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Image Compression and Entropy Estimation using 2 level Wavelett Transform Technique

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***Abstract*—Now a days it can be observed that it is easy to communicate with people through images ,however the problem arrises when the image file are large in size which requires higher bandwidth and more time to travel from transmitter end to receiver end.Many applications have and developed to facilitate users to communicate in form of text, audio, vedio and images. In this thesis images are taken and compressed in such a way that it doesnot losses its information or we can say images are compressed without degrading the quality of the image and keeping intact the amount of information present in original image.Wavelett transform technique is useful when it comes to compress an image , however the compressed image result in loses the information content of an original image.**

***Index Terms*—Image Compression, Entropy Estimation, DWT.**

I. Introduction

Image compression is very important for efficient transmission and storage of images. Demand for communication of multimedia data through the telecommunications network and accessing the multimedia data through Internet is growing explosively. With the use of digital cameras, requirements for storage, manipulation, and transfer of digital images, has grown explosively. These image files can be very large and can occupy a lot of memory. A gray scale image that is 256 x 256 pixels have 65, 536 elements to store and a typical 640 x 480 color image has nearly a million. Downloading of these files from internet can be very time consuming task.When digital images are to be viewed or processed at multiple resolutions the discrete wavelett transform is the mathematical tool for choice .In addition to being an efficient,highly intuitive framework for the representation and storage of multi resolution images , the DWT provides powerful insight into an image 's spatial and frequency characteristics.Discrete wavelet transforms is the most popular transformation technique adopted for image compression.

Data compression techniques are:

a. Lossless data compression

b. Lossy data compression

Lossless data compression is nothing but the original data can be reconstructed exactly from compressed data. Lossy data compression in which data after compression and then decompression retrieves a file that is not exactly as the original data as there will be loss of data.

MATLAB is a high performance language for technical computing for this purpose.It integrates computation,visualization,and programming in an easy to use environment where problems and solutions are expressed in familiar mathematical notation.

An image may be defined as a two- dimensional function f(x,y),where xand y are spatial coordinates,and the amplitude of at any pair of coordinates(x,y) is called the intensity or grey level of the image at that point.When x and y,and the amplitudes value of f are all finite,discrete quantities,we call the image a digital image.

II. Previous Work

Three techniques of image compression that used previous are pixel coding, predictive coding, and transform coding. The idea behind pixel coding, is to encode each pixel independently. The pixel values that occur more frequently are assigned shorter code words (fewer bits), and those pixel values that are more rare are assigned longer code words. This makes the average code word length decrease.

Predictive coding is based upon the principle that images are most likely smooth, so if pixel b is physically close to pixel a, the value of pixel b will be similar to the value of pixel a. When compressing an image using predictive coding, quantized past values are used to predict future values, and only the new info (or more specifically, the error between the value of pixels a and b) is coded.

The image compression technique most often used is transform coding. A typical image's energy often varies significantly throughout the image, which makes compressing it in the spatial domain difficult; however, images tend to have a compact representation in the frequency domain packed around the low frequencies, which makes compression in the frequency domain more efficient and effective. Transform coding is an image compression technique that first switches to the frequency domain, then does it's compressing. The transform coefficients should be decorrelated, to reduce redundancy and to have a maximum amount of information stored in the smallest space. These coefficients are then coded as accurately as possible to not lose information.

III. Methodology

In the modern era where the communication means a lot and is the most essential part of our society and being an integral part of the current system, it is very important to have the better speed and accuracy.

In this paper there are two points on which the research has been done firstly to compress an image such that it does not losses its important information and also gets its size compressed, secondly a method has been explored to hide the binary data bits of any seceret data, on adding the binary data bits results have been compared to the previous technologies

and it has been found that the method proposed and suggested in this paper can produce very good results.

Step 1: Image has been taken as an input.

Step 2: Image is converted to GrayScale Image from a RGB Image.

Step 3: Image scaling has been done to maintain the uniformity.

Step 4: DWT based compression will be imposed over the resized or the scaled image.

However the DWT has been performed in two stages so as to hide the binary bits properly and with a moto not to modify or lose the image information.

Step 5: As explained in the previous step binary data bits are embedded into the subbands of the dwt decomposed images.

Step 6: After embedding the data bits image is been reconstructed using the reverse algorithm.

Step 7: Image format has been specified and then it is transffered to the data base.

IV. Results

During the development of this work it has been observed that on compressing an image with the wavelet transform technique data does not gets vanished even after compressing it twice.

In this paper we have compared our result with a previous paper in which the average MSE was around 4 and PSNR was around 41.[5]

To measure the quality and the error in full reference, MSE is calculated which estimates the error in the reconstructed image with respect to the original image also PSNR has been calculated to estimate the image quality and its readibility with respect to the original image.

V. Conclusions

In this paper the focus was on the compressing the image and maintaining its quality, to avoid the loss of data during the image compression technique we have observed that if no data bits are inserted in the decomposed subbands the image might get fully recovered generating MSE as zero and PSNR as Infinity.

Howevere there can be various field in which the proposed methodology can be implemented over the video transmission which not accumulates more data bits but also enhances the data security.

The generated results also suggests that even after modifying the decomposed subbands explicitly the image quality does not degraded that much.

This work hence can be implemented over the audio files, video files and as well as the audio vidio visual files.

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