Analyze the Performance of Image Compression Techniques using Hybrid and Swarm Optimization Methods

Roopesh Kumar Kurmi, Harendra Singh

Abstract: ***Every day, a massive amount of information is stored, processed, and transmitted digitally. The primary goal of image compression is to minimize the number of bits required to represent the original images by reducing the redundancy in images, while still meeting the User defined quality requirements. Uncompressed images normally require a large amount of storage capacity and transmission bandwidth. In this paper we proposed a hybrid image compression technique for the image which is better in the terms of result by measuring performance evaluation parameters to increase the value of PSNR; our empirical results study shows that hybrid methods are better than existing techniques.***

Keywords: Discrete Wavelet Transform (DWT), discrete Cosign Transform (DCT), PSNR, RGB, HVS, Image Compression.

I. INTRODUCTION

Uncompressed multimedia (graphics, audio, images and video) requires considerable storage capacity and transmission bandwidth. In recent years, there has been rapid progress in storage capacity of storage media, processing or compilation time of processors or compilers, and digital communication system performances. On the same hand, bandwidth consuming applications and number of users are also increasing Simultaneously. Therefore the demand for data compression and data transmission bandwidth continues to acts as a ban on technological growth. While compression/bandwidth conservation theories are going at a snail's pace, the recent growth of data intensive multimedia-based web applications have made it even more important to develop efficient ways to compress and encode signals and images. Digital images are usually encoded by lossy compression methods due to their large memory or bandwidth requirements. The lossy compression methods achieve high compression ratio at the cost of image quality degradation. However, there are many cases where the loss of information or artifacts due to compression needs to be avoided, such as medical, prepress, scientific and artistic images [7]. Image compression aims to reduce the data size of images and to store or transmit these images efficiently. Therefore, it offers the promise of image/video transmission under limited bandwidth. The past few decades have witnessed an extensive body of literature on both lossless [2] and lossy image compression [9]. With the arrival of the internet and the multimedia age, The number of images available online has grown rapidly, and there is an increasing demand for better image compression techniques [3].

The image is actually a kind of redundant data i.e. it contains the same information from certain perspective of view. By using data compression techniques, it is possible to remove some of the redundant information contained in images. Image compression minimizes the size in bytes of a graphics file without degrading the quality of the image to an unacceptable level. The reduction in file size allows more images to be stored in a certain amount of disk or memory space. It also reduces the time necessary for images to be sent over the Internet or downloaded from web pages. Two elementary components of compression are redundancy and irrelevancy reduction. Redundancy reduction aims at removing duplication from the signal source image.

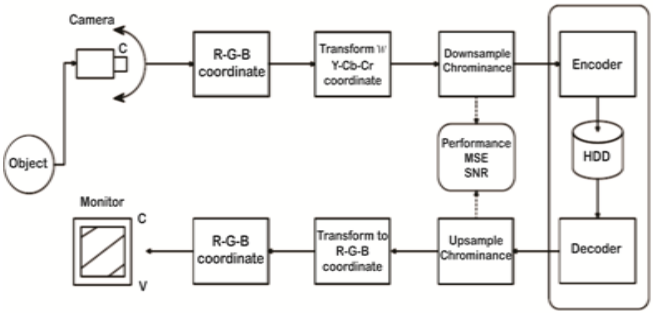

Fig 1: General Image Storage System

A compression method consists of definitions of two complex processes compression and decompression. Compression is a transformation of original data representation into different representation characterized by smaller number of bits. Opposite process reconstruction of the original data set is called decompression. There can be distinguished two types of compression: lossless and lossy [16].

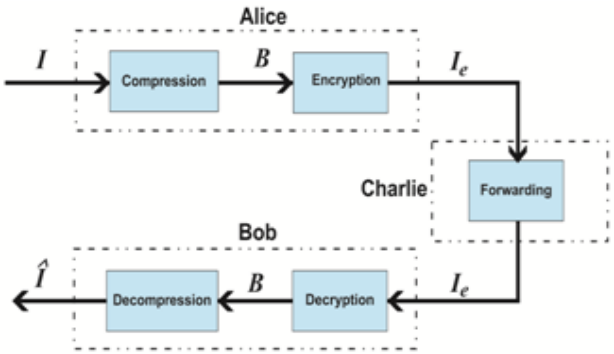

Fig 2: Traditional Image Compression and Decompression Mechanism

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The rest of this paper is organized as follows in section II we shows that the vital application of image compression, in section III we discuss about the proposed methodology and architecture. In section IV we discuss about the Experimental result analysis between proposed and existing techniques. And finally in section V we conclude the paper and also define the future scope of this paper.

II. APPLICATIONS OF IMAGE COMPRESSIONS

Image compression techniques, especially lossy method are considered to be computationally more complex as they get more and more efficient. In this proposed work, an attempt has been made to propose an efficient and less complex image codec algorithm that would be suitable for the internet application and low bit rate image transmission purposes using hand held devices. Proposed algorithm is supposed to produce a good quality image for a given bit rate and will accomplish this task in an embedded fashion i.e. in such a way that all encoding of same image at lower bit rates are embedded in the beginning of the bit stream for the target bit rate. It will be helpful in many applications, particularly for progressive transmission, image compatible Trans coding in a digital hierarchy of multiple bit rates. It is also applicable to transmission over noisy channel in the sense that the ordering of the bits in order of importance leads naturally to prioritization for the purposes of layered protection schemes. As per the literature survey, the existing wavelet based compression methods already have following characteristics.

1. Quality (SNR) which is called as bit rate scalability
2. Spatial scalability
3. Temporal Scalability (Frame rate scalability used in video compression)

The ultimate aim will be propose an efficient image codec algorithm, which would be suitable for the internet application and low bit rate image compression and transmission applications for low capacity, limited battery life hand held multimedia devices.

III. PROPOSED METHOD ARCHITECTURE

In this section discuss the proposed algorithm for image compression. The proposed algorithm is hybrid method which is a combination of integer wavelet transform and optimization methods. The wavelet transform methods generates the symmetrical block coefficient, the symmetrical wavelet coefficient decomposed into number of layers. The decomposed layers computes in fashion of horizontal vertical and diagonal transform. The value of transform combined and make block matrix. The block matrix process for motion estimation process of structure reference process. The structure reference process set the block value of similar and dissimilar. For the finding the position the value of equal coefficient used optimization methods. The optimization methods search the block coefficient for passes of code matrix HCC.

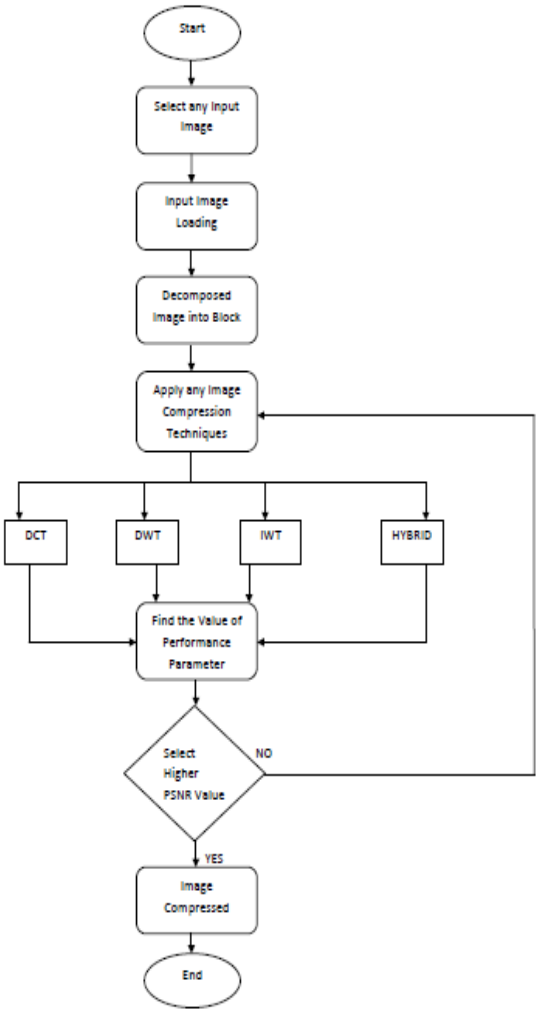

Fig 3: Proposed Methodology Architecture

IV. EXPERIMENTAL RESULT ANALYSIS

In this section we discuss the about the experimental process of image compression is performed. This process of image compression is done by using four different methods that are DCT, DWT, IWT and HYBRID. Here we are using four different images and each image having different sizes. All these input images are of same dimension and that is 512 x 512. The all the input images are applied with the number of image compression methods and find the result for respective image and methods.

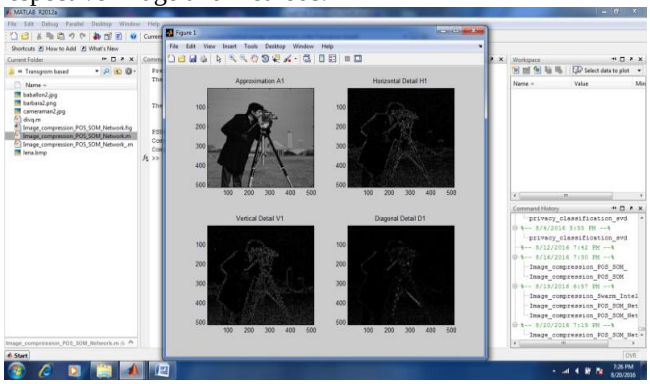

Fig 4: Shows that the Transformation window for Cameraman Image using DCT Methods.

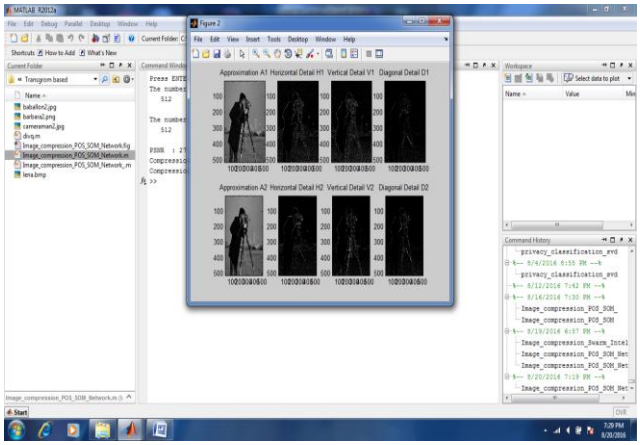

Fig 5: Shows that the Horizontal Transformation window for Cameraman Image using IWT Methods.

Table 1: Shows that the PSNR, Compression Rate and Compression Ratio using DCT, DWT, IWT and HYBRID method for Cameraman.jpeg image.

Image	Method Name	PSNR	Compression Rate	Compression Ratio
Cameraman	DCT	22	0.54	8.3
	DWT	26	0.48	12
	IWT	27	0.43	15
	HYBRID	29	0.49	13

Table 2: Shows that the PSNR, Compression Rate and Compression Ratio using DCT, DWT, IWT and HYBRID method for Baballon2.jpeg image.

Image	Method Name	PSNR	Compression Rate	Compression Ratio
Baballon 2	DCT	18	0.67	6.79
	DWT	21	0.59	9.79
	IWT	22	0.53	12
	HYBRID	24	0.58	11.29

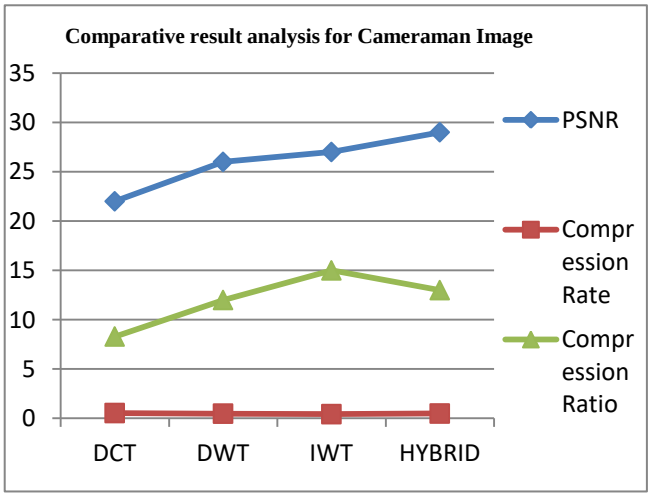

Fig 6: The above figure Show the result analysis on the basis of comparative result analysis study of using Cameraman image with include the performance parameter is PSNR, Compression Rate and Compression Ratio value with applied the method such as DCT, DWT, IWT and HYBRID Method. And here our HYBRID method result shows the better result than existing methods.

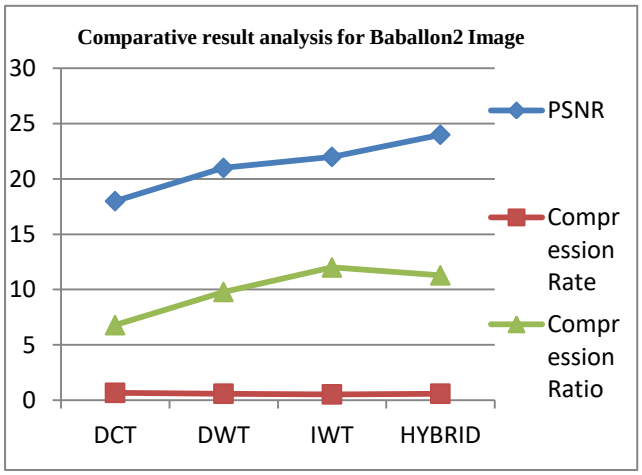

Fig 7: The above figure Show the result analysis on the basis of comparative result analysis study of using Baballon2 image with include the performance parameter is PSNR, Compression Rate and Compression Ratio value with applied the method such as DCT, DWT, IWT and HYBRID Method. And here our HYBRID method result shows the better result than existing methods.

V. CONCLUSION AND FUTURE WORK

The digital image compression is vital research field in the area of communication and storage. The size of multimedia data acquired more space and more bandwidth during transmission and storage. In the process of size reduction and utilization of bandwidth used various image compression techniques. Some compression technique based on lossy technique and some compression technique based on lossless technique.

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