

# IMAGE COMPRESSION USING DCTWT & N-LEVEL-HYBRID TECHNIQUE

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## ABSTRACT

As per the current position, the collective growing of knowledge and the arrival into the numerical age, we have to grip a huge quantity of info each period which frequently grants problems. So, the numeral info must be kept and recovered in an effectual and real method, in instruction for it to be place to applied custom. Compressing an image is meaningfully dissimilar than compressing fresh binary data. General resolution compression packages can be used to compress images, but the consequence is less than best. In this paper, an original system that indicates the Discrete Wavelet Transform (DWT) and Discrete Cosine Transform (DCT) and N-level hybrid DCTWT technique proposed. DCT has high energy compaction stuff and requires less computational capitals. On the additional pointer, DWT is multi-resolution transformation.

**Keywords** — Compressing, Discrete Wavelet Transform, Discrete Cosine Transform, N-level DCTWT

## 1. Introduction

In a digital true- color images, each color constituent is quantized with 8 bits, and so a color is specified with 24 bits. As a result, there are  $2^{24}$  likely colors for the image. Still, a color image typically comprises a lot of information dismissal and entails a countless quantity of storing planetary. In instruction to inferior the sequencer and storing price, image density is wanted. Most color images are logged in RGB model, which is the most famous color perfect. Though, RGB perfect is not correct for image processing drive. For compression, a luminance-chrominance picture is cautious superior to the RGB description.

### 1.1 Image Compression in Various Stage

The neutral of image compression is to reduction irrelevance and release of the image statistics in training to be intelligent to typical or carry statistics in an effectual procedure. The finest image excellence at an assumed bit rate (or compression rate) is the key area of image compression. The brilliance of a compression method regularly is leisurely by the Peak signal to noise ratio. It events the amount of noise obtainable through a lossy thickness of the image[6].

Image compression can be of 2 categories:

- (i) Lossy
- (ii) Lossless

### 1.2 RGB image compression

A color image classically suppressions a lot of material idleness and needs a large quantity of storing space. Multimedia gratified receipts up a lot of storing space and bandwidth. A true color 512 x 512 image would take 0.75 Mbyte of space. In instruction to inferior the broadcast and storing cost, color image compression is required [2].

## 2. Discrete Wavelet Transform method

A wavelet is a scientific purpose used to split a assumed purpose or continuous-time indication into dissimilar ruler mechanisms. A wavelet transform is the symbol of a purpose by wavelets. Wavelet transform are of two types:

**2.1 Continuous wavelet transform:** In continuous wavelet transforms, an assumed indication of finite energy is predictable on a incessant domestic of occurrence groups.

**2.2 Discrete wavelet transforms:** It is computationally intolerable to inspect a signal using all wavelet coefficients, so one may miracle if it is adequate to pick a separate subsection of the higher half plane to be talented to rebuild a signal from the consistent wavelet coefficients.

The Haar wavelet's mother wavelet function  $\psi(t)$  can be labeled as

$$\psi(t) = \begin{cases} 1 & 0 \leq t \leq 1/2 \\ -1 & 1/2 \leq t \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

its scaling function  $\phi(t)$  can be describe as

$$\phi(t) = \begin{cases} 1 & 0 \leq t \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

Advantages of Haar Wavelet transform:

- Best presentation in relations of calculation time
- Calculation speed is high
- Memory effectual
- Simplicity
- Easily implementable in hardware

In this paper, discrete Haar wavelet transform is used which has subsequent compensations done discrete cosine transform:

- DCT is used for alteration in JPEG normal whereas DWT is used for modification in JPEG 2000 standard.
- DWT ducks blocking relics which destroy rebuilt images which DCT can't do.
- Compression upsurges with upsurge in space size for DCT and reductions with upsurge in space size for DWT.

i) **Haar Wavelet Transform** Haar wavelet transform (HWT) involves of both: **low pass** and **high pass** filters is the preferred wavelet because it can be freely applied in hardware [7]. The estimate band (LL) is the result of smearing low pass filter in vertical and result of applying low pass filter in vertical and applying horizontal low pass filter and upright high pass filter, while the (HL) group is the consequence of flat high pass filter and vertical low pass filter and lastly (HH) band is the consequence of horizontal and perpendicular high pass filter. The foundations of these 4-filters might be resulting as surveys:

- $L = 1/\sqrt{2} \begin{bmatrix} 1 & 1 \end{bmatrix}$
- $H = 1/\sqrt{2} \begin{bmatrix} 1 & -1 \end{bmatrix}$
- LL= vertical LPF + horizontal HPF
- HL= horizontal HPF + vertical LPF
- LH= Horizontal LPF + Vertical HPF
- HH= Horizontal HPF + Vertical HPF

$$LL = 1/2 \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} \quad (1)$$

$$HL = 1/2 \begin{bmatrix} 1 & 1 \\ -1 & -1 \end{bmatrix} \quad (2)$$

$$LH = 1/2 \begin{bmatrix} 1 & -1 \\ 1 & -1 \end{bmatrix} \quad (3)$$

$$HH = 1/2 \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} \quad (4)$$

If we relate forward (HWT) on examination color image (e.g., luminance component), at the opening of decomposition, the image will be separated into four sub-bands LL, HL, LH, and HH, this process describes first level sub-band coding, while separated sub-band LL of first level into four sub-bands describes second level, and separated sub-band LL of second level into four sub-bands describes third level. To renovate the image, the similar four two dimensional filters have been secondhand [3].

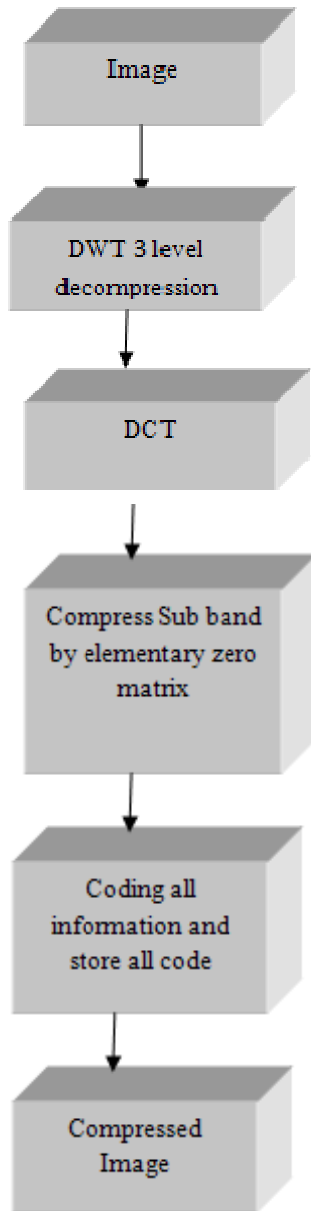


Fig.1 Flow chart for image compression

**3. Discrete Cosine Transform**

The discrete cosine transform (DCT) supports discrete the image into portions (or spectral sub-bands) of opposing position (with deference to the image's visual excellence). Discrete Cosine Transform (DCT) exploits cosine functions, it convert an indication from latitudinal symbol into incidence field. The DCT signifies an image as a amount of sinusoids of variable scales and incidences.

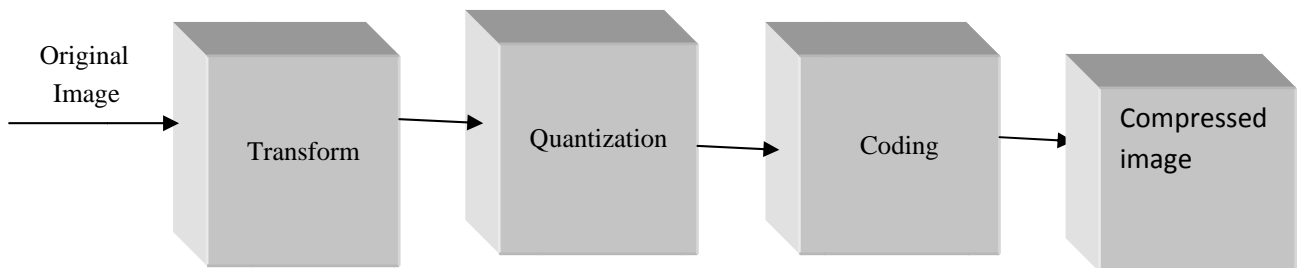


Fig.2 Image compression model

DCT has the property that, for a classic image most of the visually important info around an image is intense in impartial few constants of DCT. After the calculation of DCT numbers, they are regularized according to a quantization table with dissimilar scales providing by the JPEG typical calculated by psycho graphic indication.

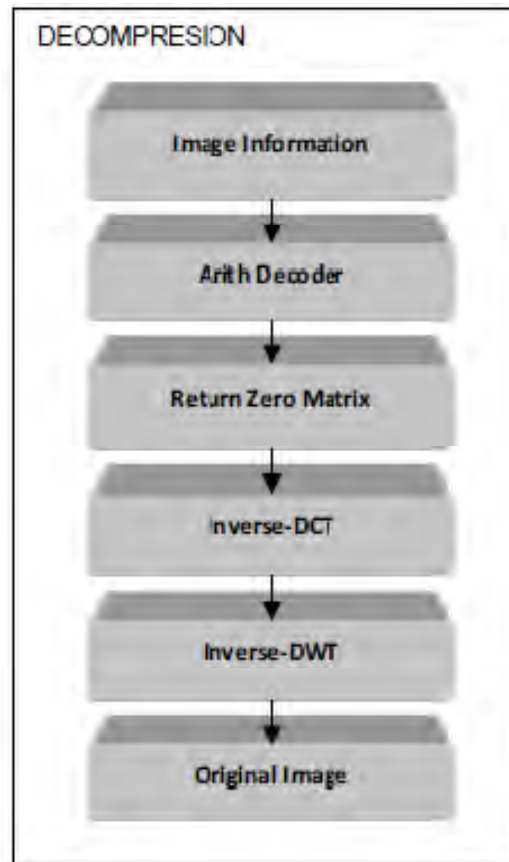


Fig 3. Flow chart for image decompression

#### 4. N-level HYBRID (DCTWT) TRANSFORM

The neutral of the n-level combination DCTWT procedure is to activity the assets of both n-level DWT and DCT .Hybrid methods to image compression deals with merging n bits traditional methods to improve separate approaches and attain improved excellence recreated images with advanced compression relation. The wavelet transform, which provides a multi resolve symbol of images, has been extensively used in image compression through fusion approach. Wavelet transforms have been mutual with standard systems of image coding to find high excellence beaten images with advanced compression relations.

In this part we will discuss the hybrid approach by combining hybrid DWT, and their appearances merging the advantage of DCT i.e. comprising most important material in smallest numbers and the multi resolve competence of DWT, we can attain better excellence and advanced compression relation of an image. N bits Hybrid (DCTWT) Transform decreases blocking art effects, false contouring and ringing effect [9]

##### 4.1 Compression procedure

The input image is first changed to gray image from color image, after this whole image is separated into size of 32x32 pixels blocks. Then 2D-DWT practical on all block of 32x32 blocks, by applying 2D-DWT, four facts are twisted. Out of four sub band particulars, estimate detail/sub band is additional distorted over by 2D-DWT which stretches additional four sub-bands of 16x16 blocks. Above step is followed to decompose the 16x16 block of approached part to get novel set of four sub band/details of size 8x8. The level of decomposition is depend on size meting out block gotten firstly,i.e. here we are separating image originally into size of 32x32, hence the equal of decomposition is 2.

##### 4.2 Decompression procedure

At handset side, we translate the quantized DCT constants and calculate the opposite two dimensional DCT (IDCT) of every block.

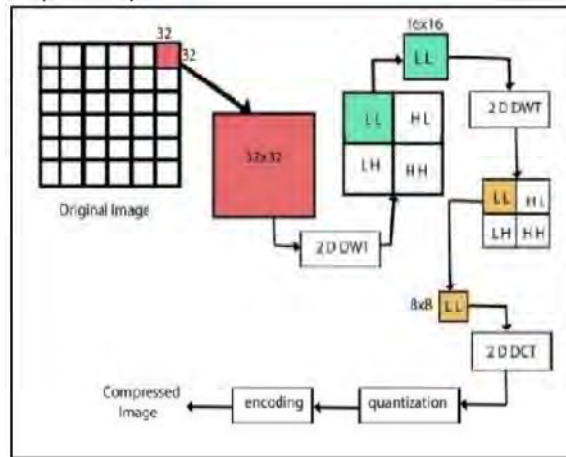


Fig.4 Compression technique using Hybrid transform

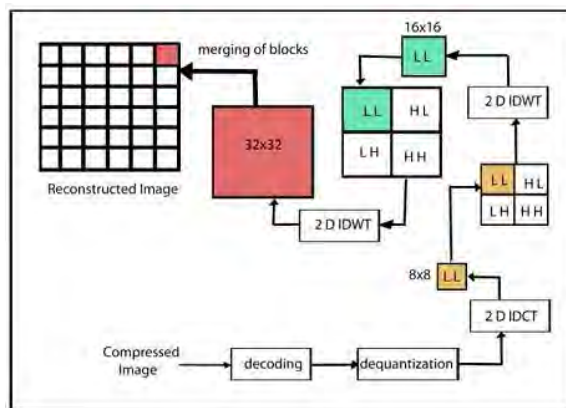


Fig 5. Decompression technique using Hybrid transform

### 5. Simulations and Result

This segment evaluates the performance of the proposed n level hybrid DCTWT algorithm. The proposed hybrid algorithm is applied on several types of images: natural images, human images, benchmark images such that the performance of proposed algorithm can be verified for various applications. The retrieve image is also shown.

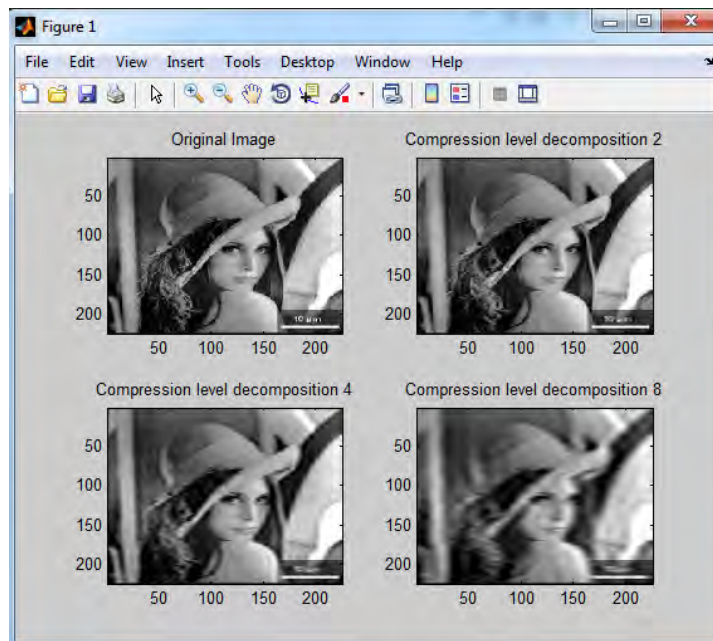


Fig6. Hybrid DCTWT Decomposition

Compression\_Ratio = 149.9630

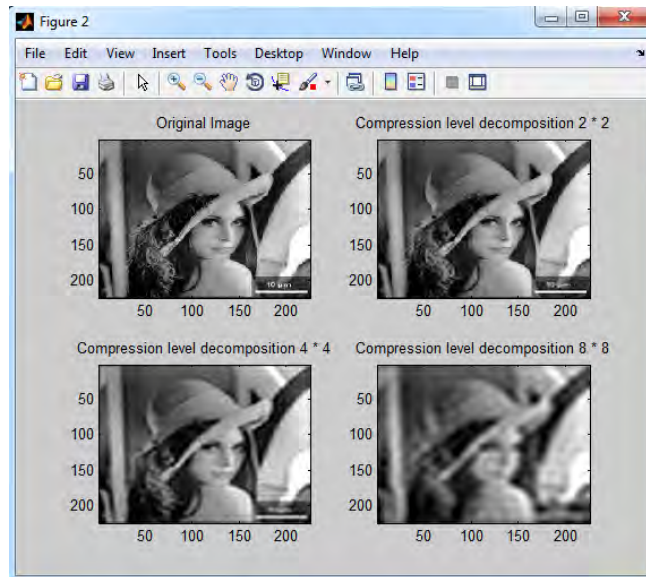


Fig7. Hybrid DCTWT Decomposition in Matrix Form

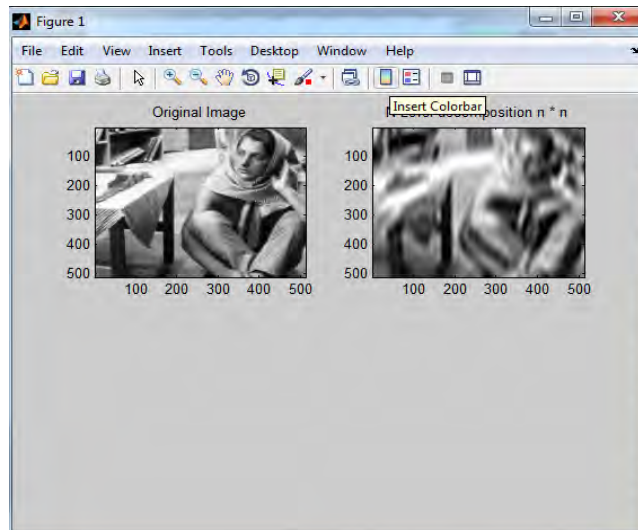


Fig8. Hybrid N-level DCTWT Decomposition

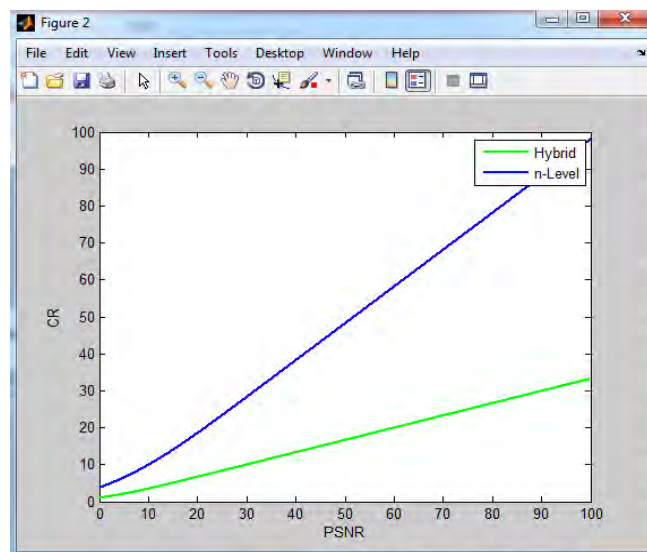


Fig.: Compare study of improved N level Technique



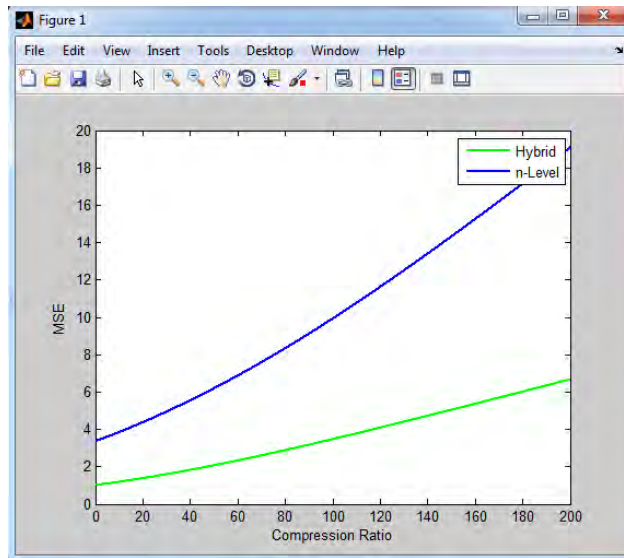


Fig10. Compare study in between for MSE& CR

Table1: Tabular Data in each technique with N level Hybrid Technique

Computation	DCT	DWT	Hybrid DWT	DCT-nLevel-Hybrid DCT-DWT	Image Type
PSNR	+30.05999	+30.04428	88.5480861086375	88.5480861086375	Image2.jpg
	+30.25261	+30.00515	44.1670966726663	35.0958111821136	Image1.jpg
	+30.22263	+30.24768	37.0958111821136	44.2763367366595	Image3.jpg
MSE	+64.63694	+64.8712	9.1552734375e-05	9.1552734375e-05	Image2.jpg
	+61.83281	+65.45828	2.51055802469136	2.1055802469161	Image1.jpg
	+62.26112	+61.90298	12.7908325195313	2.44819641113281	Image3.jpg
CR(Compression ratio)	+21.13485 dB	84.5584869384766	115.42261686358	230.845233727159 (256*256)	image2.jpg
	+3.93993 dB	84.552001953125	74.9814860528265	31.5194784374499 (small size-256*192)	Image1.jpg
	+10.00397 dB	84.5413208007813	40.0158754388643	140.811459265891	Image3.jpg

**6. Conclusions**

In this research, a hybrid scheme combining the DWT and the DCT algorithms under high compression ratio constraint for image has been presented. It was observed that the proposed algorithm n level hybrid technique has better performance as compared to the other standalone algorithms which provided the high compression ratio with others and linear PSNR iteration in proposed approach. Moreover, the proposed algorithm was also compared with some standards and already developed n –level hybrid concept. It was observed that the proposed n level hybrid algorithm performs better than the existing algorithms. The proposed scheme is intended to be used as the image compressor applications where high compression is required which is optimal in image compression technique.

In future we can conclude the n level of decomposing in distortion have to resolve and can be optimize for high pixel images data.

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