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Low Complexity, Lossless Compression Algorithm for Binary and Discrete-Color Images

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ABSTRACT:-

There are many different ways in which image files can be compressed. Compressing an image is significantly different than compressing the raw binary data. Image compression addresses the problem by reducing the amount of data required to represents a digital image. The uncompressed image data requires a large storage capacity and transmission bandwidth. The purpose of the lossless image compression technique is to reduce the amount of data required to represents the image with less degradation in the visual quality of the image and without any information loss. In a monochrome image, the neighboring pixels are more correlated the image. The discrete cosine transform are commonly used to reduces the redundancy between the pixels and for the energy compaction. In a color image, correlation exists between the neighboring pixels of each color channels and as well as between the color channels but pixels beyond the neighbor matrix will not match so it introduce the new method that is based on the image byte streaming and color correlation. It exploits the context matching technique to rank the neighboring pixels when predicting a pixel, an adaptive color difference estimation scheme are there to remove the color spectral redundancy when handling red and blue samples, and an adaptive rice coding technique for encoding the prediction residues.

I. INTRODUCTION

Images may be appeal a thousand terminology, but the process usually engage much additional liberty in a hard disk or bandwidth in a diffusion system, than the recognizable foil. Image compression may be loss or lossless. Lossless compression is ideal for the archival purposes and repeatedly for medical imaging, methodological drawings, clip art, or caricatures. The purpose of lossy compression methods, principally when worn at squat bit rates, commence compression artifacts. Lossy methods were particularly suitable for expected images such as photographs in applications where negligible thrashing of commitment is been tolerable to accomplish a generous lessening in bit rate. The lossy compression that produces unnoticeable differences might be called visually lossless. Image compression is a procedure that deals with tumbling the quantity of data mandatory is to symbolize a digital image by removing the superfluous data. It has been used to curtail the size in bytes of the graphics file exclusive of corrupting the excellence of the image to an undesirable intensity. The lessening in the file dimension allows supplementary images to be stored in a specified quantity of diskette or recollection of space. It is also reduces the instant mandatory for images to be sent over the internet or downloaded from web pages. The modeling of stage attempts to characterize the statistical properties of the mapped image data. It attempts to provide accurate probability of estimates to the coding stage, and may even slightly alter the mapped data. By being mindful of higher orders correlation, the modeling stage can go beyond the memory less source model and can provide better compression would be apparent from measuring the entropy of the mapped image data. The symbol coding stage aims to store mapped pixel efficiently, making use of probability estimates from the modeling stage. Symbol coders are also sometimes called statistical coders and entropy coders (because the aim is to represent data using no more storage are allowed by the entropy of the data). Medical image diagnosis that plays a vital

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role now days is to save life and cure diseases and thus usage of medical images have been drastically will be increased. Normally for best quality medical images, spatial as well as color resolutions are increased which consumes more bandwidth to store images. Huffman tree to use is irrelevant. Image compression is the ultimate solution to fulfill the storage requirements. Color medical images Magnetic Resonance Images (MRI) and Computed Tomography (CT) images, Ultrasound images, that result from radiological techniques capture volume acquisitions of images that could have been considered as the succession of the slices. Here any lapse in data leads to a big issue for surgical, diagnostic and the telemedicine application. So a heavy medical data accumulation is essential and the process leads to the requirement of both effective and lossless compression and efficient reconstruction algorithm.

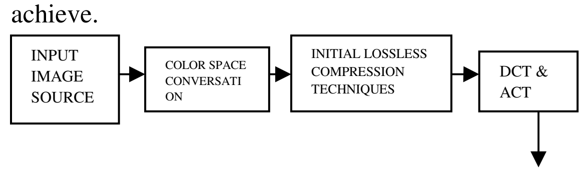
II. PROBLEM STATEMENT

A method reversible lossless spectral-spatial transforms are investigated, that can remove statistical redundancies in both the spectral and spatial domains and discover that a particular wavelet decomposition scheme, called Mallat wavelet packet transform, is ideally suited coding technique is proposed to compress the coefficients of Mallat wavelet packet transform. Lossless compression of color mosaic images poses a unique and interesting problem of spectral decorrelation of spatially interleaved R, G, and B samples. The compression scheme, an alternative approach of compressing color mosaic images directly without deinterleaving the color bands is considered. The strength and weakness of both DPCM (Differential Pulse Code Modulation) and wavelet based lossless coding methods in the above two different approaches are studied. A analysis leads to a new wavelet decomposition scheme that is well suited for lossless coding of bayer pattern mosaic data directly without de-interleaving.

Central to the proposed method in this work is the idea of partitioning a binary image or the bi-level layers of discrete- color image into non-overlapping 8 × 8 blocks. Partitioning binary images into the blocks and encoding them, referred to as block coding, wherein images are divided into blocks of totally the white (0-valued) pixels and non-white (1-valued) pixels. Former blocks are coded by one single bit equal to 0, whereas the latter coded with a bit value equal to 1 followed by the content of the block in a row-wise order. Moreover, the hierarchical variant of a block coding relies in dividing a binary image into b × b blocks (typically, 16 × 16), which are then represented in the quad-tree structure. In this case, a 0-valued b × b block is encoded using bit 0, whereas other blocks are coded with the bit 1 followed by recursively-encoded blocks of pixels with the based case being one single pixel it is suggested that the block coding can be improved by resorting to Huffman coding or by employing context-based models within larger blocks. In the context of discrete-color images, lossless compression methods are generally classified into two categories: (i) methods are applied directly on the image, such as the graphics interchange format (GIF) or the portable network graphics (PNG); and (ii) methods applied on every layer extracted (or separated) from the image, such as TIFF-G4 and JBIG. In this research, we have to focus on the second category. Previous work in literature amounts to several lossless compression methods for the map images based on layer separation. The standard JBIG2, which have to specifically designed to compress bi-level data, employs the context-based modeling along with arithmetic coding to compress binary layers.

III. THE PROPOSED METHOD

Image compression technique is minimizing the size in bytes of a graphics file without degrading the quality of the image to an unacceptable level. In lossless compression techniques, the original image can be perfectly recovered from the compressed (encoded) images. These are also called noiseless since the do not add noise to the signal (image). It is also known as the entropy coding since it use statistics/decomposition techniques to eliminate minimize redundancy. Lossless compression is used only for a few application with stringent requirements such as medical imaging. It not only reduces storage requirements but also the overall execution time. In future one can use hash algorithm structure for the reference of the color bytes so that the access of color reference may faster than array. Image compression techniques reduce the number of bits required to represent an image. Image compression technique using a new method of pixel correlation with DCT is implemented. New technique is used only on JPEG images the compression ratio of the image. It achieves more than 50% compression ratio is without any effect to quality of images as compare to other techniques. There is no neighbor color correlation by which have more efficient image compression will achieve.



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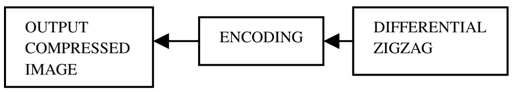

Fig 1. Block Diagram

The final succession of coded output symbol with variable length will be on average smaller than that obtained with fixed length of input symbols. The length of each code word is not identical for all the symbols. the most frequent symbols are coded with short code words, while the most uncommon symbols receive longer binary codes. A lossless compression scheme for bayer CFA images is proposed. The scheme separates a CFA image into the green sub-image and the non-green sub-image and then encodes them separately with predictive coding. The prediction process is carried out in the intensity domains for the green sub-image while it is carried out in the color difference domain. In both cases, the context matching technique is used to rank the neighboring pixels of a pixel for predicting the existing sample values of the pixel. The prediction residues originated from the red, the green, and the blue samples of the CFA images are then separately encoded by using adaptive rice coding technique. Lossy image compression, a new technique of lattice vector quantization is proposed, which is capable of conquering the disadvantages of traditional vector quantization technique. The technique is supposed to reduce the computational time as well as the memory requirement for the picture compression. By employing lossless compression techniques to separate moving objects from stationary backgrounds, the coder optimizes a bit allocation to those areas that are changing most frequently. The ability to selectively encode, decode, and manipulate the individual objects in a video stream and, hence, supports content-based functionalities such as object scalability and object manipulation easily.

The first compression method performs BWT before applying entropy coding stage. Adding BWT process slows down the operation, meanwhile it increases the average compression ratio. However, not all of the tested images improve their compression performances. The process includes a variety of images (such as humans, scenes, animations) with a wide range of complexity. The technique implemented a method by integrating BWT and the entropy coding process into PVRG-JPEG codec. Huffman coding is used in data coding stage. The compression method increases the compression ratio for 15 images out of the 30 test images. The highest performance ratio achieved for the compression method is 88%, which means that the compression method reduces the file size by 12% compared with JPEG.

IV. MODULES & TECHNIQUES

A. Color Space Conversion

Each entry specifies one color using a maximum of 8 bits for each of red, green and blue. The color palette must be built prior to coding and is sent along with the compressed data. The conversion is posits a complex situation involving an alphabet of 264 symbols. Note that images with more than 256 colors cannot be losslessly coded with GIF. The LZW coding is applied directly to the pixel data.

B. Initial Lossless Compression Techniques

The presented predictive and the adaptive lossless image compression algorithm was designed to achieve high compression speed. The prediction errors are obtained using simple linear predictor are encoded using codes adaptively selected from the modified Golomb-Rice code family. Opposed to the unmodified Golomb-Rice codes, the family limits the codeword length and allows the coding of incompressible data without expansion. Lossless techniques compress data without destroying or losing anything during then the process. When the original document is decompressed, it's bit-for-bit identical to the original.

C. DCT & ACT

The general approach to data compression is the representation of the source in digital form with as few bits as possible. The 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. As society has become increasingly reliant upon digital images to communicate visual information, a number of the forensic techniques have been developed to verify the authenticity of digital images.

D. Encoding

Decoder of lossless compression scheme must be able to produce the original image from compressed

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data by the encoder. To ensure the encoder must only make predictions on the basis of pixels whose value the decoder will already know. Therefore, if all past pixels have been losslessly decoded, the decoder's next prediction wills the same as that made by the encoder. Also of importance, is that the encoder and decoder agree to the nature of the variable length coding scheme to be used. The process is easy when a fixed coding scheme is used, but if an adaptive scheme is used, where the meaning of codes change over time, then the decoder must make the same adaptations. An entropy encoder further compresses the quantized values of the lossless to give better overall compression. It uses a model to accurately determine the probabilities for the each quantized value and produces an appropriate code based on these probabilities so that the resultant output code stream.

E. Multi Attribute- Lossless Compression Technique

Image compression technique has been becoming increasingly important with the development of aviation, communications, internet and the space techniques. Especially lossless compression becomes indispensable when there is no loss of information is tolerable such as a medical image, remote sensing, image archiving, and satellite communications and so on. Compression ratio and the bit distortion always contradict each other, so the techniques pursuing for higher compression ratio with less distortion even without the information loss has been one of the popular research issues in image compression. Demosaicing first and the compression first schemes, demosaicing first processing sequence was inefficient in a way that the demosaicing process always introduced a some redundancy which should eventually be removed in the following compression step.

F. Reversible Integer DCT

Discrete Cosine Transform (DCT) is used by JPEG standard for lossy image compression, and lossy standard cannot be lossless because of the round of DCT process. However, some authors have been proposed reversible integer DCT for lossless mode. It employs an encoding technique different from JPEG. It uses the framework of JPEG, and just converts DCT and the color transform to be integer reversible. Integer DCT is implemented by factoring the float DCT matrix into a series of the elementary reversible matrices and each of them is directly integer reversible. The integer DCT integrates lossy and lossless schemes are nicely, and it supports both lossy and lossless compression by the same method. Experiments show that the performance of JPEG with the integer reversible DCT is very close to that of the original standard JPEG for lossy image coding, and more importantly, with integer DCT, it can compress images lossless.

There are many type of run-level coding that have been developed by some authors to increase compression performance. As stated above, the original scheme of BWT used run length encoding zero (RLE0) since GST stage produces runs of zeros. Some authors developed their own RLE0 or other run-level coding to improve compression performance. Run-level coding aims to shrinks long runs of same symbols. Long runs have an important impact for the BWT and also statistical coding performances. The main function of run-level coding is to support the probability estimation of the next stage.

Christo Ananth et al. [6] proposed a system which uses intermediate features of maximum overlap wavelet transform (IMOWT) as a pre-processing step. The coefficients derived from IMOWT are subjected to 2D histogram Grouping. This method is simple, fast and unsupervised. 2D histograms are used to obtain Grouping of color image. This Grouping output gives three segmentation maps which are fused together to get the final segmented output. This method produces good segmentation results when compared to the direct application of 2D Histogram Grouping. IMOWT is the efficient transform in which a set of wavelet features of the same size of various levels of resolutions and different local window sizes for different levels are used. IMOWT is efficient because of its time effectiveness, flexibility and translation invariance which are useful for good segmentation results.

MULTI ATTRIBUTE- LOSSLESS COMPRESSION TECHNIQUE

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compression.The process out of the two approaches, i.e., demosaicing first and the compression first schemes, demosaicing-first processing The sequence was inefficient in a way that the demosaicing process always introduced some redundancy which should be eventually be removed in the following compression step. As a result, an alternative processing sequence which carries out of the compression before demosaicing has been proposed. Under this new strategy, digital cameras can have a simpler design and lower power consumption as a computationally heavy processes like demosaicing can be carried out the process in an offline powerful personal computer. This motivates the demand of CFA image compression schemes.

Image data compression technique is an important component of digital camera design and digital photography. It is more than the process of an issue of storage and bandwidth, but rather to be considered in light of overall system performance and functionality, particularly in a relation to color demosaicing.

V. APPLICATIONS

A. Binary Image

We tested the proposed method on the variety of more than 100 binary images collected from different sources. These images are not part of the frequency analysis process. This new image sample we compiled comprises various topological shapes ranging from the solid shapes to complex, less regular geometries. The empirical results presented here are classified in three categories: the solid binary images, irregular geometries, and images JBIG2 compresses more efficiently than the proposed method.

B. Discrete-Color Images

In addition to the binary images, we tested the proposed scheme on two sets of discrete-color images. The first set consists of the sample of topographic map images consisting of four semantic layers that were obtained from the GIS lab at the University of the Northern British Columbia (Northern, 2009).

VI. RESULT

Original image upload into the input to estimate peak signal noise ratio, mean square estimation and root mean square estimation value. Binary scale mapping the input value to monochrome value. Partitioning a binary image or the bi-level layers of the discrete color images into non-overlapping 8 × 8 blocks. It separate the block of stochastic discrete dynamic system to assemble infinitude of binary images for a determining a precise entropy value.

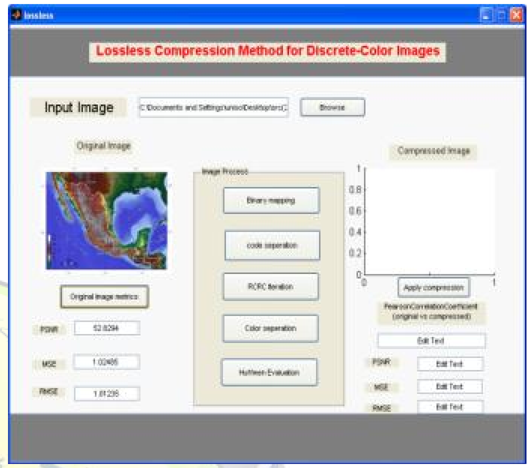

Fig 2. Discrete-Color Image

VII. CONCLUSION

Thus color medical image compression by Curve let transform with lifting and Huffman coding alleviate memory problem by increasing the compression ratio by without degrading its original quality. It works well for variety of images with the different sizes. The proposed method gives higher compression ratio when compared to other compression schemes with the perfect reconstruction quality. It finds applications in telemetry and telemedicine.

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