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Image Compression Using DCT with Hashing Function

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Abstract

Data Compression has become essential part of data warehouse because by using this only we can handle the bulk amount of data due to eruptive growth of multimedia technology.Several formats of data are like audio, video, image, text etc. The goal of image compression is to decrease inconsistency and repetition of the image data in order to be able to collect or spread data in an efficacious way. Some image compression tactics does not focus on reduce the storage amount of bits but also focus on not to degrade the quality of image.DCT is the very effective way of compressing the image with high quality. This paper proposed a new compression technique using dct with hashing function and adding modules of resampling and interpolation tactics. It is a technique for getting better compression ratio and picture quality.

Keywords-Image compression, dct, hashing function, interpolation.

INTRODUCTION

There is quote a significant difference in the compression of raw and primary data. The common algorithms that we use for general purposes can also compress images but they are not that optimal. The reason is their specific statistical properties which can be only be exploited by encoders that specifically look into these. Apart from this, some granular level details of the image can be compromised with for saving some bandwidth and space. It may be said that the pixel level or quality level may be compromised in this case but the bandwidth and the space that is saved is far more beneficial and overcomes the image quality up to a large extent. This means that we can use the lossy compression techniques for compressing the images.

IMAGE COMPRESSION SYSTEM SPECIFICATION:

The two basic element of image compression system are

i. Encoding

ii. Decoding

In encoding we take original image as an input and after processing the output image is compressed image. In decoding the compressed image is taken as input and after processing

the resultant image is much identical to the original one. These days dct, dwt, vector quantization is very well known tactics for compressing the image. DCT works on the principle of partial separation of images into differing frequencies. The less important frequencies are discarded during the part of compression, called quantization. Hence few bits are loosed during the process, the term LOSSY is used. Thus only the most important part of frequencies of images is retrieved during decompression.

DISCRETE COSINE TRANSFORM

In dct the image is separated into different segments of varying importance. DCT signify a series of finitely various data points just like cosine functions waggle at different frequencies. Specifically DCT works on Fourier transform which is quite similar to DFT but using only when we used DCT.An image is divided into N*N blocks of pixels where N= 8. 2D DCT is applied to each block and working from top to bottom, left to right.DCT coefficients are quantized using an 8*8 quantization table. The quantization is achieve by dividing each element of the transformed original data matrix by corresponding element in the quantization matrix Q and rounding to the nearest integer value.

$$Dqua(i,j)=round[DDCT(i,j)/Q(i,j)]$$

After this compression is accomplish by implement suitable scaling factor. Then for reconstructing the data, dequantization and rescaling is performed. The dequantization matrix is then transformed back using the IDCT.The flow Chart for image compression via DCT and the IDCT is shown in fig.1 and figure.2

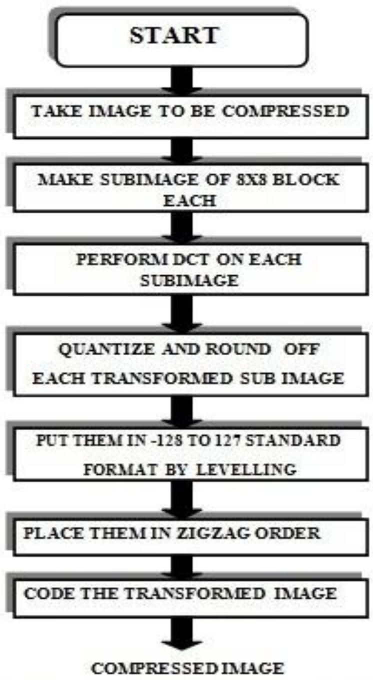

Fig.1 Flow chart of compression procedure the image

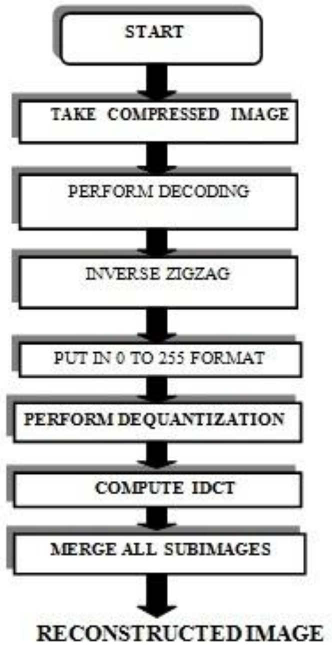

Fig.2 shows flowchart of reconstructing image

Drawback of DCT- The most important part of frequencies of images is retrieved throughout decompression, resulting in distorted images.

PROPOSED METHODOLOGY

The objective of proposed methodology is to add one step which is calculating the hash value of image. Hash value is calculated for checking the integrity of image. Before compression we calculate the hash value and after compression the hash we get, it should be the same. Mean square error (S1) and PSNR are also calculated after the compression. Different filteration techniques have been applied for removing the distortion. After that again Mean square error is calculate (S2).If S1>S2 then our result will be improved.

Figure 3 & 4 shows the flowchart of compressing the image using DCT with hash function and reconstructing the image using IDCT.

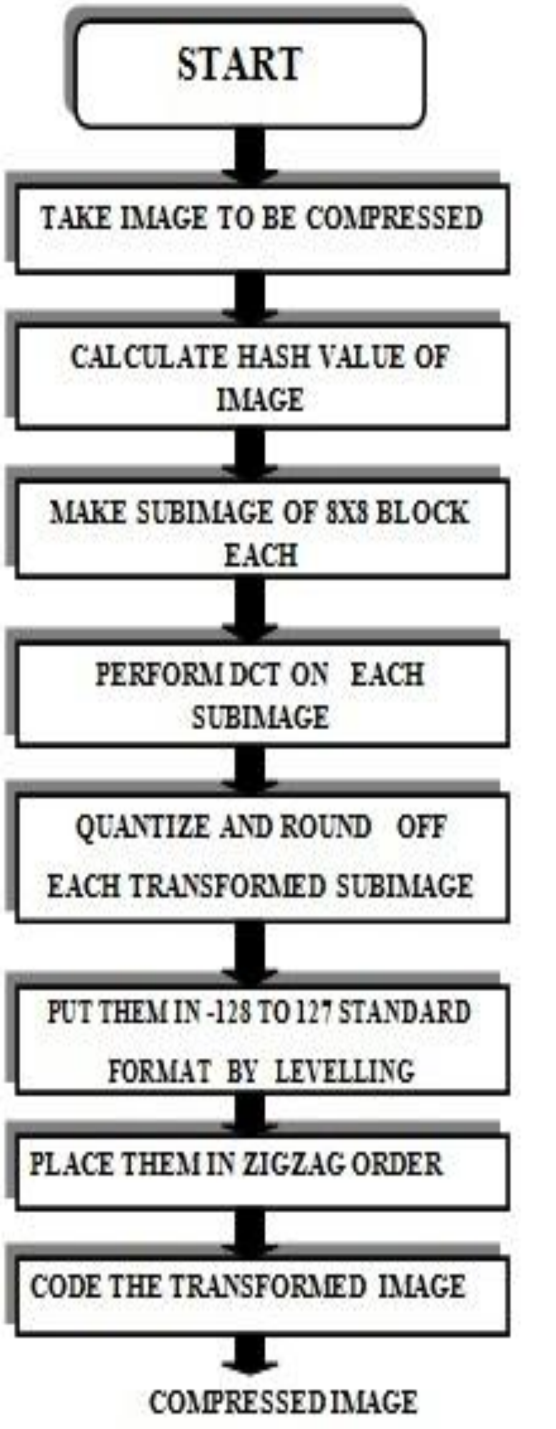

Fig.3 Flow chart of compression procedure

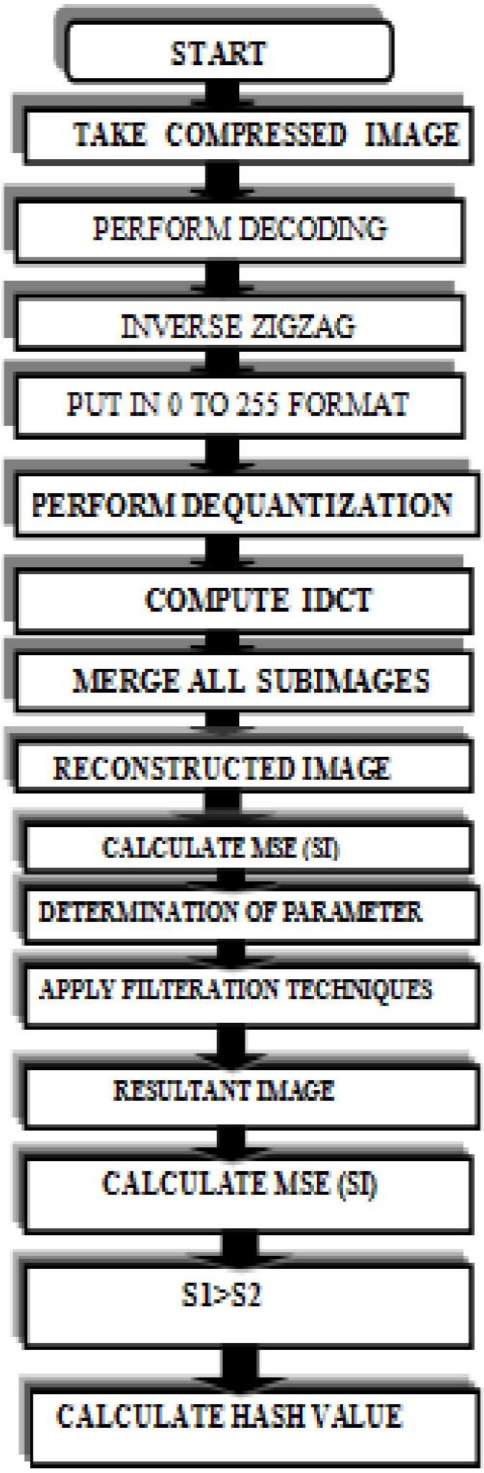

Fig.4 shows flowchart of reconstructing the image

RESULT AND CONCLUSION

DCT is a technique for image compression which performs efficiently at medium bit rates. Disadvantage of DCT is that only spatial correlation of the pixels is considered and the correlation from the pixels of the neighboring blocks is neglected. Using DCT blocks cannot be decorrelated at their boundaries. In DCT blocking artifacts which degrade the reconstructed image. Figure 1 shows the original image, DCT of image and IDCT of image. Figure 2 shows the original image.

We have done two types of analysis i.e. objective and subjective.

(i) Objective Analysis

In this section, the performance of the DCT has been show using several parameters. By

Adjusting the parameters, trade-off can be achieved for compressed image against reconstructed image quality over a wide range.

(a) PSNR

PSNR in decibel is evaluated as follows:

PSNR= 10 log10 (I 2/MSE) where, I is allowable image pixel intensity level.MSE is mean squared error. It compares the original data with reconstructed data and then results the level of distortion. The MSE between the original data and reconstructed data is:

$$MSE = \frac{1}{MN} \sum_{i=1}^{M} \sum_{j=1}^{N} (A_{i,j} - B_{i,j})^2$$

Where, A = Original image of size M×N

B = Reconstructed image of size M×N

(b) CR

It is a measure of the reduction of detail coefficient of data.

CR = (Discarded Data) / (Original Data)

In the process of image compression, it is important to know how much important coefficient one can discard from input data in order to preserve critical information of the original data.

Subjective analysis- For the application users, a standard image of cameraman is considered for demonstration. The image is compressed using proposed, DCT with hashing function as shown in fig1, fig2,fig3,fig4,fig5

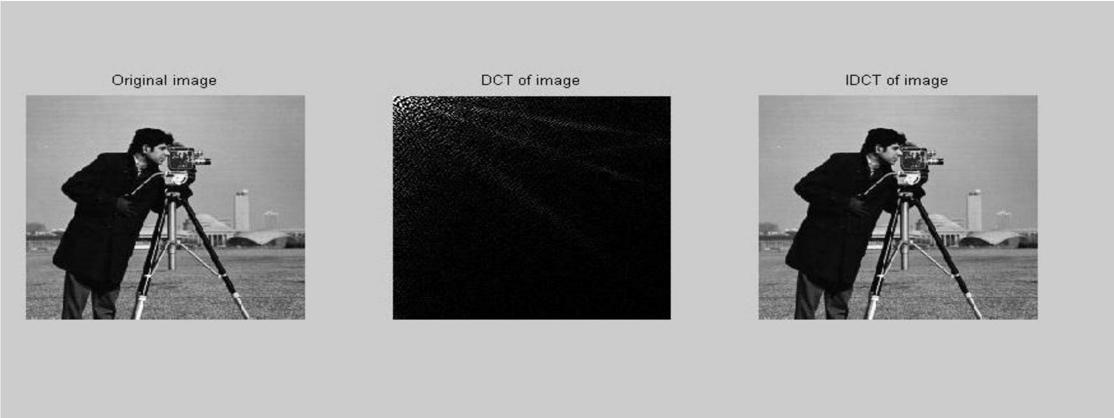

Figure 1

Figure 2

figure 3

Figure 4

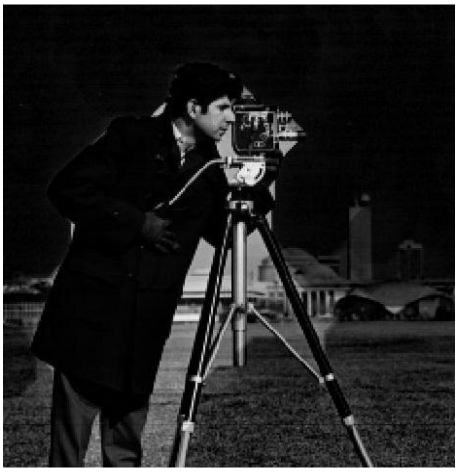

figure 5

FUTURE WORK

Following the results and analysis discussed in the paper further future work can be as follows:

II. The proposed algorithm can also be used for video coding, audio compression etc.

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