"Review the Technique for Lossless Image Compression via Bit-Plane Separation and Multilayer Context"

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Abstract- There are many methods for compressing Lossless Image nowadays and most of them are lossy. However, in many important situations, lossless image compression is irreplaceable. The purpose of this paper is to develop a new lossless image compression algorithm that outperforms the classical lossless image compression methods. In this paper, we review efficient lossless image compression framework with a specific implementation. Under this appraoch, compression performance can be further improved when combined with state-of-the-art image interpolation methods. Finally to study and analysis in comparison reflects the fact that Innovative Lossless Compression Method for Discrete Images produces better consequences in compression when compared to Efficient DCT-Based Image Compression System Based on Combination Model and compare Bit-Plane Separation and Multilayer Context.

Keywords- hyperspectral imagery, lossless compression, integer-coefficient wavelet transforms, hyperspectral data compression.

I. INTRODUCTION

This age of rapid information explosion, digital images as an important media has become more and more important, with billions of new images being produced every day. Uncompressed images require large memory to store them and large bandwidth when transmitting. As a result, image compression becomes an important tool to mitigate this problem. Generally speaking, image compression can be classified into two groups, one is lossy, the other is lossless. Lossy image compression usually achieves very high compression ratio at the cost of image quality degradation. However, there are many cases where this kind of image quality degradation is unbearable, thus lossless image compression becomes the only alternative. Hence it is necessary to research efficient lossless image compression methods. Numerous lossy and lossless image compression techniques have been presented for ordinary images. But, only a few has focused on satellite images. The compression techniques proposed for ordinary images are not applicable to satellite images. Similarly, the image quality assessment metrics for ordinary images are not highly helpful for satellite images. There are two main factors to be considered while developing satellite image compression techniques. There are two principal differences between ordinary and satellite images. Lossy compression is not effective for satellite images as it contains sensitive information. For example, smaller variation in satellite images can lead to more information loss. JPEG standard are not applicable to satellite images. Thus techniques such as JPEG are not well suited to satellite imagery. Image compression is the application of Data compression on digital images. The objective of image compression is to reduce redundancy of the image data in order to be able to store or transmit data in an efficient form. Image compression can be lossy or lossless. Lossless compression is sometimes preferred for artificial images such as technical drawings, icons or comics. This is because lossy compression methods, especially when used at low bit rates, introduce compression artifacts. Lossless compression methods may also be preferred for high value content, such as medical imagery or image scans made for archival purposes. Lossy methods are especially suitable for natural images such as photos in applications where minor loss of fidelity is acceptable to achieve a substantial reduction in bit rate. The lossy compression that produces imperceptible differences can be called visually lossless. Run-length encoding and entropy encoding are the methods for lossless image compression. Transform coding, where a Fourier-related transform such as DCT or the wavelet transform are applied, followed by quantization and entropy coding can be cited as a method for lossy image compression.

The succeeding part of the paper is organized as follows. The state of art techniques is given is Section II. The comparison techniques are explained in Section III. The collected dataset is described and the results are compared in Section IV. The paper is ended with the highlights and suggestions are given in Section V.

II. RELATED WORK

Yu, L., et al[1]In this paper, the principle and data characteristic of the LASIS were briefly presented. A data rearrange method and an OPD band order based on the data characteristic were introduced. The interference information superimposed on the spatial images LASIS data can be separated using the proposed rearrange method. The correlation coefficient map becomes smoother by the band reordering approach. These two approach were employed in the proposed lossless compression scheme combined with the CCSDS-123.

Yamagiwa, S., et al[2] Lossless data compression is emerged to utilize in the BigData applications in the recent days. Especially in a data migration situation such as interconnection networks among IT equipments, the higher data bandwidth like Tbyte/sec for transmitting the data stream in the medium is expected. Although the best way could be increasing the physical bandwidth of the data communication path, we focus on a technique to reduce the data amount transferred by lossless data compression technique.

Ahilan, A., et al[3] This research work proposes PSO and its variants like DPSO and FODPSO for the multilevel thresholding application in abdomen CT medical images for the extraction of ROI. For lossless compression of medical images, classification and blending prediction technique was proposed. The materials and methods describe the data acquisition, variants of PSO algorithm and its parameters tuning. Finally, the algorithms output, performance analysis, and conclusions are drawn.

Toreyin, B. U, et al[4] Compression performances of a selection of integercoefficient DWT filters implemented as spectral decorrelators for on-board lossless hyperspectral image compression purposes is presented. Effect of number of decomposition levels is also investigated. Popular AVIRIS data set is used for benchmarking.

Uthayakumar, J. et al[5] Onboard image compression systems reduce the data storage and downlink bandwidth requirements in space missions. This paper presents an overview and evaluation of some compression algorithms suitable for remote sensing applications. Prediction-based compression systems, such as DPCM and JPEG-LS, and transform-based compression systems, such as CCSDS-IDC and JPEGXR, were tested over twenty multispectral (5-band) images from CCD optical sensor of the CBERS-2B satellite. Performance evaluation of these algorithms was conducted using both quantitative rate-distortion measurements and subjective image quality analysis. The PSNR, MSSIM, and compression ratio results plotted in charts and the SSIM maps are used for comparison of quantitative performance. Broadly speaking, the lossless JPEG-LS outperforms other lossless compression schemes, and, for lossy compression, JPEG-XR can provide lower bit rate and better tradeoff between compression ratio and image quality.

Poolakkachalil, T. K., et al[6] The paper titled An Efficient DCT-Based Image Compression System Based on Laplacian Transparent Composite Model propose an efficient nonpredictive image compression system, where quantization (including both hard-decision quantization (HDQ) and soft-decision quantization (SDQ) and entropy coding are completely redesigned based on the LPTCM. The results of An Innovative Lossless Compression Method for Discrete Color Images show that this method achieved a high compression ratio that in many cases was higher than 95%.

III. PROPOSED METHODOLOGY

The technique by which redundant data are filtered out of an image and a lot of unnecessary space is saved in a limited amount of available storage is known as image compression. There are two common forms of image compression: lossy image compression and lossless image compression. The lossless techniques of image compression are used in situation where even a small amount of noise cannot be tolerated and the exact information without any disruption is needed. Lossy techniques are more commonly used as they do not require the precision of the lossless techniques but work nearly as well. The values of the adjacent pixels of an image do not vary in a large manner so we can coordinate these into a single value. If the image is separated into different spatial blocks according to the pixel values the loss due to the compaction of the adjacent pixel can also be reduced. A novel compression/decompression algorithm is depicted in this research work, which exploits the pixel domain of an image and reduces the redundancy by working in small domains and preserving them. The proposed method provides us with advantages such as fast encoding, high ratio of compression, and simple encoding.Entropy encoding is a kind of coding method that compresses data in a lossless manner. There are some classical entropy encoding methods, e.g., DCT or the wavelet transform , coding, Huffman coding and Arithmetic coding. In our proposed framework, the subcomponents and prediction errors are to be compressed via entropy encoding methods. Hybrid algorithm frequently used for lossless data compression. In our implementation of the proposed compression algorithm, Hybrid algorithm is adopted as the entropy encoding method for its simplicity and efficiency. In our framework, at the decoder, the exact reverse process illustrated in Fig. 1

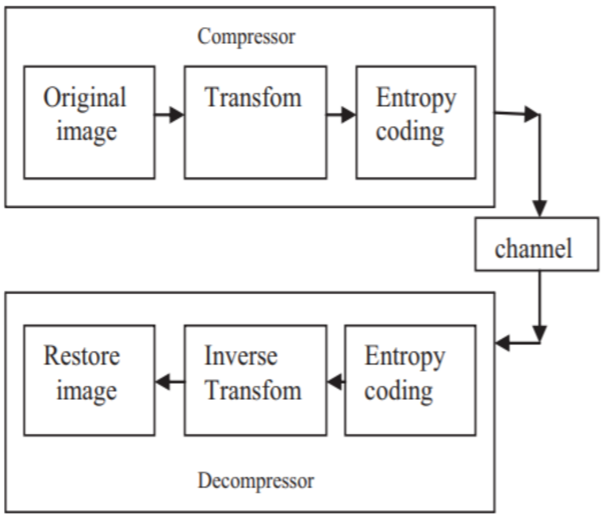

Fig.1: Proposed compression appraoch

Is applied to reconstruct the original image. Also in this appraoch, compression results can be further improved combined with state-of-theart image interpolation methods. However, more elaborate image interpolation methods are often computationally expensive, so we must usually make a compromise between compression performance and computational efficiency in practice usage.

begin

fill view from input

while (view is not empty) do

begin

find longest prefix p of view starting in coded part

i := position of p in window

j := length of p

X := first char after p in view

output(i,j,X)

add j+1 chars

end

end

The algorithm takes any colored image as input. This algorithm provides a very

high compression ratio by compressing the image into a really small size.

Algorithm for Encoding

Step 1: Read the given image.

Step 2: Minimize the pixel value.

• Divide the image into groups by dividing each pixel value by 8.

• For each pixel value divided by 8 find the remainder and store it in place of the old pixel value.

Step 3: Byte compression.

• Left shift the blue component to get it into 2 bits.

• Merge the red, blue, and green components into a single 8-bit value and store it in place of the three components.

Step 4: Block compression using 4 × 4 blocks.

• Take a 4 × 4 block from the matrix.

• Calculate the average of these 16 values.

• Replace the entire block with this average value.

Algorithm for Decoding

Step 1: Read the compressed image.

Step 2: Block decompression.

• Read a pixel from the image.

• Create a 4 × 4 block with each value being the same as that of the pixel read.

• Replace the single pixel with this 4 × 4 block.

Step 3: Byte decompression.

• Read a single value from the new matrix.

• Convert the value into binary.

• Divide the binary value into three parts with bits 1–3 being the first

part, bits 4–6 being the second part, and the remainder as the third part.

• Convert the first part into decimal and store as the new red component, the second part into decimal and store as the new green component, and the third part into decimal and store as the new blue component.

Step 4: Extraction of the actual pixel values.

• Take a pixel value and check to which group it belongs.

• Multiply the group number by 8 and add the pixel value to it.

• Store this value as the decompressed pixel value.

• Continue this for all components.

This paper compared the compression techniques used in Efficient DCT-Based Image Compression System Based on Laplacian Transparent Composite Model and Innovative Lossless Compression Method for Discrete Color Images are better suited for Maps and charts. Based on the study, it has been found that Efficient DCT-Based Image Compression System Composite Model is better suited for traditional images Innovative Lossless Compression Method for Discrete Color Images are better suited for Maps and charts.

IV. CONCLUSION

Modifications on the padding style showed reduction in the error, because it offers a better reproduction of image at its edges. It also supports faithful reproduction of the image, keeping the size of the transform coefficient matrix equal to the image size. The proposed algorithm is a robust and effective compression algorithm for digital images. Although being lossy in nature it shows its effectiveness as it provides simple implementation, and a higher compression ratio than JPEG images in most cases. This algorithm is applicable to color images of different dimensions and sizes giving it a much larger domain in which it can be used. With the recent trend of various multimedia applications and cross-platform media exchange, this algorithm can prove to be really useful to the ever-expanding universe of Internet and media exchange. Selection of this architecture was based on the least area and its better performance in timing and power analysis. The discrete wavelet transform was computed using a customised code to reduce the redundancy and to avoid the needless computation. The transform coefficients obtained after DWT is encoded by exploiting the presence of zero trees to obtain the compressed form of the image. The compressed image was stored using two bit streams namely, flag register and data register which complements each other to represent the image in a compressed form.

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