STUDY ON DIFFERENT LOSSLESS IMAGE COMPRESSION TECHNIQUES

Satveer Singh
M.Tech.* CSE Department BABA FARID COLLEGE OF ENGINEERING &TECH
Muktsar Road, Bathinda
satveersinght@gmail.com

Harleen Kaur
Department of Computer science & engineering BABA FARID COLLEGE OF ENGINEERING &TECH Muktsar Road, Bathinda
harleengrover@gmail.com

Abstract
There are several different ways in which image files can be compressed. Compressing an image is significantly different than compressing raw binary data. Image compression addresses the problem by reducing the amount of data required to represent a digital image. The uncompressed image data requires a large storage capacity and transmission bandwidth. The purpose of the image compression algorithm is to reduce the amount of data required to represent the image with less degradation in the visual quality and without any information loss. In a monochrome image, the neighboring pixels are more correlated. The discrete cosine transform (DCT) and wavelet transform are commonly used to reduce the redundancy between the pixels and for energy compaction. The JPEG standard uses the DCT and the JPEG2000 standard uses the wavelet Inter Color Correlation Based Enhanced Color In a color image, correlation exists between the neighboring pixels of each color channel and as well as between the color channels But pixels beyond the neighbor matrix will not match so we will introduce a new method that is based on the image byte streaming and color correlation.

Keywords:- Discrete cosine transform (DCT), wavelet transform, JPEG2000

1. INTRODUCTION

1.1 IMAGE COMPRESSION
Image compression is minimizing the size in bytes of a graphics file without degrading the quality of the image to an unacceptable level.
It is a process intended to yield a compact representation of an image, thereby reducing the image storage/transmission requirements. Compression is achieved by the removal of one or more of the three basic data redundancies:

1. Coding Redundancy
2. Interpixel Redundancy
3. Psychovisual Redundancy

Coding redundancy is present when less than optimal code words are used. Inter pixel redundancy results from correlations between the pixels of an image. Psychovisual redundancy is due to data that is ignored by the human visual system (i.e. visually non essential information). Image compression techniques reduce the number of bits required to represent an image by taking advantage of these redundancies. An inverse process called decompression (decoding) is applied to the compressed data to get the reconstructed image. The objective of compression is to reduce the number of bits as much as possible, while keeping the resolution and the visual quality of the reconstructed image as close to the original image as possible. Image compression systems are composed of two distinct structural blocks: an encoder and a decoder.

\[ f(x,y) \] Encoder Compressed image \( F(x,y) \) Decoder Image \( f(x,y) \) is fed into the encoder, which creates a set of symbols form the input data and uses them to represent the image. If we let \( n_1 \) and \( n_2 \) denote the number of information carrying units (usually bits) in the original and encoded images respectively, the compression that is achieved can be quantified numerically via the compression ratio,

\[ CR = \frac{n_1}{n_2} \]

As shown in the figure, the encoder is responsible for reducing the coding, interpixel and psychovisual redundancies of input image. In first stage, the mapper transforms the input image into a format designed to reduce interpixel redundancies. The second stage, quantizer block reduces the accuracy of mapper’s output in accordance with a predefined criterion. In third and final stage, a symbol decoder creates a code for quantizer output and maps the output in accordance
with the code. These blocks perform, in reverse order, the inverse operations of the encoder’s symbol coder and mapper block. As quantization is irreversible, an inverse quantization is not included.

1.2 IMAGE COMPRESSION TECHNIQUES

The image compression techniques are broadly classified into two categories depending whether or not an exact replica of the original image could be reconstructed using the compressed image. These are:
1. Lossless technique
2. Lossy technique

1.2.1 Lossless compression technique

In lossless compression techniques, the original image can be perfectly recovered from the compressed (encoded) image. These are also called noiseless since they do not add noise to the signal (image). It is also known as entropy coding since it uses statistics/decomposition techniques to eliminate/minimize redundancy. Lossless compression is used only for a few applications with stringent requirements such as medical imaging. Following techniques are included in lossless compression:
1. Run length encoding
2. Huffman encoding
3. LZW coding
4. Area coding
5. Mapper Quantizer

1.2.2 Lossy compression technique

Lossy schemes provide much higher compression ratios than lossless schemes. Lossy schemes are widely used since the quality of the reconstructed images is adequate for most applications. By this scheme, the decompressed image is not identical to the original image, but reasonably close to it.

As shown above the outline of lossy compression techniques. In this prediction – transformation – decomposition process is completely reversible. The quantization process results in loss of information. The entropy coding after the quantization step, however, is lossless. The decoding is a reverse process. Firstly, entropy decoding is applied to compressed data to get the quantized data. Secondly, dequantization is applied to it and finally the inverse transformation to get the reconstructed image.

Major performance considerations of a lossy compression scheme include:
1. Compression ratio
2. Signal - to – noise ratio
3. Speed of encoding & decoding.
Lossy compression techniques includes following schemes:
1. Transformation coding
2. Vector quantization
3. Fractal coding
4. Block Truncation Coding
5. Subband coding.

1.3 BENEFITS OF COMPRESSION
• Less disk space (more data in reality)
• It provides a potential cost savings associated with sending less data over switched telephone network where cost of call is really usually based upon its duration.
It not only reduces storage requirements but also overall execution time.
• It also reduces the probability of transmission errors since fewer bits are transferred.
• It also provides a level of security against illicit monitoring.

2. LITERATURE SURWAY
This section gives the brief descriptions of the existing algorithms for lossless compression.

2.1 LOSSLESS COMPRESSION OF DITHERED IMAGES
Basar koc et al. [1] presents pseudo distance technique (PDT) for dithered images. In order to display high-bit resolution images on low-bit resolution displays, bit resolution needs to be reduced. This problem is vital especially for low-cost or small (mobile) devices. To untangle the bit reduction problem, special color quantization algorithms, called dithering, are employed on high-bit resolution images. The dithering process helps to remedy the problem, but it does not help much in terms of storage and transmission to images. To reduce storage needs and lower data transmission, numerous special compression techniques have been proposed in the last several decades. While the well-known compression algorithms, such as gzip, help lower image tile sizes, usually, they are not adequate. To improve the compression gain, special compression techniques that take into account structure to image data must be developed. In this paper, we show that, when the pseudo distance technique (PDT) is used for dithered images, it yields better compression results than GIF and PNG.

Steps in pseudo distance technique to perform a compression in dithered images. First step is we form a distance matrix d and calculating Euclidean distance between every pair of indices form a color palette (color map table). In each row of d, there may be similar values. Second step is we find out the reference in x y z. Third step is we concluded that predict method than the best predicted of x form its neighbor. Fourth step is we used a procedure in PDT with dynamic. Fifth step is the decoding process reconstructs the original image file. Advantage of PDT technique is we have shown that when the PDT is used in conjunction with a context-model BAC, we obtained better compression result than the well-know image compression such as gif png, jpeg-Ls and jpeg 2000 on dithered images. Disadvantage is this work is not completed because we have further compression gain are possible gains are possible when we update...
one more neighbor of the predicted pixel in PDT matrix.

2.2 LOSSLESS COMPRESSION OF MEDICAL IMAGES USING MULTIRESOLUTION POLYNOMIAL APPROXIMATION MODEL.

Ghadah Al-khafij & Mahmood[2] In this paper, a simple fast lossless image compression method is introduce for compressing medical images, it is based on integrated multiresolution coding along mini polynomial approximation of linear based to decompose image signal followed by efficient coding. The test results indicate that the suggested method can lead to promising performance due to flexibility in overcoming the limitation of restrictions of the model order length and extra overhead information required compared to traditional predictive coding techniques. Steps to work in medical images by using multiresolution polynomial approximation model .First step is load the input uncompressed image .Second step is perform decompose the image into bands or sub bands .Third step is polynomial representation to remove the spatial redundancy embedded on the approximation band. Forth step is create the approximated or predicted image value of low resolution using the estimated polynomial coefficient for each block representation. Fifth step is find the difference between the original low resolution approximated sub band and predicted one . Sixth step is apply entropy encoder on the compressed information using run length code which is passed through huffman coding to remove the rest of redundancy. Seventh is decode the image to take a original form. Advantage of this technique is Imaging it also know as diagnostic image lie at the heart of healthcare. Various medical digital available either in 2d or 3d forms depending on the application such as magnetic resonance, ultrasound, ct, nm, pet, digital subtraction angiography and x –rays images.

2.3 A NEW FRACTROL LOSSLESS COMPRESSION SCHEME FOR MEDICAL IMAGES

Abdesh Singla & Singla [3] Compression is the process of reducing the size of a file or of a media such as high-tech graphical images etc, by encoding its data information more efficiently. By doing this, there is a reduction in the number of bits and bytes used to store the information. Therefore, a smaller file or image size is generated in order to achieve a faster transmission of electronic files or digital images and a smaller space required for downloading. Compression is believed to be an important feature for a coding system meant to be used for medical applications[4], which largely compensates for the eventual loss in compression that could be implied. The medical images like Ultrasound, Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) contains large volume of data. These medical images produce the human body pictures in digital form and due to rapid growth in technology various mobile equipment has been developed for the medical treatments which uses digital medical images so it is very important to reduce the size of medical images. The
efficiency should be very high in medical images because it can cause loss of a life so medical image compression requires negligible information loss. In this paper we have presented a new lossless improved fractal algorithm for compression of medical images. The proposed algorithm improves the compression ratio, time for compression and MSE values. Steps in working this technique. First step is consider the input medical images. Second step is compute the threshold on the input image. Third step is choose the size of the range blocks and domain blocks. Fourth step is revise the above defined threshold. Fifth step is perform hard thresholding on each block in order to obtain the new range block. Sixth step is partition the image into non-overlapping domain blocks and rescale the domain blocks to the size of the range blocks. Seventh step is construct the possible affine transformation of each domain block and compare each range block with the whole domain blocks to find the best match. Eight step is save the location of the domain. Ninth step is continue to do the same for the rest of the range blocks until it reaches the last range block. Tenth step is calculate the mse value. Elavanth step is calculate the psnr. Advantage this technique is the proposed method is tested against pure fractal encoding algorithm, fractal image compression in wavelet domain without threshold and with threshold and spiht compression method. Disadvantage in this technique is more difficult approach to gain a compression because its calculate psnr. Compared other technique is easy to gain a better compression.

2.4 NEAR LOSSLESS COMPRESSION TECHNIQUE FOR BAYER COLOR FILTER IMAGES USING WAVELETS

Lakshami.m &allirani.a[4] Interpolating full-resolution color image from color-filter-array(cfa) samples is Image demosaicing. Bayer pattern is popular among various cfa pattern and demosaicing with bary pattern produce high resolution color images. This, paper presents a new demosaicing approach for spatially sampled image data perceived through a color filter array, and thereby exploiting the correlation of color components for subsampled image reconstruction. the above method is compatible with wavelet-domain denoising before demosaicing, it is also a general framework to apply existing image denoising algorithm in color fine. Compression is through Huffman coding and application of biorthogonal wavelets with the results provide that the purposed method is satisfactory in comparison with other techniques are available in the literature. Steps to work this techniques. First step is take the input cfa image. Second step is divided into low frequency sub band and high frequency sub band. Third step is performed a Huffman encoding. Fourth step is inverse biorthogonal wavelet transform. Fifth step is measure compression ratio & psnr. Advantage this technique is experiment reveal that this method has higher compression performed but only adequate psnr than traditional image compression methods and other compression methods. Disadvantage this technique the method is amenable to wavelet-domain.
denoising before demosaicing and general framework to apply existing image.

3. DISCUSSIONS AND CONCLUDING REMARKS:-

We use bit reference in our image compression technique so there is no way to effect to image for any type of generation of image artifacts. We use array of generic structure for the access the reference of bits which is cost effective and performance effective. So It provides a potential cost savings associated with sending less data over switched telephone network where cost of call is really usually based upon its duration. It not only reduces storage requirements but also overall execution time. In future one can use hash algorithm structure for the reference of the color bytes so that access of color reference may faster than array.

4. REFERENCES

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