ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 20, April 2016

Comparison of DCT and DWT in Image Compression Techniques

R.Mehala[#]

[#]Research Scholar, Alagappa University, Karaikudi

[1]mrsmehalamurugan@gmail.com

***Abstract*— Image processing is depends on the compression which helps to reduction of the Image size for large Image transmission in a stipulated and reduced time. Compression is a process of reducing or eliminating redundant or irrelevant data. An Image compression is the addresses of the problem of reducing the amount of data required to represent a digital image.. This paper is to compare a Discrete Cosine Transformation and Discrete Wavelet Transformation in Compression Techniques.This is a comparative study based on compression ratio and Peak-Signal-to-Noise-Ratio(PSNR) values of image qualities for corresponding techniques .**

***Keywords*— DCT, DWT , Compression Techniques.**

1. INTRODUCTION

Image Processing is a powerful era of the Modern Digital Technology. Digital image processing focused on two major tasks are Improvement of pictorial information for human interpretation and the Processing of image data for storage, transmission and representation for autonomous machine perception. Compression is a process of minimizing the size in bytes of a graphics file without degrading the quality of the image to an unacceptable level. Digital Image Compression for the good performance complexity of still imagery and the comparative study of several algorithms. Various techniques have been proposed over years for compression. Among those Discrete Cosine Transformation (DCT), Discrete Wavelet Transformation (DWT) are mostly used .In this paper a comparative study of DCT and DWT. It is based on the compression ratio and Peak-Signal-to-Noise-Ratio (PSNR) values of image qualities for corresponding techniques.

2. METHODOLOGY

2.1 Discrete Cosine Transformation(DCT)

The Discrete Cosine Transform (DCT) algorithm is a commonly used for image compression. DCT converts the pixels in an image, into sets of spatial frequencies. It has been chosen because it is the best approximation of the transform that provides the best compression ratio. The DCT work by separating images into the parts of different frequencies. During a step called Quantization, where parts of compression actually occur, the less important frequencies are discarded, hence the use of the lossy. Then the most important frequencies that remain are used retrieve the image in decomposition process. As a result, reconstructed image is distorted. Compared to other input dependent transforms, **DCT has many advantages :**

(1) It has been implemented in single integrated circuit.

(2) It has the ability to pack most information in fewest coefficients.

(3) It minimizes the block like appearance called blocking artifact that results when boundaries between sub-images become visible.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 20, April 2016

In the DCT compression algorithm

- The input image is divided into 8-by-8 or 16-by-16 blocks
- The two-dimensional DCT is computed for each block.
- The DCT coefficients are then quantized, coded, and transmitted.
- The receiver decodes the quantized DCT coefficients, computes the inverse two-dimensional DCT (IDCT) of each block.
- Puts the blocks back together into a single image.

2.2 Discrete Wavelet Transformation(DWT)

The discrete wavelet transform (DWT) refers to wavelet transforms for which the wavelets are discretely sampled. A transform which localizes a function both in space and scaling and has some desirable properties compared to the Fourier transform. The transform is based on a wavelet matrix, which can be computed more quickly than the analogous Fourier matrix. Most notably, the discrete wavelet transform is used for signal coding, where the properties of the transform are exploited to represent a discrete signal in a more redundant form, often as a preconditioning for data compression. The wavelet transform describes a multi-resolution decomposition process in terms of expansion of a signal onto a set of wavelet basis functions.

Wavelet compression is a form of data compression well suited for image compression (sometimes also video compression and audio compression). The goal is to store image data in as little space as possible in a file. A certain loss of quality is accepted (lossy compression). Using a wavelet transform, the wavelet compression methods are better at representing transients, such as percussion sounds in audio, or high-frequency components in two-dimensional images,

First, wavelets are efficient in representing non stationary signals because of the adaptive time frequency window. Second, they have high decorrelation and energy compaction efficiency. Third, blocking artifacts and noise are reduced in a wavelet based image coder. Finally, the wavelet basis functions match the human visual system characteristics, resulting in a superior image representation. Compared with DCT, DWT uses more optimal set of functions to represent sharp edges than cosines. Wavelets are finite in extent as opposed to sinusoidal functions.

Advantages of DWT over DCT:

1. No need to divide the input coding into non-overlapping 2-D blocks, it has higher compression ratios avoid blocking artifacts.
2. Allows good localization both in time and spatial frequency domain.
3. Transformation of the whole image introduces inherent scaling.
4. Better identification of which data is relevant to human perception higher compression ratio.

3. PROPOSED METHODS

3.1 Compression using DCT

Step1. Input to a Original Image.

Step 2. Similarly the DCT compression is applied on the original Image.

Step3. Level of compression is modified to attain better result of Image representation.

Step4. The Image with primitive pixels and structures are retrieved from the compressed data.

Step5. The compressed Images are plotted along with the original Image to calculate the changes.

Step6. Computed the correlation ratio and psnr among the original Image and reconstructed Image.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 20, April 2016

3.2 Compression using DWT

Step1. Repeated the compression of required Image using DWT compression, considering the Images as wavelet. Step2. The accumulation of the information values contained in the Image after the compression are calculated. Step3. The original Image is reconstructed from the compressed Image achieved.

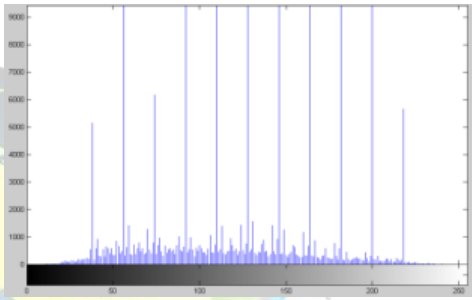
Step4. The resultant Images are plotted along with the original Image.

Step5. The extent of the distortion is calculated by the correlation ratio and psnr values.

Fig 2

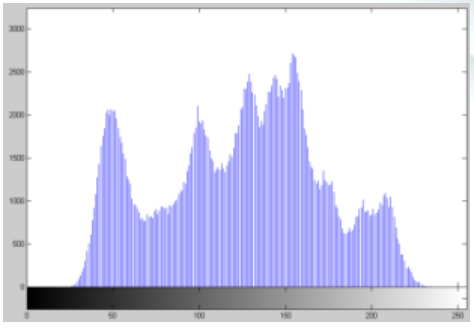
4. RESULTS & DISCUSSION

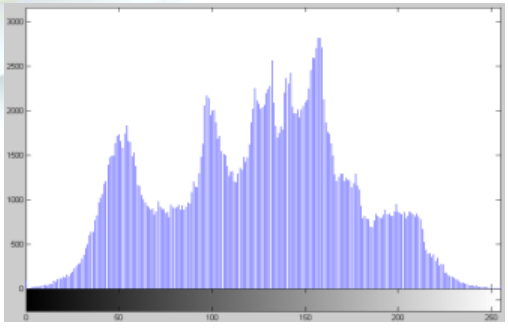
Original Image:



Histogram

Fig 1





Histogram

DeCompressed Image (DWT):

DeCompressed Image (DCT):

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 20, April 2016

Fig 3 Histogram

Compare the Images which are Compressed by applying DCT and DWT using MATLAB. The Decompressed Image and its Histogram are shown in above Figures.

TABLE
PERFORMANCE FACTORS COMPARISON OF DCT AND DWT

Compression Techniques	Compression Ratio(CR)	Peak Signal to Noise Ratio(PSNR)	Mean Square Error (MSE)
DCT	**6:1**	**23.90**	**264.4**
DWT	**6:1**	**27.09**	**126.8**

5. CONCLUSIONS

In this paper, we have considered the image compression Techniques (DCT and DWT). it is observed that the PSNR value is the high and the MSE value is low in DWT than DCT based on compression. From the results it is concluded that overall performance of DWT is better than DCT on the basis of compression rates. This results is to noticeable at low bit rates. In future, to compare a DCT, DWT and DFT to observed that the values and know about low bit rates.

REFERENCES

[1] Majid Rabbani, Rajan Joshi, "An overview of the JPEG2000 still image compression standard," *Signal Processing: Image Communication 17*, 2002.

[2] Gregory Wallace, "The JPEG Still Picture Compression Standard," *IEEE Transactions on Consumer Electronics*, 1991.

[3] Bryan Usevitch, "A Tutorial on Modern LossyWavelet Image Compression : Foundations of JPEG 2000," *IEEE Signal Processing Magazine*, 2001.

[4] Jerome Shapiro "Embedded Image Coding Using Zerotrees of Wavelet Coefficients," *IEEE Transactions in Signal Processing*, 1993.

[5] Zixiang Xiong, Kannan Ramchandran, Michael T. Orchard, and Ya-Qin Zhang, "A Comparative Study of DCT- and Wavelet-Based Image Coding," *IEEE Transactions on Circuits and Systems for Video Technology*, Vol. 9, No. 5, 1999.

[6] Amir Said, Willian Pearlman, " A New Fast and Efficient Image Codec Based on Set Partitioning in Hierarchial Trees," *IEEE Transactions on Circuits and Systems for Video Technology*, 1996.

[7] David Taubman, "High Performance Scalable Image Compression with EBCOT," *IEEE Transactions on Image Proc.* , 2000.

[8] Zixiang Xiong, Onur Guleryuz, Michael Orchard, " A DCT-Based Embedded Image coder," *IEEE Signal Processing Letters*, 1996.

[9] Marc Antonini, Michel Barlaud, "Image Coding Using Wavelet Transform," *IEEE Transactions on Image Processing*, 1992.

[10] David Taubman, Michael Marcellin, "JPEG2000: Standard for Interactive Imaging," *IEEE Proc.*, Vol 90, No. 8, 2002.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 20, April 2016

[11] Andy Hung, Teresa Meng, "Optimal Quantizer Step Sizes for transform Coders," *IEEE Proc.*,1991.

[12] David Taubmana, Erik Ordentlichb, Marcelo Weinberger, Gadiel Seroussi, "Embedded block coding in JPEG 2000," *Signal Processing: Image Communication*, 2002.

[13] Michael W. Marcellina, Margaret A. Lepleyb, Ali Bilgina, Thomas J. Flohrc, Troy T. Chinend, James H. Kasnere "An overview of quantization in JPEG 2000," *Signal Processing: Image Communication*, 2002.