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A New Method of Image Compression and Decompression Using Huffman Coding Technic

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ABSTRACT

This paper is intended to enforce image compression technic for better and convenience way of communication and information processing. Since, internet has connected whole world together by means of technology. Everyone is sharing fast and efficient information. Image sharing is also become a popular for social data sharing. Because of the raw images need large amounts of disk space seems to be a big disadvantage during transmission & storage, so that the efficient technique for image compression is needed and will be ever increasing. There so many all-ready present technics for compression. But there is always being a requirement of a better technique which is faster in processing, memory efficient and simple surely suits the user requirements. Here we are proposing the Lossless method of image compression and decompression using a simple coding technique called Huffman coding. This is the simplest technique in implementation and utilizes less memory.

Keywords- Huffman codes, Huffman encoding, Huffman decoding, symbol, source reduction.

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I. INTRODUCTION

The sampling and quantizing a continuous tone picture obtained by digital image requires very large storage space. Suppose, a 24 bit color image with 512x512 pixels will occupy 768 Kbyte storage on a disk, and any other picture twice of this size will not fit in a single floppy disk. Transmitting such an image over network having a 28.8 Kbps modem would take almost 4 minutes. To reduce the amount of data required for representing sampled digital images and therefore reduce the cost for storage and transmission the image compression is very important. Image compression plays a key role in many important applications, which includes image database, image communications, remote sensing (the use of satellite imagery for weather and other earth-resource application). The image(s) which is to be compressed are gray scale with pixel values between 0 to 255. Different techniques are available for compressing images. These are broadly classified into two classes called lossless and lossy compression techniques. No any data loss occurs in lossless Huffman technique. I.e. he reconstructed image from the compressed image is identical to the original image in every sense. Whereas, some image information is lost in lossy compression, i.e. the reconstructed image from the compressed image is similar to the original image but not identical to it. In this work we will use Huffman encoding and decoding. I.e. a lossless compression and decompression through a technique called Huffman coding.

Huffman's algorithm is generating minimum redundancy codes compared to other algorithms. The Huffman coding can be effectively used in compressing text, image and video compression, and also the conferencing system such as, JPEG, MPEG-2, MPEG-4, and H.263 etc. In this technique collects unique symbols from the source image and calculates its probability value for each symbol and then they are sorted based on their probability. Then, from the lowest probability value symbol

to the highest probability value symbol, two symbols combined at a time to form a binary tree. Then, zeros will be allocated to the left node and one to the right node starting from the root of the tree. For obtaining the Huffman code of a particular symbol, all zero and one collected from the root to that particular node in the same order.

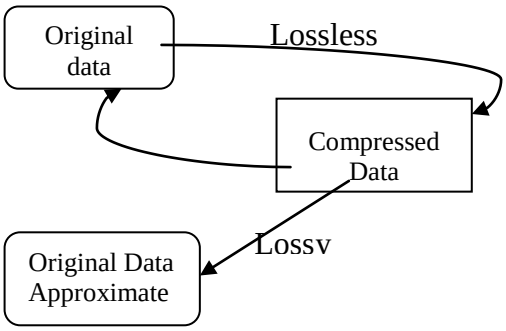

Fig: 1. Traditional image compression technique.

II. LITERATURE SURVEY

The previously published image compression techniques dose not satisfies all the requirements. The pixel domain cannot be stored in the lossy-compression format. The previous technique produces the result but it is not much effective. Following are some previous techniques and their drawbacks.

A. DWT Based Image Compression Techniques

It is wavelet and ridge let based compression methods. It involves the conversion of RGB image to grey scale and is de-noised using Gaussian filter; Discrete Wavelet Transform (DWT) is performed on the de-noised image; Finite Ridge let Transform (FRT) is employed to obtained wavelet coefficients; compressed image of reduced size is obtained; decompression is done by applying Inverse FRT and DWT and the original image is obtained without loss of data. This hybrid image compression technique results in compression of the image in an effective manner without losing data. A combination of wavelet technique with algebraic Generalized Principal Component Analysis (GPCA) that provides compression of multimedia information without reducing its quality. The proposed algorithm is as follows: Load the RGB image; wavelet transform is applied to the image; the approximation co-efficient will be decomposed into a sub-band tree; Hybrid Linear Modelling is performed on the approximation coefficients; Entropy encoding is executed to obtain the compressed image; Reconstruction of the image is done by reverse process. Performance of the proposed method is better than the classic wavelet method and achieves a higher performance. PSNR-values were found to be 15% larger. An image compression using Multi-wavelets in medical applications states that it has better efficiency and the computing complexity is reduced. The steps are: the input image is converted into 256x256; colour image is converted to grey scale; feature extraction is done; input image data is segmented and transformed to a set of features; for decompressed image binary encoding is implemented. The proposed algorithm for image compression using the multi-wavelet transform has inferred that it has educed mean square error is reduced (MSE) and high compression ratio (CR).

B. Hybrid Image Compression Techniques Using

This paper present a scheme for medical image compression based on hybrid compression technique (DWT and DCT). The proposed technique is as follows: Load the RGB image and convert into YC b Cr; to obtain approximate 8x8 coefficient bands apply Forward Discrete Wavelet Transform (FDWT); Perform Forward Discrete Cosine Transform (FDCT) on the image and apply DCT and DWT quantization; Discrete Pulse Code Modulation (DPCM) is implemented to convert the bands into positive values and Variable Shift Coding algorithm is employed; Reconstruction is done by the reverse procedure. Experimental results show that these images preserve its quality where quantization factor is less than 0.5. It uses a hybrid image compression scheme which comprises of three techniques for efficient storage and data delivery. The original color image is converted into luminance and chrominance components. The luminance component is decomposed by one level Daubechies-4 wavelet transform. Lifting wavelet scheme is applied on the chrominance component. DWT based decomposition and lifting scheme were applied on gray scale image. As coarse component has less correlation and detail component has more correlation, Huffman encoder encodes the coarse component with more number of bytes and detail with lesser number and then compressed file is obtained. Performance of the proposed technique is evaluated in terms of Compression Ratio (CR), Bits per pixel (BPP) & Peak Sound to Noise Ratio(PSNR) and is compared with different methods. It is inferred that the proposed technique produces higher compression ratio with lesser bits per pixel for both gray and color images of different sizes. It uses hybrid image compression technique by combining JPEG algorithm and Symbol Reduction Huffman technique to obtain more compression ratio. The methodology involves the following techniques: Input the image to be compressed and divide the source image into 8X8 sub blocks; Convert the divided image into a gray scale level between [-128to 127] and apply DCT on each sub image; The coefficients were quantized and the less significant coefficients are set to zero; Further zigzag ordering is applied and the coefficients of increasing frequency are obtained; Finally, the remaining values are quantized by the proposed entropy encoder. It is inferred that this Hybrid JPEG image compression scheme was found to have 20% more compression ratio than in Standard JPEG image compression.

C. SPHIT Based Compression Techniques

This method included a new image compression scheme by combining Hyper analytical Wavelet Transform (HWT) and Set Partitioning in Hierarchical Tree (SPIHT) which resulted in appreciable increase in PSNR and compression ratio. The proposed algorithm comprises of the following steps: Source image is converted into a hyper analytical image by Hilbert Transform; each component of the image is decomposed into wavelet coefficients by 2D DWT method; Encoding is done by using SPIHT technique to achieve desired compression ratio; Reconstruction of the image is obtained by the reverse process. As a result the combination of HWT and SPIHT produces better quality of reconstructed images when compared with the combination of DWT and SPIHT. It is a technique to achieve high compression ratio by using block based seam carving with hybrid transform and SPIHT algorithm. The stages involved are: The RGB image is input and converted into YCbCr format; Image analysis is performed to extract the Region of interest (ROI); manually define the region and sharpen that ROI region by using filter to give contrast to ROI and high weighing factor is given to ROI is to get high energy value; DWT is performed on the carved images; DCT is applied to the wavelet coefficients; SPIHT is used for coding the transformed coefficients; Recovery of image can be done by applying the reverse process. This method is not only efficient for obtaining high compression ratio but also to obtain images with high quality in given bitrate with less complexity. Also it provides good quality and efficient method to avoid duplication of data with less complexity and storage space.

D. Image Compression Using Neural Networks

This illustrated a wavelet transform and neural network based model for image compression. The demonstrated technique comprises of the following steps: Store a color image of a moderate size; Discrete Wavelet Transform (DWT) is used to decompose the image to obtain approximation coefficients; the coefficient bands are compressed using DPCM and Neural Network techniques; Huffman Coding is performed on the bit stream to obtain the compressed image; Reconstruction is done by the reverse process. This illustrated technique results in improved quality of reconstructed images and eliminates blocking effects associated with DCT. Moreover it can be used in Bar code creation and can also be used in various fields such as space, medical, defense and many more. Decompose the input data into a set of wavelets bands into smooth blocks of side length 1; Non redundancy transformation is achieved by the FRIT; In Finite Rad on Transform(FRAT), 2-D wavelet transform is performed; high-pass filter and a low-pass filter are applied to the approximation bands and smooth partitioning is done on each window; FRIT is performed on each window; hybrid neural network with Back propagation algorithm is carried out on the given input; Reconstruction of the image is done by inversing the process which is previously used. It is observed that proposed algorithm is able to achieve good quality performance with a simple algorithm. Also it does not require complicated bit allocation procedures.

III. Proposed System

The we have created a code in java for Huffman method. Following steps describes working and algorithm for Huffman coding.

a) Input any image (e.g. Jpeg, png, tiff, bmp etc.) by using file view control in java language.

b) Call a function that will Sort or prioritize characters based on frequency count of each characters in file.

c) Call a function that will merge symbols until only two probability will remain

d) According to the prioritized list create a Huffman code tree.

e) Perform insertion sort on the list with the new node.

f) Repeat STEPS 3, 4, 5 UNTIL you only have 1 node left.

g) Perform a traversal of tree to generate code table. This will determine code for each element of tree.

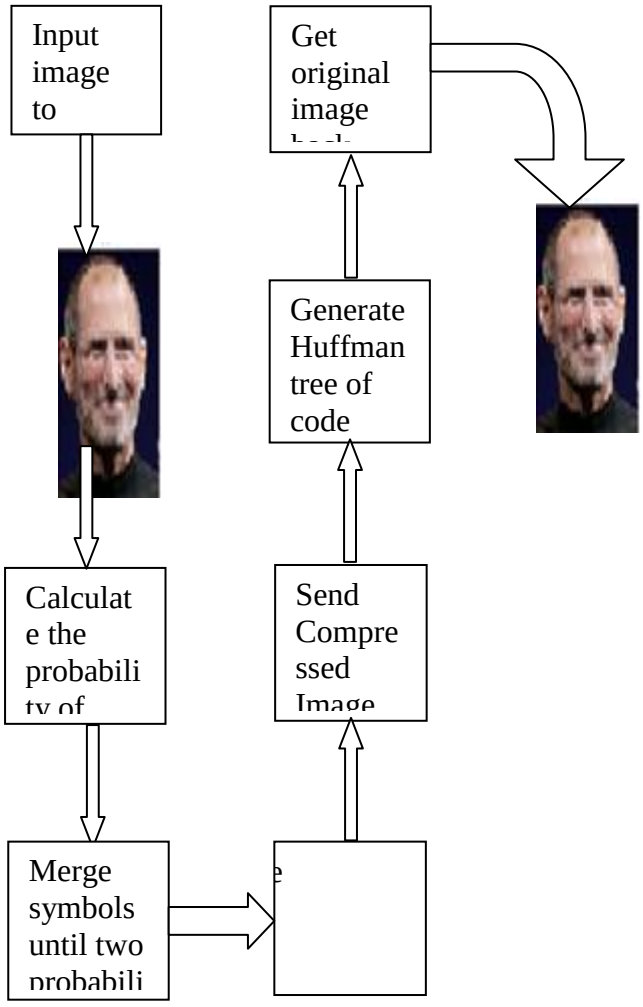

Fig: 2. System Architecture

IV. CONCLUSION

Thus we can conclude that, there are two types of image compression techniques which exist are Lossy and Lossless techniques. Comparing the performance of compression technique is difficult; therefore we use identical data sets and performance measures. Some of these techniques are obtained good for certain applications like security technologies. After study of all techniques it is found that lossless image compression technique is most effective over the lossy compression techniques. Lossy provides a higher compression ratio than lossless.

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