SIMULINK BASED PROPOSED MODEL FOR IMAGE COMPRESSION AND COMPARISION WITH OTHER IMAGE COMPRESSION TECHNIQUE

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ABSTRACT

In this research paper we compare various image compression techniques, and also proposed an image compression technique. We also compare proposed model with other compression techniques. As we know that Image compression is very necessary when required to reduce image size. Some of the information is lost during image compression but basic information of image is retained as it is.

I INTRODUCTION

Image compression is much necessary to improve storage capacity of images and also for utilizing transmission bandwidth. There are two types of image compression techniques lossless and lossy image compression technique. In this paper we are discussing some of lossy image compression techniques. As the demand and growth of digital imaging application increases for various application there is need of image compression is also increases. As we well know that there are various techniques used for image compression, in this paper we are discussing few of them as we are familiar with DCT (discrete cosine transform) which is very much similar with the DFT. We are using simple model for DCT which is used for image compression. Similarly we are discussing one more important technique for image compression is discrete wavelet transform (DWT) used for image compression. We also proposed a model for image compression in which we are using simulink model block processing. Each block in this model contains encoding and decoding methods. Encoding and decoding is performed using 2D-DCT and IDCT respectively. We discuss each of these models in brief.

1.1 DCT (Discrete Cosine Transform) Based Image Compression

One dimensional DCT is only useful for processing of one dimensional signal but for image processing we need two dimensional DCT. 2D-DCT for 2D input signal is can be defined as following expression.

$$P(u,v) = \frac{2}{\sqrt{nm}} c(u)c(v) \sum_{y=0}^{m-1} \sum_{x=0}^{n-1} p(x,y) \cos\frac{(2x+1)u\pi}{2n} \cos\frac{(2y+1)v\pi}{2m}$$

Where P (u,v) represents 2D DCT of input signal p(x, y) and

$$C(u) = \frac{1}{\sqrt{2}} \quad \text{for} \quad u=0$$

$$= 1 \quad \text{for} \quad \text{otherwise}$$

2D-DCT is same as 1D-DCT, only difference is that it takes DCT for both Rows and Columns.

1.1.1 Algorithm

Step 1: Take image in workspace need to compress.
Step 2: Generate 8*8 DCT matrix .
Step 3: Now take DCT of each 8*8 block of matrix.
Step 4: In each block there are 64 elements, define mask matrix to select samples from these 64 elements.
Step 5: Now apply this mask to input image to take samples.
Step 6: Finally take IDCT of masked input image.

1.2 Discrete Wavelet Transform (DWT) Based Image Compression

Wavelets are signals which are local in time duration and scale and generally have irregular shape. Wavelets have generally average value zero. Wavelets have the great advantage of being able to separate the fine details in a signal. Very small wavelets can be used to isolate very fine details in a signal, while very large wavelets can identify coarse details.

We are using haar model of wavelet compression, we are compressing image by taking all the terms to zero near to the global threshold. As the global threshold is smaller there is less compression ratio and when there is large global threshold, compression ratio is also larger but image quality also reduces.

II PROPOSED MODEL

In this model each block processing have encode for compression and decode for decompression image but finally when we get image is in compressed format and smaller in size. First we take DCT transform of an image and then quantized that image. After Quantization we perform DC prediction of quantized image. In first case we take two past values for DC prediction while in second case we take only single past value for prediction. At the decoding time we further perform this operation. After block processing output we apply it to the Median Filter Which provides smoothness to the image. After two block processing we get final Image to the workspace.

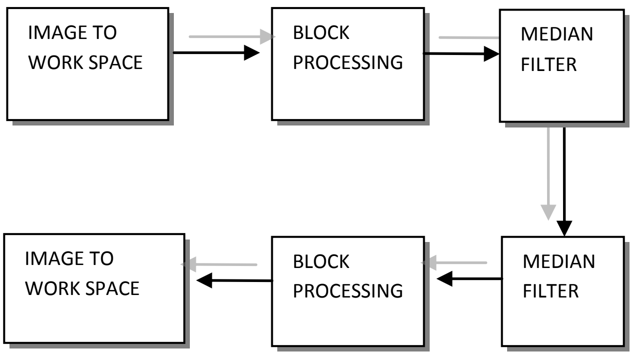

Fig 1: Proposed Model for Image Compression

III ANALYSIS OF SIMULATION RESULTS

3.1 Image Compression through DCT

In this compression technique, we take samples of image through the mask matrix of 8*8. In first case we take 6 ones in 64 values, so that in each 64 values of image we get only 6 samples. We also analyze this technique for 10, 15 &21 samples. Finally we get Image is compressed, as the number of samples increases image quality improves but compression ratio reduces.

Original Image

Compression Ratio-61.3

File Size-8546

S. No	Image Dimension Wid*Hig* Bit Dep	Sampls Per 8*8	File Size	Compressin Ratio	Psnr
1	256*256*8	06	4207	124.62	28.74
2	256*256*8	10	5545	94.55	31.34
3	256*256*8	15	6659	78.733	33.85
4	256*256*8	21	7716	67.948	36.85

Table 1: Compressed Image Details For Different Number Of Sample.

Fig 2: Original Image

Fig 3: DCT-06

Fig 4: DCT 10

Fig 5:DCT 15

Fig 6: DCT 21

3.2 Image Compression through DWT

In this case we are analyzing this technique for different Global threshold values, as global threshold increases from zero image size reduces compression ratio increases but image quality reduces.

Original Image

Compression Ratio-63.914

File Size-8203

S.No	Image Dimension Wid*hig*Bit Dep	Global Threshold	File Size	Compression Ratio	PSNR
1	256*256*8	10	7696	68.12	41.89
2	256*256*8	20	7361	71.225	35.66
3	256*256*8	50	6752	77.95	30.13
4	256*256*8	100	6167	85.015	27.62
5	256*256*8	150	5954	88.056	26.28
6	256*256*8	200	5892	88.987	26.12

Table 2: Compression Ratio and PSNR for Different Global Threshold

Fig 7: Original Image

Fig8: DWT 10

Fig 9:DWT 20

Fig 10 :DWT 50

Fig 11: DWT 100

Fig 12: DWT 200

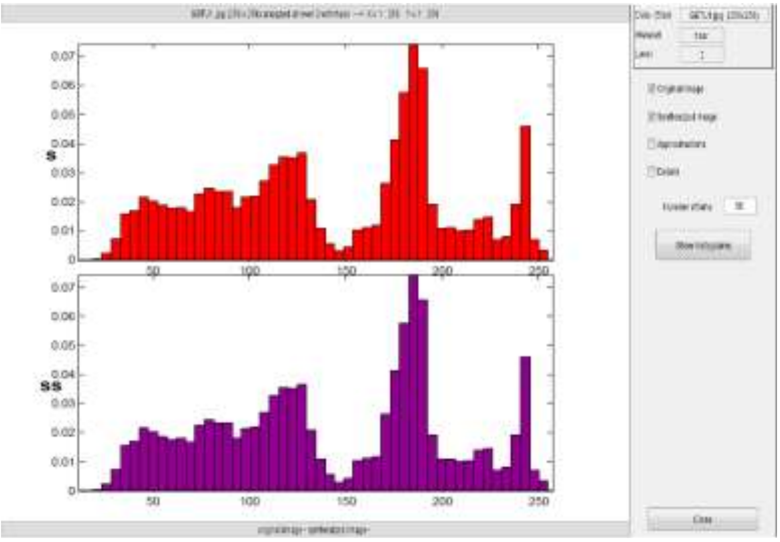

Fig 13: Histogram of Image

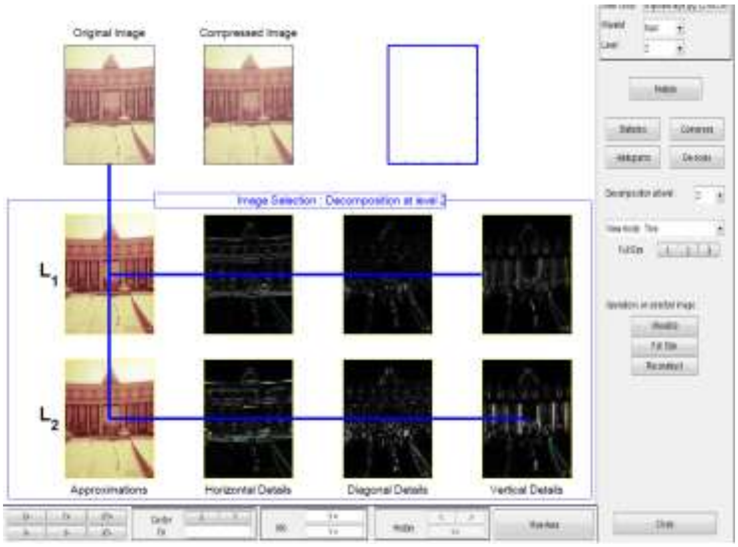

Fig 14: Image Decomposition Detail

3.3 Compression Through Proposed Model

As the details of original image and compressed image is given when comparing this image with the DCT compressed image and DWT compressed image, we get that for same values of PSNR and Compression Ratio we get somewhat better image as shown in Fig 5, Fig 10 & Fig 17.

Original Image

Compression Ratio-61.3

File Size-8546

Compressed Image

Compression Ratio-76.8

File Size-6827

PSNR-30.59

Fig 15: Original Image

Fig 16: Compressed Image

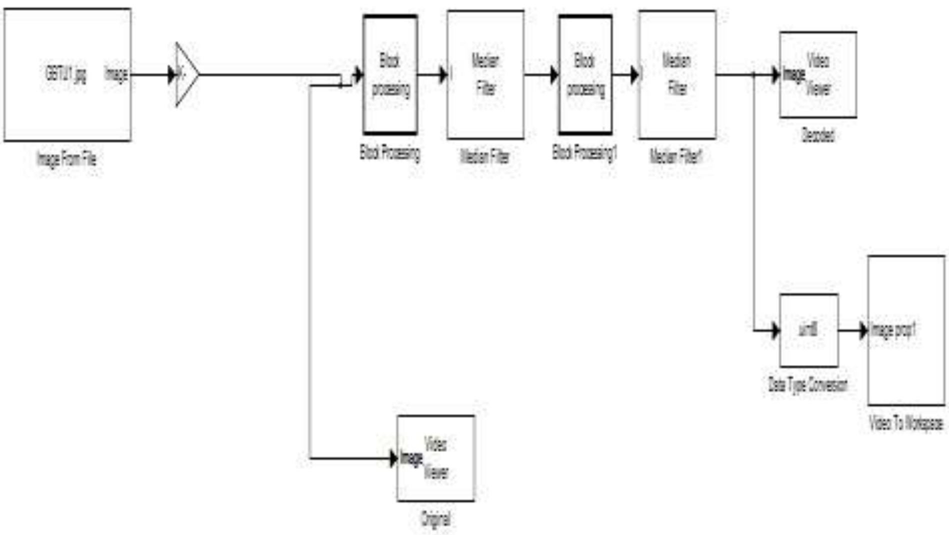

Fig 17: Matlab Simulink Model For Image Compression

IV CONCLUSION

We analyze various image compression techniques such as that through discrete cosine transform, discrete wavelet transform and compare this technique with our proposed model. Finally we get that for same values of compression ratio and PSNR proposed model have better quality of image. Although we are using same discrete cosine transform in our proposed model but in this model we use prediction for both encoding and decoding, so that there is less error and better PSNR for same compression ratio.

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