DIGITAL WATERMARKING METHOD WORKING WITH TWO DIMNSIONAL

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Abstract
Image data compression becomes still more important because of the fact that the transfer of uncompressed graphical data requires far more bandwidth and data transfer rate. So images are compressed. But in Quantization phase of compression process, there is some loss of data and hence some discontinuities are produced at the block boundaries. These are known as blocking artifacts. So it is necessary to remove or reduce these blocking artifacts. These filters are based on fuzzy rules. The main advantage of FIDRM is that it leaves the noise free pixels unchanged. SAWS (Signal Adaptive Weighted Sum) technique has also been implemented in which all the pixels of the given input image are modified. So experimental results shows the feasibility of new algorithm. A numerical measure such as PSNR and MSE show convincing results for grayscale images. The proposed algorithm is compared with SAWS technique which gives better results than that of SAWS technique. And it is observed that PSNR of proposed approach is greater than that of SAWS technique and MSE value of proposed approach is less than that of SAWS technique at a particular quality. Also proposed algorithm takes less execution time than that of SAWS technique.

Keywords: - DIP, DWM, CT, PSNR, and SAWS.

1 INTRODUCTION

A common characteristic of most images is that the neighboring pixels are correlated and therefore contain redundant information [7]. The foremost task then is to find less correlated representation of the image. Two fundamental components of compression are redundancy and irrelevancy reduction. Redundancy reduction aims at removing duplication from the signal source (image/video). Irrelevancy reduction omits parts of the signal that will not be noticed by the signal receiver, namely the Human Visual System (HVS). In general, three types of redundancy can be identified Spatial Redundancy or correlation between neighboring pixel values and Temporal Redundancy or correlation between adjacent frames in a sequence of images (in video applications). Image compression research aims at reducing the number of bits needed to represent an image by removing the spatial and spectral redundancies [5,7] as much as possible. In recent years, the development and demand of multimedia product grows increasingly information bearing units. Image compression is an application of data compression that encodes the original image with few bits. So the objective of image compression is to reduce the redundancy of the image and to store or transmit data in an efficient form. Lossy compression, on the other hand, removes some data from the original file and saves the image with a reduced file size. It's up to you, as the designer, to tell it how much data to disregard by setting the image compression rate. Wavelet analysis can be used to divide the information of an image into approximation and detail sub-signals. The approximation sub-signals shows the general trend of pixel values and three detail sub-signals show the

vertical, horizontal and diagonal details or changes in the image. If these details are very small then they can be set to zero without significantly changing the image. The value below which details are considered small enough to be set to zero is known as the threshold. The greater the no. of zeros the greater the compression that can be achieved. The rest of paper is organized as follows. In Section II Techniques of image compressions, Section III discusses proposed methodology, Section IV discusses of steps. In section V discuss result analysis followed by a conclusion in Section VI.

II TECHNIQUE OF IMAGE COMPRESSION

A digital image consists of a grid of dots, or "pixels" [7], with each pixel defined by a numeric value that gives its color. The term data compression refers to the process of reducing the amount of data required to represent a given quantity of information.

Coding Redundancy

It consists in using variable length codeword selected as to match the statistics of the original source, in this case, the image itself or a processed version of its pixel values . This type of coding is always reversible and usually implemented using lookup tables (LUTs). It is almost always present when an image's gray levels are represented with a straight or natural binary code. Let us assume that a random variable r_K lying in the interval [0, 1] represents the gray levels of an image and that each r_K occurs with probability $P_r(r_K)$.

$$P_r(r_K) = N_k / N \text{ where } k = 0, 1, 2\ldots L1 \qquad (1.1)$$

Inter Pixel Redundancy

Inter pixel redundancy is another form of data redundancy, which is related to inter pixel correlation within an image. Usually the value of certain pixel in the image can be reasonably predicted from the values of group of other pixels in the image.

Psycho Visual Redundancy

Many experiments have proven that the human eye does not respond with equal sensitivity to all incoming visual The knowledge of which particular types of information are more or less relevant to the final human user have led to image and video compression techniques that aim at eliminating or reducing any amount of data.

III PROPOSED METHODOLOGY

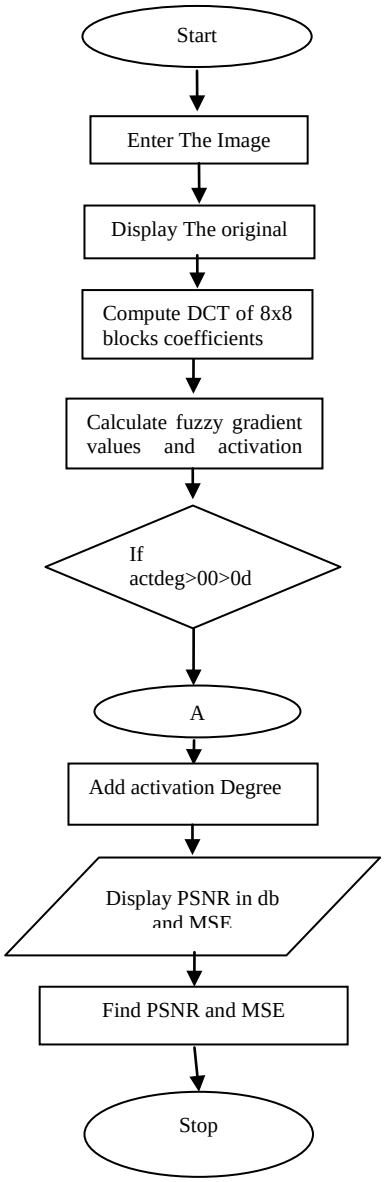

Figure 1: Flow Chart followed for compression artifact removal.

IV DIFFERENT STEPS OF ARTIFACT REMOVAL

Derivation of Saws Equation:

Let *I* and *p(i,j)* be an image of size *R* x *C* and its pixel, respectively, then we have

I = $\{p_{i,j}\}$i = 0, …, R – 1, j = 0, …, C – 1.

The image is coded with non overlapping blocks of N xN size br, c, and thus I can be rewritten as

I = $\{b_{r,c}\}$r = 0, …, (R/N) – 1, c = 0, …, (C/N) – 1

A De blocking block and its sub blocks are a pixel in De blocking Block (DB) is modified by using three pixels at block boundaries, to remove block discontinuities in this SAWS technique. And these three pixels belongs to three Sub Blocks except for the Sub Block containing the to be modified pixel.

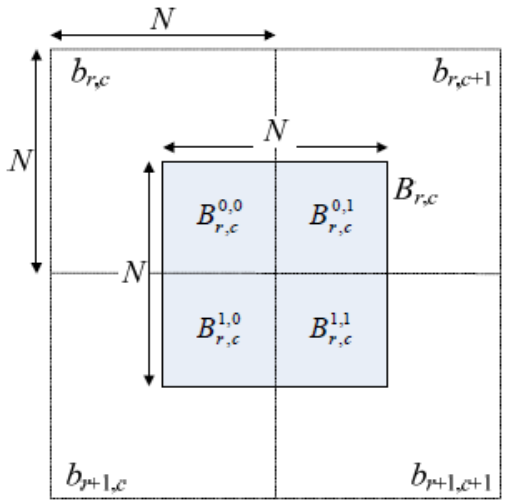

Figure 2: A De blocking Block (DB) and its Sub Blocks.

Let be the modified pixel of in the DB, and the weighted sum equation is given by the equation given as below:

$$\frac{p_{i,j}+\alpha_{i,j}p_{i,n}+\beta_{i,j}p_{m,j}+\gamma_{i,j}p_{m,n}}{1+\alpha_{i,j}+\beta_{i,j}+\gamma_{i,j}}$$

Where m is N/2 if I is less than N/2; otherwise, (N/2)1, and n is N/2 if j is less than N/2 otherwise, (N/2) on diagonal position. The weights a, b and c are functions of distance between and its boundary pixel.

V RESULTS AND ANALYSIS

Now we are showing the results obtained by SAWS technique and proposed method at quality from 1 to 9.The original image is shown. Then since after compression, image contains blocking artifacts. So firstly image is corrected using SAWS technique and then it is corrected using proposed method and both corrected images are displayed. Also it is observed as the quality increases image contains more artifacts and also image corrected by proposed method is clearer than that of SAWS.

Type of Images Supported By MATLAB

1. Intensity image (gray scale image)

This is the equivalent to a "gray scale image" and this is the image we will mostly work with in this course. It represents an image as a matrix where every element has a value corresponding to how bright/dark the pixel at the corresponding position should be colored. There are two ways to represent the number that represents the brightness of the pixel: The `double` class (or data type). This assigns a floating number ("a number with decimals") between 0 and 1 to each pixel. The value 0 corresponds to black and the value 1 corresponds to white.

1. **2. Binary image**

This image format also stores an image as a matrix but can only color a pixel black or white (and nothing in between). It assigns a 0 for black and a 1 for white.Mostly work is done on binary images and gray scale images.

2. **3. Indexed image**

This is a practical way of representing color images. (In this course we will mostly work with gray scale images but once you have learned how to work with a gray scale image you will also know the principle how to work with color images.) An indexed image stores an image as two matrices. The first matrix has the same size as the image and one number for each pixel. The second matrix is called the color

map and its size may be different from the image. The numbers in the first matrix is an instruction of what number to use in the color map matrix.

4.RGB image

This is another format for color images. It represents an image with three matrices of sizes matching the image format. Each matrix corresponds to one of the colors red, green or blue and gives an instruction of how much of each of these colors a certain pixel should use.

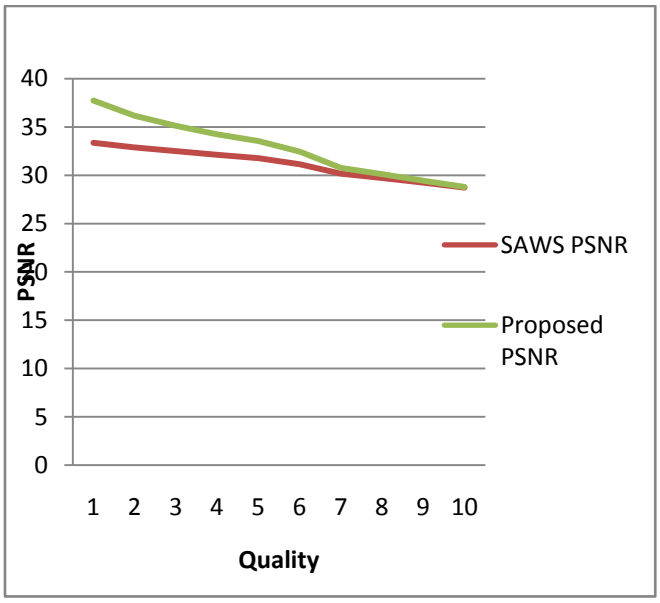

Figure 3: PSNR v/s Quality for c.tiff with SAWS and proposed method.

The above graph shows quality along X-axis and PSNR value along y- axis. As it is clear from the graph The PSNR value of SAWS is lesser than that of proposed approach. Also it is observed that on increasing the quality factor PSNR value decreases. The reason behind this is on increasing the quality factor, compression ratio increases and hence more artifacts are produced and more artifacts implies less PSNR.

VI CONCLUSION

There are several types of artifacts like ringing artifacts, staircase noise and blocking artifacts. Here we discussed only blocking artifacts that are discontinuities at the block boundaries. There are several techniques to reduce the blocking artifacts. Each of them has some shortcomings. For example, some may blur the images; some have very large execution time. Some of them have low value of PSNR and some have large value of MSE. So PSNR, MSE and execution time all are important factors while designing the techniques to remove blocking artifacts and hence we should consider all these factors while designing an algorithm to reduce the artifacts. The proposed approach has less execution time than that of SAWS technique. But as the compression ratio increases, more artifacts are produced and hence the execution time increases. So further research should focus on reducing this processing time so that speed of processing can be further increased. Also we have observed that as the quality increases MSE value increases and since the MSE is the cumulative squared error between the compressed and the original image. So less value of MSE means lesser error. So research can be done in order to decrease MSE of the image to be processed.. The proposed algorithm is compared with SAWS technique which gives better results than that of SAWS technique. The PSNR value as well as MSE value of SAWS technique and proposed method has been calculated at quality from 1 to 9 and then comparison has been done between SAWS and proposed approach.

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