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A REVIEW ON IMAGE COMPRESSION METHODS AND TECHNIQUES

Muskan Garg[1], Anuj Sharma[2]
M.Tech Scholar[1], Associate Professor[2]
Department of Computer Science and Engineering, Om Group of Institutions[1,2]
Muskangarg0203@ggmail.com [1]
deanoitm@gmail.com [2]

Abstract— In this paper all basic image compression techniques have been discussed. The image compression techniques which are useful in their related areas are analyzed. Compression methods DCT and DWT recently used for image compression which gives better compression ratio. This review paper gives clear idea about basic compression techniques and method.

Keywords— MDP, KLT, SIFT, S-PCA

I. INTRODUCTION

Image compression is an application of information compression that encodes the initial image with few bits. The target of image compression is to reduce the redundancy of the image and to store or transmit information in an efficient type. Fig 1 shows the diagram of the image compression system[1]. The main goal of such system is to cut back the storage amount the maximum amount as possible, and also the decoded image displayed within the monitor are often similar to the original image as much as are often[2].

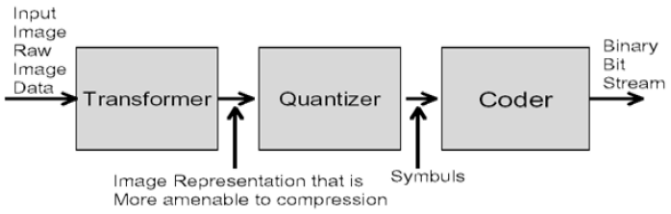

Fig. 1 Image Compression System [3]

IMAGE COMPRESSION CODING

Image compression coding is to store the image into bit-stream as compact as possible and to show the decoded image within the monitor as precise as possible. currently consider an encoder and a decoder as shown in Fig. 2.once the encoder receives the initial image file, the image file are going to be converted into a series of binary information, that is named the bit-stream. [5]The decoder then receives the encoded bit-stream and decodes it to create the decoded image. If the overall information amount of the bit-stream is a smaller amount than the overall information amount of the initial image, then this is often known as image compression[7].

The complete compression flow is as shown in Fig. 2.

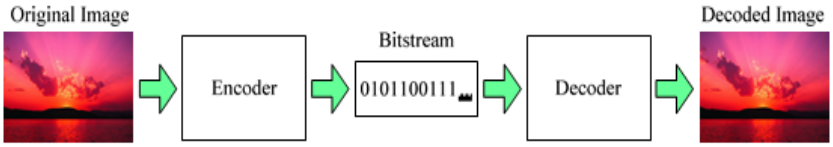

Figure 2: Image Points Matching of figure [2]

The compression ratio is defined as follows:

$$C_r = \frac{n1}{n2}$$

Where*n1*is the data rate of original image and *n2* is that of the encoded bit-stream.

METHODS OF COMPRESSION

There are two methods for compression.

1. Discrete Cosine Transform (DCT)[10]
2. Discrete Wavelet Transform (DWT)[10]

DCT:
The discrete cosine transform (DCT) is a technique for changing a signal into elementary frequency elements. Like different transforms, the discrete cosine transform (DCT) tries to de correlate the image information[15]. Once decorrelate every transform coefficient are often encoded independently without losing compression efficiency.

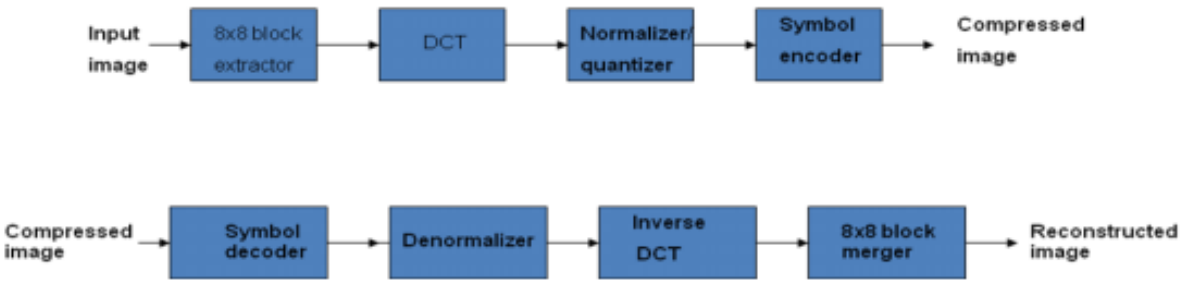

Fig.3 Image Compression using DCT[21]

DWT:
The wavelet transform (WT) is a way to represent a signal in time-frequency type. Wavelet transform are based on small waves, known as wavelets, of varying frequency and limited period wavelet transform uses multiple resolutions wherever {different totally} frequencies are analyzed with different resolutions. This provides a more elaborate image of the signal being analysed[18]. A transform can be thought of as a remapping of a signal that provides additional information than the initial. The Fourier transform fits this definition quite well because the frequency International Journal of Signal Processing, Image Processing and Pattern Recognition Vol. 4, No. 3, September, 2011 66 information it provides often leads to new insights about the original signal[19].

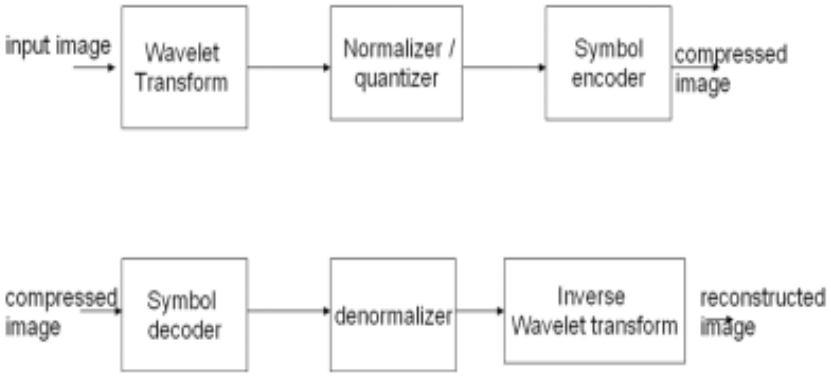

Fig.5: Image Compression Using Wavelets [21]

II. LITERATURE REVIEW

In this thesis analysis of numerous Image compression techniques for various images is done founded on parameters, compression ratio(CR), mean square error (MSE), peak signal to noise ratio (PSNR). Our simulation results from chapter 4 shows that we can achieve higher compression ratio using Hybrid technique but loss of evidence is more. DWT gives better compression ratio without losing more information of image. Pitfall of DWT is, it necessitates more processing power. DCT overcomes this disadvantage since it needs less dispensation power, but it gives less compression ratio. DCT based standard JPEG uses blocks of image, but there are still correlation departures across blocks. Block boundaries are obvious in some cases. Blocking artifacts can be seen at low bit rates. In wavelet, there is no need to divide the image. More robust under transmission errors. It facilitates liberal transmission of the image (scalability) [1].

Lossless image compression algorithm for both the binary images and gray-scale images is developed. Lossless image compression has extensive application in medical imaging, space shooting and film industry to archive and diffuse images. To efficiently compress images, we first decompose images into a set of binary images to reduce encoding symbols. The benefits lie in four aspects. First, the progressive image broadcast is achieved by image decay. Second, the encoding alphabet is reduced to the binary alphabet which is suitable for situation quantization and adaptive arithmetic coding. Third, decomposition provides a chance to use those partial future" information of non-causal pixels to help encoding. Finally, the failure provides a straight-forward way to encode bi-level images, considering that current gray-scale image compression algorithms usually have bad presentation on bi-level images [2].

This paper was motivated by the wish of improving the efficiency of lossless image compression by refining the BCH and LZW. We providing an overview of various existing coding values lossless image compression techniques. We have proposed a high effectual algorithm which is implemented using the BCH coding approach. The experimentations were carried on collection of dataset of 20 test images. The result valuated by using compression ratio and bits per pixel. The experimental results show that the proposed algorithm progresses the compression of images associating compared with the RLE, Huffman and LZW algorithms, the proposed method average compression ratio is 1.636383, which is better than the normal lossless image compression [3].

A single sensor information obtained is limited, often cannot meet the actual needs, in calculation, different sensors have the advantage of the imaging principle and its unique, as in color, shape features, band access, spatial resolution from the features of all have their own characteristics. Registration algorithm is proposed in this paper has better strength to image noise, and can achieve sub-pixel accuracy; the registering time has also been greatly improved. In terms of image fusion, the images to be attached through wavelet transform of different resolution sub image, using a new image fusion method based on energy and correlation coefficient [4].

In this paper, an image compression arrangement is proposed, based on discrete cosine transform (DCT). This scheme is a hybrid method, which association's vector quantization (VQ) and difference pulse code modulation (DPCM). This scheme begins with transforming image from altitudinal domain to frequency domain using DCT. Then the block data is distorted into a vector according to zigzag order, and then truncated. After that, the vector is split into DC coefficient and AC coefficients. After scale quantization, DC coefficient is coded using DPCM. AC coefficients are coded using multistage vector quantization (MSVQ). Then, entropy encoding is performed on index-tables and DC part, separately. The experimental results show that, compared to conventional VQ and DCTVQ schemes, proposed scheme has a better performance [5].

III. RESEARCH METHODOLOGY

The general approach to data compression is the representation of the source in digital form with as few bits as possible. Source can be data, still images, speech, audio, video or whatever signal needs to be stored and transmitted. In general, data compression model can be divided in three phases: removal or reduction in data redundancy, reduction in entropy and entropy coding.

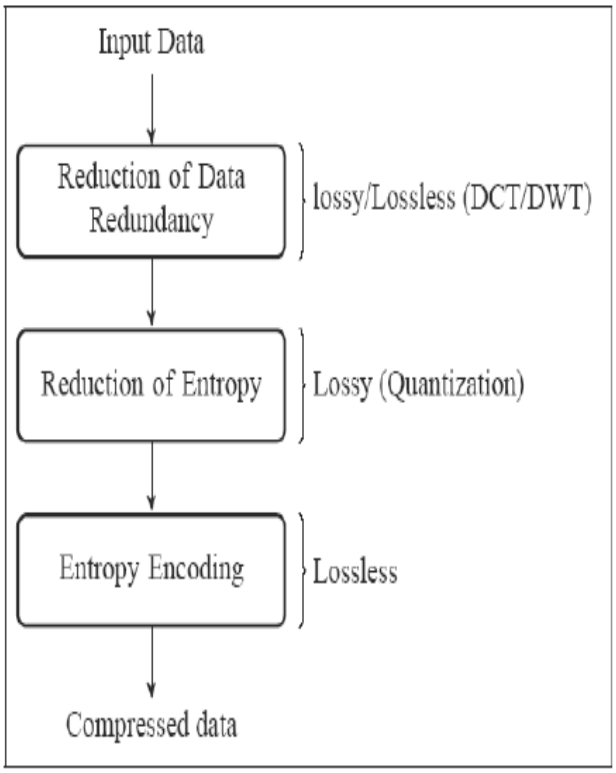

Fig 6: Data compression model

Research methodology of the work is below:

- Compress the image using dwt for lossless compression
- Decompose the image using 'harr' wavelet
- Decomposes an image wavelet to level 2" and threshold values varied to get better results
- Quantification of image and use idwt for calculating the errors.
- Calculate and comparing the CR, PSNR, SNR for different types of images.

IV. PROBLEM FORMULATION

Uncompressed images normally require a large amount of storage capacity and transmission bandwidth. For example, a 24-bit true color high-definition television (HDTV) image with size 1920£1080 needs approximately 6 megabytes (6M bytes) of storage space. On the other hand, various types of redundancy exist in images, such as temporal redundancy, spatial redundancy (or interpixel redundancy), coding redundancy, spectral redundancy and psychovisual redundancy. 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. The core issue in image compression is to design efficient and effective compression schemes. In terms of reconstruction ability, image compression schemes can be broadly classified into two major categories: lossless image compression and lossy image compression. Lossless image compression refers to the compression in which the original image can be fully reconstructed from the compressed image, i. e., no loss of any information during the compressing. Lossy image compression, on the contrary, allows some kind of difference or distortion between the reconstructed image and the original image, and the original image can not be fully recovered. Lossless image compression has many applications such as

medical imaging, space photograph, and film industry. In practice, medical images must be represented flawlessly for medical professionals to make clinical diagnosis with accuracy. Any minor distortion or errors introduced by lossy compression may lead to serious consequences to patients. In space exploration, astronomical images obtained by the satellites are often compressed and transmitted back to the earth for later processing such as object identification and feature extraction. These processing procedures may "amplify" the distortion caused by lossy compression and thus produce false results due to the distortion. In such cases, lossy compression is not appropriate because original astronomical images are very difficult and expensive to be obtained again. Finally, in film industry, lossless compression also has a huge market in archiving the films in order to save storage and meanwhile maintain the original high quality for future editing and re-compressing.

V. OBJECTIVES

Our objective is to design an efficient and effective progressive lossless image compression scheme.

- Study of existing image compression techniques.
- Understand and design efficient "wavelet transform" Technique.
- Implement the proposed algorithm in MATLAB Tool for Redundant data removal and image compression.
- To Achieve a higher PSNR value, decomposes an image wavelet to level N=2
- Evaluate results.

VI. CONCLUSION

Image compression is an application of information compression that encodes the initial image with few bits. The objective of compression is to cut back the redundancy of the image and to store or transmit information in an efficient type. Compression coding is to store the image into bit-stream as compact as possible and to show the decoded image within the monitor as actual as possible. All basic compression techniques are mentioned here. To conclude all the compression techniques that are useful in their related areas. Compression methods DCT and DWT recently used for compression which provides higher compression ratio. This review paper provides clear idea about basic compression techniques and methodology.

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