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# Review of Digital Image Compression Technique Based on Different Transform Function for Quality Improvement of Compressed Image

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**Abstract**
The quality of compressed image is major issue in digital image compression process. The process of image compression depends on the local variance of pixel data of image. The local variance predicts the smoothness of image and better quality of digital image. For the betterment of image compression used various transform based function such as DCT, DWT and JPEG image compression techniques. The DCT and DWT image compression techniques is very slow in terms of compression ratio, but the quality of image is retaining. Instead of JPEG image compression is fast but the quality of image not retain. In this paper presents the review of digital image compression based on transform function. Also evaluate the performance of image compression of three methods such as DCT, DWT and JPEG image compression. For the measuring quality of image used PSNR and compression ratio of given image.

**Keywords: -** ***Digital Image, Compression, Variance, Transform Function, PSNR***

## I. INTRODUCTION

Advanced Images are generally utilized as a part of PC applications. Uncompressed computerized Images require significant capacity limit and transmission data transfer capacity. Effective Image pressure arrangements are turning out to be more basic with the late development of information serious, media based web applications. Information pressure is the way toward changing over information records into littler documents for productivity of capacity and transmission [1-3]. As one of the empowering advances of the interactive media transformation, information pressure is a key to quick advance being made in data innovation. It would not be handy to put Images, sound, and video alone on sites without pressure. Information pressure calculations are utilized as a part of those measures to lessen the quantity of bits required to speak to a Image or a video arrangement[7-10]. Pressure is the way toward speaking to data in a reduced frame. Information pressure regards data in computerized frame as parallel numbers spoke to by bytes of information with substantial information sets. Pressure is a fundamental and basic strategy for making Image records with sensible and transmittable sizes[5-6]. Keeping in mind the end goal to be valuable, a pressure calculation has a relating decompression calculation that, given the compacted record, repeats the first document. There have been many sorts of pressure calculations created [4].

PRINCIPLES OF IMAGE COMPRESSION: A standard normal for most Images is that the neighboring pixels are related and along these lines hold repetitive data. The preeminent errand then is to discover less connected representation of the Image. Two rudimentary segments of pressure are excess and immateriality diminishment. Excess diminishment goes for expelling duplication from the flag source Image. Insignificance decrease discards parts of the flag that is not saw by the flag beneficiary, in particular the Human Visual System (HVS). When all is said in done, three sorts of excess can be distinguished [12-15]:

- Spatial Redundancy or relationship between's neighbouring pixel values,
- Spectral Redundancy or relationship between's various shading planes or ghastly groups
- Temporal Redundancy or connection between's nearby casings in an arrangement of Images particularly in video applications.

Image pressure look into goes for diminishing the quantity of bits expected to speak to an Image by expelling the spatial and phantom redundancies however much as could reasonably be expected [11]. The rest of paper discuss as section II Image compression techniques. In section III, Discuss the Related work. In section IV discuss Discrete Cosine Transform and in the section V Performance Parameter. Finally, in section VI discuss conclusion and future scope.

## II. IMAGE COMPRESSION TECHNIQUES

Pressure takes an information X and produces a representation XC that ideally requires less bits. There is a reproduction calculation that works on the packed representation XC to produce the recreation Y. In view of the necessities of remaking, information pressure plans can be isolated into two wide classes. One is lossless pressure and the other is lossy pressure, which by and large gives much higher pressure than lossless pressure [14-16].

- **Lossless Compression:**

In the event that information has been losslessly compacted, the first information can be recouped precisely from the packed information. It is for the most part utilized for applications that can't permit any distinction between the first and recreated information [17].

- **Lossy Compression Methods:**

Lossy pressure strategies include some loss of data and information can't be recouped or reproduced precisely. In a few applications, correct reproduction is redundant. For instance, it is worthy that a reproduced video flag is not quite the same as the first the length of the distinctions don't bring about irritating ancient rarities. However, for the most part acquire higher pressure proportions than is conceivable with lossless pressure [18].

## III. RELATED WORK

Vikrant Singh Thakur and Kavita Thakur Et al. [1] In this paper, a novel image compression technique FSHJPEG is successfully implemented using MATLAB. It is concluded that the discussed technique FSHJPEG, not only gives much higher compression ratio but also capable of keeping MSE smaller than JPEG and JPEG2K techniques. Hence FSHJPEG technique provides efficient gray image compression. The fusion of Fuzzy logic with the hybrid transform leads to efficient solution for image imprecise conditions. FSHJPEG can be further extends for color image compression.

Saif Alzahir and Arber Borici Et al. [2] In this paper, they present an innovative method for lossless compression of discrete-color images, such as map images, graphics, GIS, as well as binary images. They have introduced an innovative method for lossless compression of discrete-color and binary images. This method has a low complexity and it is easy to implement. The experimental simulation results on more than 150 images show that the discussed method enjoys a high compression ratio that in many cases was higher than 95%.

K. Srinivasan, Justin Dauwels and M. Ramasubba Reddy Et al. [3] In this paper, lossless and near-lossless compression algorithms for multichannel electroencephalogram (EEG) signals are presented based on image and volumetric coding. They discussed novel compression algorithms for multichannel EEG. they represent the EEG in the form of an image or volume. Such representations help to exploit both the spatial and temporal correlations. they followed a “two-stage” coding philosophy: the EEG data are first coded at an optimal rate using a wavelet-based scheme, and next the residuals are further encoded by an entropy encoding scheme. They achieve attractive compression ratios for low error values.

Chiyuan Zhang and Xiaofei He Et al. [4] they consider the problem of lossy image compression. Recently, machine learning techniques have been introduced as effective mechanisms for image compression. They discussed the TEM algorithm and its improved version TEM-C for image compression. The key advantage over previous methods comes from the maximum exploitation of the full label set at the encoding stage. Furthermore, TEM-C used the label set to generate and store a difference image for correcting the prediction error and improved the colorization quality significantly. Experimental results demonstrated the outstanding performance of the discussed methods. Although the computation burden is still high, TEM-C is already competitive to the industrial standard JPEG in image quality and compression ratio.

Tilo Strutz Et al. [5] they discussed approach to automated selection incorporated spatial decorrelation. This was essential, as the color trans-formation can disturb the spatial dependencies between signal values if noise from one color component is spread over the other components. The results showed that this approach was successful, not only for prediction-based compression, but also for wavelet-based compression schemes. The adaptation of the color transform can be increased by a block-based selection.

Jung-San Lee and Bo Li Et al. [6]in this paper they described blind watermark extraction uses a voting mechanism to retrieve exact watermark information and recover the original unmarked image without knowledge of the host image. To restore an original-like image, the discussed method can obtain the host image information, recover the host image under resist multiform attacks, and thus protect the copyright of digital products. In particular, based on the preinserted encoding system, this scheme can recognize the water-mark sequence correctly. Their novel, self-recognized, and crop-resistant watermarking method guarantees the visual quality of the embedded image and is robust against various attacks. their method cannot yet handle attacks of more than 75 percent crop-ping, and its embedding efficiency must be improved to achieve better visualization of different types of host images.

Jianji Wang and Nanning Zheng Et al. [7] In this paper, a new FIC scheme is discussed based on the fact that the affine similarity between two blocks in FIC is equivalent to the absolute value of Pearson’s correlation coefficient (APCC) between them. First, all blocks in the range and domain pools are chosen and classified using an APCC-based block classification method to increase the matching probability. Second, by sorting the domain blocks with respect to APCCs between these domain blocks and a preset block in each class, the matching domain block for a range block can be searched in the selected domain set in which these APCCs are closer to APCC between the range block and the preset block. Experimental results show that the discussed scheme can significantly speed up the encoding process in FIC while preserving the reconstructed image quality well. Experiment results show that the discussed scheme can greatly reduce the encoding time with preserving the reconstructed image quality well.

Miguel Hernández-Cabronero, Victor Sanchez, Michael W. Marcellin and Joan Serra-Sagristà Et al. [8] In this work, they discuss the suitability of lossy compression for DNA microarray images and highlight the necessity for a distortion metric to assess the loss of relevant information. They also discussed one possible metric that considers the basic image features employed by most DNA microarray analysis techniques. Experimental results indicate that the discussed metric can identify and differentiate important and unimportant changes in DNA microarray images.

Seyun Kim and Nam Ik Cho Et al. [9] They have discussed a lossless color image compression method based on a hierarchical prediction scheme and context-adaptive arithmetic coding. For the compression of an RGB image, it is first transformed into YCuCv color space using an RCT. After the color transformation, the luminance channel Y is compressed by a conventional lossless image coder. Pixels in chrominance channels are predicted by the hierarchical decomposition and directional prediction. Finally, an appropriate context modeling of prediction residuals is introduced and arithmetic coding is applied. The discussed method and several conventional methods have been tested on the Kodak image set, some medical images, and digital camera images, and it is shown that average bit rate reductions over JPEG2000 for these sets are shown to be 7.10%, 13.55%, and 5.52% respectively.

Seyun Kim and Nam Ik Cho Et al. [10] They have discussed a new lossless compression algorithm for the Bayer-patterned CFA images. The discussed scheme predicts the color components hierarchically and uses context-adaptive arithmetic coding. The hierarchical prediction means that they first encode half of the green samples using a conventional grayscale coder, and then use those encoded samples for the prediction of other half of the green samples. All of the green samples are then used for the prediction of the red pixels, and both the green and red pixels are then used for the prediction of blue samples. The results show that the discussed method yields less bits per pixel than the transform-based method and other existing prediction-based methods.

Mai Xu, Shengxi Li, Jianhua Lu and Wenwu Zhu Et al. [11] In this paper, they have discussed a CCSR approach with learnt over-complete dictionary for compressing images at low bit-rates. More specifically, in their CCSR approach, given the learnt over-complete dictionary, an image patch can be well represented with the linear combination of elements selected from this dictionary, based on the coefficients constrained by the discussed CCSR formulation. Finally, the CCSR approach is capable of compressing images through the quantization and entropy encoding of compressible coefficients. The experimental results demonstrated that the discussed CCSR approach greatly outperforms the conventional JPEG 2 000, RLS-DLA, and MP approaches in compressing images at low bit-rates.

M Ferni Ukrit and G.R. Suresh Et al. [12] They discussed compression method combines Super-Spatial Structure Prediction with interframe coding to achieve higher compression ratio. Initially the Super Spatial Structure Prediction algorithm is applied with the fast block-matching process which includes Diamond Search method. To further increase the compression ratio, they discuss a new scheme Head Code Compression. Experimental results of their discussed Composite algorithm for medical image sequences achieve 25% more reduction than the prior arts.

Krishan Gupta, Dr Mukesh Sharma and Neha Baweja Et al. [13] The need for an efficient technique for compression of Images ever increasing because the original images need large amounts of disk space seems to be a big disadvantage during transmission & storage. Even though there are so many compression techniques already present a better technique which is faster, memory efficient and simple which surely suits the requirements of the user. This paper has three version of KG technique which named as KGI, KG2 and KG3. These techniques are very useful in image compression but all have different way to compress image. Compression ratio of image are also different in these three version and better to each other which depends upon what types of image chosen for compression.

## IV. DISCRETE COSINE TRANSFORM

The discrete cosine change (DCT) isolates the picture into parts (or ghostly sub-groups) of varying significance (as for the picture's visual quality). The DCT is like the discrete Fourier change: it changes a flag or picture from the spatial space to the recurrence area

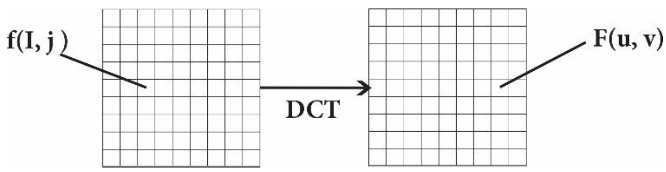


Figure 1: Transformation of function into DCT.

A discrete cosine change (DCT) communicates an arrangement of limitedly numerous information focuses as far as an entirety of cosine capacities wavering at various frequencies. DCTs are vital to various applications in science and building, from lossy pressure of sound (e.g. MP3) and pictures (e.g. JPEG) (where little high-recurrence segments can be disposed of), to phantom for the numerical arrangement of incomplete differential conditions. The utilization of cosine instead of sine capacities is basic in these applications: for pressure, for reasons unknown cosine capacities are significantly more proficient (as depicted beneath, less are expected to estimate a common flag), though for differential conditions the cosines express a specific decision of limit conditions [7, 9].

Specifically, a DCT is a Fourier-related change like the discrete Fourier change (DFT), however utilizing just genuine numbers. DCTs are comparable to DFTs of generally double the length, working on genuine information with even symmetry (since the Fourier change of a genuine and even capacity is genuine and even), where in a few variations the information as well as yield information are moved significantly an example. There are eight standard DCT variations, of which four are regular [3, 11].

## V. PERFORMANCE PARAMETER

| METHOD | COMPRESSION RATIO | ELAPSED TIME | PSNR |
|---|---|---|---|
| DCT | 0.20402 | 2.764899 | 15.022122 |
| DWT | 1.504 | 2.230397 | 23.022122 |
| JPEG | 1.904 | 2.278958 | 25.022122 |

Table 1: Show that the Comparative values of Compression Ratio, Elapsed Time and PSNR for Leena image using DCT, DWT and JPEG Method.

| METHOD | COMPRESSION RATIO | ELAPSED TIME | PSNR |
|---|---|---|---|
| DCT | 0.20674 | 2.627560 | 20.901528 |
| DWT | 1.5067 | 2.620161 | 28.901528 |
| JPEG | 1.9067 | 2.617354 | 30.901528 |

Table 2: Show that the Comparative values of Compression Ratio, Elapsed Time and PSNR for Barbara image using DCT, DWT and JPEG Method.

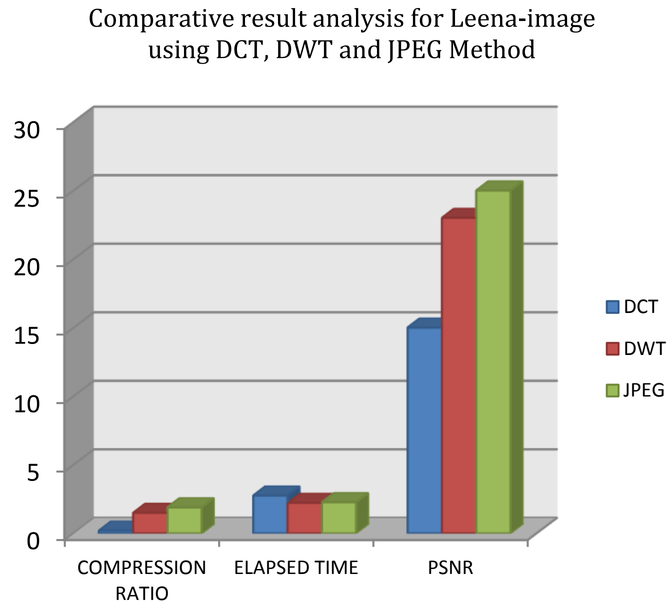


Figure 2: Shows that the comparative result graph for Leena-image using DCT, DWT and JPEG Methods, here we found the value of Compression Ratio, Elapsed Time and PSNR.

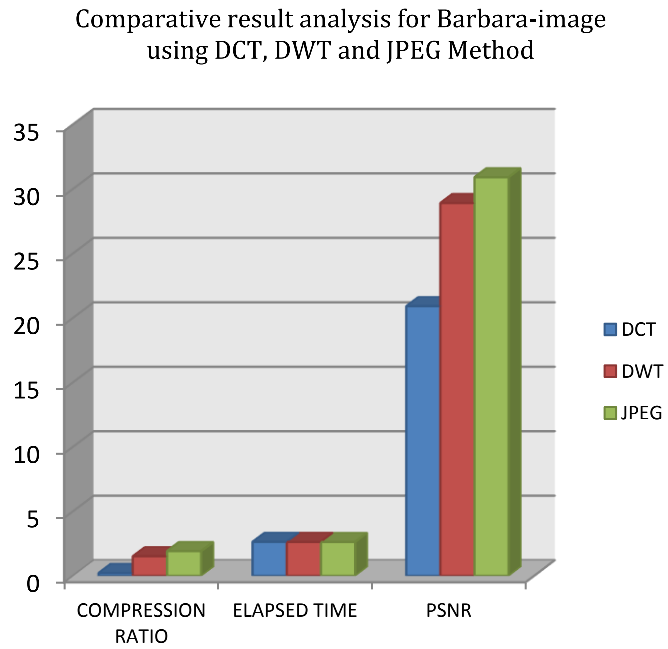


Figure 3: Shows that the comparative result graph for Barbara-image using DCT, DWT and JPEG Methods, here we found the value of Compression Ratio, Elapsed Time and PSNR.

## V. CONCLUSION & FUTURE SCOPE

The image compression enhances the multimedia data storage and transmission capacity over the networks. The compression process reduces the size of image and multimedia data and efficiently manage the bandwidth and memory of storage device. In this paper presents the review of image compression. The compression technique used DCT, DWT and JPEG methods. In terms of quality of image, the value of PSNR is increase, the methods used DWT. The DWT is lossless image compression techniques, but the image compression ratio of DWT is very slow. The JPEG image compression is fast but the quality of image not retain. It is also noted that the DWT method does not always perform best for every set of images. The DWT hierarchical encoding scheme sometimes works better and sometimes worse than the conventional methods, depending on image sets and depending on the channels. It is also true for every compression algorithms, i.e. the coding gain of compression algorithms differ on different set of images. For example, on the set of classical test images such as Lena, Peppers, and Mandrill, even the channel independent CALIC sometimes performs better than JPEG2000

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