size gets minimized at its best so that a number of images can be reserved in an available memory space or disk. Moreover, a very less time is needed to transmit the images over the internet.

Fig. 1: Compression of an Image

The image files can be compressed by using various formats such as, over internet it can be done either in JPEG format or GIF format. Wavelets and Fractals are two other techniques which are used to compress the image. However, these approaches when use on the internet have some difficulty in terms of acceptance. But at the same time, both provide higher compression ratios as compared to JPEG and GIF for some particular kind of images.

II. IMAGE COMPRESSION

The neighboring pixels of an image are related to each other and also they contain useful information or data which is the most common characteristics of an image.[2] Below fig.2, shows the functional block diagram of image compression system in which a mapper, quantizer, inverse mapper are used.[3] The main component of image compression system is encoder and decoder. The compression is to carry out by encoder, the first stage of encoding is mapper then quantizer and the third one is symbol coder.

The main work of mapper is to change input image into inter pixel coefficient. Run-length encoding is the example of mapper and other transformation used for mapping are DCT, wavelet or curvelet. The next step in encoding is quantizer in which data are lost due to decrease in number of bits. The complementary operation executed by decoder.

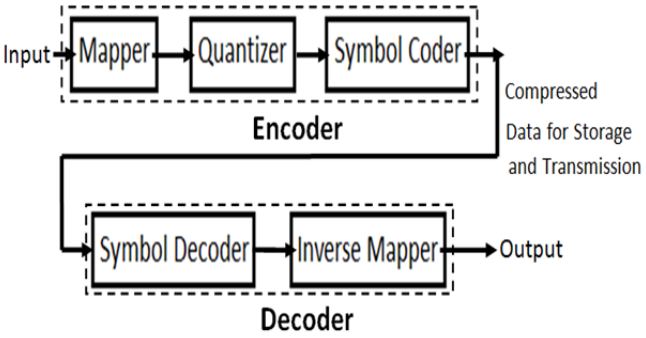

Fig. 2: Functional block diagram of a general image compression

The main applications of image compression in many areas like remote sensing, document and medical imaging, facsimile transmission, and tele video conferencing**.**

III. COMPRESSION ALGORITHM

Compression algorithms are of two types lossy and loss less, which are further divided into parts as shown in fig. 3.

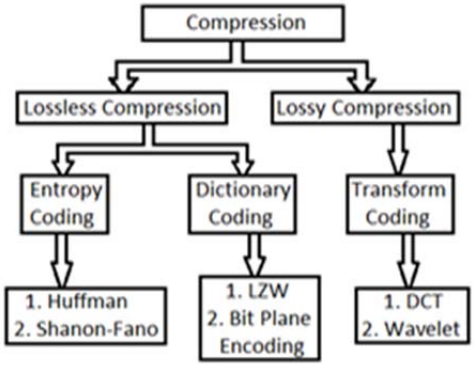

Fig. 3: Compression Algorithm

A. Lossless Compression

The compression algorithm that permits the actual image to be perfectly recovered from the compressed image is called as Lossless image compression. In case of this algorithm, there is a little chance of error occurring in the text image.

1) *Entropy encoding:* Lossless compression involves quickly on some types of entropy encoding like Huffman and Shannon-Fano. The father of information theory is Shannon-Fano.

a) *Huffman Coding:* This coding technique takes away the irrelevant information and can reduces size of file. The following steps are using for Huffman Coding of images:

(i) Images can be divided into 8x8 blocks.
(ii) Now each and every block is a symbol to be coded.
(iii) Apply Huffman coding to the set of block.
(iv) Accordingly encode all the set of blocks.

B. Lossy Compression

In this compression algorithm the image is encoded by using random approximations or partial data discarding for gaining the content that has been already encoded. It is mostly used in internet telephony and media streaming applications to compress the multimedia data such as stable images, audio and video. In lossy compression, it gives a tradeoff between the quality of image and compression ratio. The main advantage of the lossy method is that inspite of providing a much smaller compressed image it also acknowledge requirements of the application [4].

1) Transform Coding: Audio video and image are natural data that can be compressed by transform coding. The procedure of transform coding algorithm starts by dividing the actual image into small blocks having smaller size.[5] Curvelet, Wavelet and DCT are form of transform coding.

a) Wavelet Transform: Wavelet transform produces an image as a collection of wavelets with multiple scales and location [6]. A factious idea is arrived for viewing image compression process that depends on compression of wavelet decompositions. This idea specifically compares 1) The rate of decay in the error between the original image and the compressed image as the orientation of the compressed image description increases or in other words as the quantity of compression decreases to 2) The evenness of the image in some definite aligned classes called Basov spaces [7]

In this idea, the error caused by the quantization of wavelet transform coefficients is elaborated. Multiple compression mechanism built on piecewise fixed approximations are studied in some respect. It is well known that, if snaps can be explained by their membership in the evenness classes is taken into account, and then wavelet-built processes are near-ideal within a huge class of firm transform-built, nonlinear approaches of image compression. Depending upon prior investigational analysis, it is contended that in many cases the error occurred in image compression should be wisely calculated in the integral perception in place of using the mean square sense.

IV. CONCLUSION

After doing survey on image compression we have found that the compression algorithm, like lossless and lossy and their coding techniques are better performing in their own fields. The purpose of reducing noise, bandwidth and increasing storage capacity is achieved by these techniques. We conclude that the compression techniques like wavelet rely on computational complexity and quality of image. In further studies we want to use modulation technique and trying to analyze the parameter like RMSE, BERR, SNR etc.

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