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A SURVEY ON IMAGE COMPRESSION

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ABSTRACT

Due to the increasing requirements for transmission of images in computer, mobile systems, the research in the field of image compression has increased significantly. Image compression plays a important role in digital image processing , it is also very important for efficient transmission and storage of images. Image compression means reducing the size of graphics file, without compromising on its quality. Depending on the reconstructed image, two techniques for compression exist : lossy techniques and lossless techniques. This paper is a survey for lossless image compression using Discrete Cosine Transform (DCT).

Index Terms: *Image Compression* **,** *JPEG , DCT(Discrete Cosine Transform) , MSE , PSNR , DWT(Discrete wavelet Transform)*

1. INTRODUCTION

With the ever growing technology, it is significant to handle vast amount of image data and needs to be stored in a proper way by exploiting efficient techniques normally succeeded in compressing the images. Compression of image refers to reducing the quality of data used to represent a file, image or video content without exclusively reducing the quality of the original data. Image compression is the application of data compression on digital images. The purpose of image . compression is to reduce the redundancy and irrelevancy present in the image , so that it can be stored and transferred efficiently & effectively. The main objective is to reduce the image storage space, Easy maintenance and providing security, Reducing cost. In order to have a good compression ratio without

losing too much of information when the image is decompressed we use DCT [1]. A Discrete Cosine Transform (DCT) expresses a sequence of finitely many data points in terms of a sum of cosine functions. The DCT transformation is reversible.

2. IMAGE COMPRESSION: A LITERATURE SURVEY

2.1 *Image Compression Using DCT and Wavelet Transformations*

Prabhakar. Telagarapu, V.Jagan Naveen, A.Lakshmi. Prasanthi, G.Vijaya Santhi

[1]: Image compression is a widely addressed researched area. Many compression standards are in place. But still here there is a scope for high compression with quality reconstruction. The JPEG standard makes use of Discrete Cosine Transform (DCT) for compression. The introduction of the wavelets gave a different dimensions to the compression. This paper aims at the analysis of compression using DCT and Wavelet transform by selecting proper threshold method, better result for PSNR have been obtained. Extensive experimentation has been carried out to arrive at the conclusion.

2.2 *Image Compression Using Discrete Cosine Transform*

Nageswara Rao Thota, Srinivasa Kumar Devireddy [2]: In this paper it is being attempted to implement basic JPEG compression using only basic MATLAB functions. In this paper the lossy compression techniques have been used, where data loss cannot affect the image clarity in this area. Image compression addresses the problem of reducing the amount of data required to represent a digital image. It is also used for reducing the redundancy that is nothing but avoiding the duplicate data. It also reduces the storage area to load an image. For this purpose we are using JPEG. JPEG is a still frame compression standard, which is based on, the Discrete Cosine Transform and it is also adequate for most compression applications. The discrete cosine transform (DCT) is a mathematical function that transforms digital image data from the spatial domain to the frequency domain.

2.3 *Lossless Image Compression Using the Discrete Cosine Transform*

Giridhar Mandyam, Nasir Ahmed, and Neeraj Magotra[3] : In this paper, a new method to achieve lossless compression of two-dimensional images based on the discrete cosine transform (DCT) is proposed. This method quantizes the high-energy DCT coefficients in each block, finds an inverse DCT from only these quantized coefficients, and forms an error residual sequence to be coded. The number of coefficients used in scheme is determined by using a performance metric for compression. Furthermore, a simple differencing scheme is performed on the coefficients that exploits

high energy DCT coefficients in neighboring blocks of an image. The resulting sequence is compressed by using an entropy coder, and simulations show the results to be comparable to the different modes of the lossless JPEG standard.

2.4 *Analysis Of Image Compression Algorithm Using DCT*

Maneesha Gupta, Dr. Amit Kumar Garg[4]: Image compression is the application of Data compression on digital images. The discrete cosine transform (DCT) is a technique for converting a signal into elementary frequency components. It is widely used in image compression. Here we develop some simple functions to compute the DCT and to compress images. An image compression algorithm was comprehended using Matlab code, and modified to perform better when implemented in hardware description language. The IMAP block and IMAQ block of MATLAB was used to analyse and study the results of Image Compression using DCT and varying co-efficients for compression were developed to show the resulting image and error image from the original images. Image Compression is studied using 2-D discrete Cosine Transform. The original image is transformed in 8-by-8 blocks and then inverse transformed in 8-by-8 blocks to create the reconstructed image. The inverse DCT would be performed using the subset of DCT coefficients. The error image (the difference between the original and reconstructed image) would be displayed. Error value for every image would be calculated over various values of DCT co-efficients as selected by the user and would be displayed in the end to detect the accuracy and compression in the resulting image and resulting performance parameter would be indicated in terms of MSE , i.e. Mean Square Error.

2.5 *Performance Analysis of Image Compression Using Wavelets*

Sonja Grgic, Mislav Grgic, Branka Zovko-Cihlar[5] : The aim of this paper is to examine a set of wavelet functions (wavelets) for implementation in a still image compression system and to highlight the benefit of this transform relating to today's methods. The paper discusses important features of wavelet transform in compression of still images, including the extent to which the quality of image is degraded by the process of wavelet compression and decompression. Image quality is measured objectively, using peak signal-to-noise ratio or picture quality scale, and subjectively, using perceived image quality. The effects of different wavelet functions, image contents and compression ratios are assessed. A comparison with a discrete-cosine-transform-based compression system is given. Our results provide a good reference for application developers to choose a good wavelet compression system for their application.

2.6 *Two-Dimensional Orthogonal DCT Expansion in Trapezoid and Triangular Blocks and Modified JPEG Image Compression*

Jian-Jiun Ding, Ying-Wun Huang, Pao-Yen Lin, Soo-Chang Pei, Hsin-Hui Chen, and Yu-Hsiang Wang [6]: In the conventional JPEG algorithm, an image is divided into eight by eight blocks and then the 2-D DCT is applied to encode each block. In this paper, we find that, in addition to rectangular blocks, the 2-D DCT is also orthogonal in the trapezoid and triangular blocks. Therefore, instead of eight by eight blocks, we can generalize the JPEG algorithm and divide an image into trapezoid and triangular blocks according to the shapes of objects and achieve higher compression ratio. Compared with the existing shape adaptive compression algorithms, as we do not try to match the shape of each object exactly, the number of bytes used for encoding the edges can be less and the error caused from the high frequency component at the boundary can be avoided. The simulations show that, when the bit rate is fixed, our proposed algorithm can achieve higher PSNR than the JPEG algorithm and other shape adaptive algorithms. Furthermore, in addition to the 2-D DCT, we can also use our proposed method to generate the 2-D complete and orthogonal sine basis, Hartley basis, Walsh basis, and discrete polynomial basis in a trapezoid or a triangular block.

2.7 *Analysis of IMAGE COMPRESSION Algorithm Using DCT and DWT Transforms*

Navpreet Saroya, Prabhpreet Kaur [7]: Image compression means reducing the size of graphics file, without compromising on its quality. Depending on the reconstructed image, to be exactly same as the original or some unidentified loss may be incurred, two techniques for compression exist. Two techniques are: lossy techniques and lossless techniques. This paper presents DWT and DCT implementation because these are the lossy techniques .This paper aims at the compression using DCT and Wavelet transform by selecting proper method, better result for PSNR have been obtained.

Drawbacks: Comparative analysis of various Image compression techniques for different images is done based parameters mean square error (MSE), peak signal to noise ratio (PSNR). DWT gives better results without losing more information of image. Pitfall of DWT is, it requires more processing power. DCT overcomes this disadvantage since it needs less processing power, but it gives less compression ratio. DCT based standard JPEG uses blocks of image. In wavelet, there is no need to block the image[7].

2.8 *New Approaches for DCT-Based Image Compression Using Region of Interest Scheme*

U. S. Mohammed and W. M. Abd-Elhafiez [8] : In this paper, new techniques for the DCT image coding based in pixels classifications are proposed. Two image coding approaches based on the object extraction are presented to study the effect of the object based image coding on the compression quality. Moreover, modification of the traditional JPEG method based on Region-of-interest coding is achieved. In the beginning, the image is subdivided into a block of pixels with block size of NxN. Firstly; the block must be classified as foreground block or background block based on a pre-processing step. The foreground blocks will be compressed via JPEG technique but with significant quantized coefficients and the DC coefficient only from one block in the background is used to code it. The simulation result shows that the proposed technique provides competitive compression performance relative to the most recent image compression techniques.

2.9 *Image Compression Using Discrete Cosine Transform and Discrete Wavelet Transform*

Moh'dAli Moustafa Alsayyh , Prof. Dr. Dzulkifli Mohamad &. Waheeb abu-ulbaa [9] : In this hybrid model we proposed Hybrid technique combination of sundry compression techniques. Image compression is reduce the number of bits required to represent an image without degrading the quality of the image to an unacceptable level. The reduction in file size allows more images to be stored in a given amount of disk or memory space and reduces the time required for images to be sent via the Internet. Storage capacity and the speed of transmission are the two important factors that arise during the heavy duty of multimedia over Internet. The best image quality at a given bit-rate (or compression rate) is the main goal of image compression. we implement lossless technique so our PSNR and MSE will go better than the old algorithms and due to DCT and DWT we will get good level of compression. Hence overall result of hybrid compression technique is good.

Drawbacks: A new compression method which is a combination of two compression schemes DCT, DWT compression. DCT and DWT is very good to cope up compression ratio but as they are lossy techniques so our quality measurement which we are concluded with the help of PSNR is decreasing due to so, further to enhance CR . This concludes that after applying lossy echniques it's better to use lossless too to enhance compression at same PSNR.

2.10 *RGB Image Compression Using Two Dimensional Discrete Cosine Transform*

Vivek Arya, Dr. Priti Singh, Karamjit Sekhon [10]: To addresses the problem of reducing the memory space and amount of data required to represent a digital image. Image compression plays a crucial role in

many important and adverse applications and including televideo conferencing, remote sensing, document, medical and facsimile transmission. The need for an efficient technique for compression of Images ever increasing because the raw images need large amounts of disk space seems to be a big disadvantage during transmission & storage. Even though there are so many compression technique already available- a better technique which is faster, memory efficient and simple surely suits the requirements of the user. In this paper the Spatial Redundancy method of image compression using a simple transform technique called Discrete Cosine Transform is proposed. This technique is simple in implementation and utilizes less memory. A software algorithm has been developed and implemented to compress the given RGB image using Discrete Cosine Transform techniques in a MATLAB platform. In this paper rgb image is compressed up to 70%, 60%, 40% and 20% and optimum results are obtained. The analysis of results obtain has been carried out with the help of MSE (mean square error) and PSNR (peak signal to noise ratio).

2.11 *Retrieval of Images Using DCT and DCT Wavelet Over Image Blocks*

H. B. kekre, Kavita Sonawane [11] : This paper introduces a new CBIR system based on two different approaches in order to achieve the retrieval efficiency and accuracy. Color and texture information is extracted and used in this work to form the feature vector. To do the texture feature extraction this system uses DCT and DCT Wavelet transform to generate the feature vectors of the query and database images. Color information extraction process includes separation of image into R, G and B planes. Further each plane is divided into 4 blocks and for each block row mean vectors are calculated. DCT and DCT wavelet is applied over row mean vector of each block separately and 4 sets of DCT and DCT wavelet coefficients are obtained respectively. Out of these few coefficients are selected from each block and arranged in consecutive order to form the feature vector of the image. Variable size feature vectors are formed by changing the no of coefficients selected from each row vector. Total 18 different sets are obtained by changing the no of coefficients selected from each block. These two different feature databases obtained using DCT and DCT wavelet are then tested using 100 query images from 10 different categories. Euclidean distance is used as similarity measure to compare the image features. Euclidean distance calculated is sorted into ascending order and cluster of first 100 images is selected to count the images which are relevant to the query image. Results are further refined using second level thresholding which uses three criteria which can be applied to first level results. Results obtained are showing the better performance by DCT wavelet as compare to DCT transform.

3. PROBLEM DEFINITION

After study of following paper found drawbacks: DWT is a lossy technique and requires more processing power. After DWT ,it is concluded that DCT enhances compression using same PSNR.

4. CONCLUSION

After study of following papers , we conclude that DCT enhance compression with same PSNR as compared to DWT.

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