Image Compression Using DCT, Fractal and Run length Encoding

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Abstract

The color images were preprocessed using median filter.The preprocessed color image is compressed using DCT. Then zigzag process is applied to the DCT coefficients. The zigzag applied DCT coefficients are then decomposed using Quad tree Decomposition.Encoding is applied to the Quad tree Decomposed image using Fractal method and Runlength Encoding method.Thecompressed image is then decompressed by reversing the whole process to the original color image.Finally the performance of the method is measured by calculating the Compression Ratio and PSNR value.

Keywords—median filter,DCT,Zigzagscanning,PSNR,SSIM,Run length encoding.

INTRODUCTION

Compression of the images has many applications in the transmission and reception of Data. The compression of images mainly deals in reducing the pixels in the image. This will be helpful in keep the important informations safe. If the unauthorized person manages to get the image the person will not be able to get any of the information from the image since the image can be decompressed only when the compression algorithm is known.Image compression has many applications in file transfer through mobiles or file transfer between systems since the compression of the images will reduce the time taken for file transfer process.

IMAGE COMPRESSION

The objective of image compression is to reduce irrelevance and redundancy of the image data in order to be able to store or transmit data in anproficient form. Image compression may be lossy or lossless. Lossless compression is chosen for archival purposes and often for technical drawings, medical imaging, comics or clip art. Lossy compression methods, especially when used at low bit rates, introduce compression artifacts. Lossy methods are especially fitting for natural images such as photographs in applications where minor (sometimes unnoticeable) loss of fidelity is acceptable to achieve a substantial decline in bit rate. The lossy compression that generates imperceptible differences may be called visually lossless.

Methods for lossless image compression are:

Lossless data compression is a class of data compression algorithms that allows the original data to be entirely reconstructed from the compressed data. By contrast, lossy data compression, permits renovation only of anapproximation of the original data, though this usually permit for improved compression rates (and therefore smaller sized files). Lossless data compression is used in numerous applications. For example, it is used in the ZIP file format and in the GNU tool gzip. It is also often used as a component within lossy data compression technologies (e.g. lossless mid/side joint stereo preprocessing by the LAME MP3 encoder and other lossy audio encoders).Lossless compression is used in cases where it is important that the unique and the decompressed data be indistinguishable, or where deviations from the original data could be harmful. Most lossless compression programs do two things in progression: the primary step generates a statistical model for the input data, and the next step uses this model to map input data to bit sequences in such a way that "probable" (e.g. frequently encountered) data will fabricate shorter output than "improbable" data.

Mathematical Background

Conceptually, a compression algorithm can be viewed as a task on sequences (normally of octets). Compression is successful if the resulting series is shorter than the original series (and the instructions for the decompression map). For a compression algorithm to be lossless, the compression map must form a bijection between "plain" and "compressed" bit sequences. The pigeonhole principle exclude a bijection between the compilation of sequences of length N and any subset of the collection of sequences of length N−1. Therefore it is not possible to produce an algorithm that reduces the amount of every probable input sequence.

Psychological Background

Most everyday files are relatively 'sparse' in an information entropy sense, and thus, most lossless algorithms a layperson is likely to apply on regular files compress them relatively well. This may, through misapplication of intuition, lead some individuals to conclude that a well-designed compression algorithm can compress any input, thus, constituting a magic compression algorithm.

Methods for Lossy Compression:

In information technology, "lossy" compression is the class of data encoding methods that uses inexact approximations (or partial data discarding) for representing the content that has been encoded. Such compression techniques are used to reduce the amount of data that would otherwise be needed to store, handle, and/or transmit the represented content. The different versions of the photo of the dog at the right demonstrate how the approximation of an image becomes progressively coarser as more details of the data that made up the original image are removed. The amount of data reduction possible using lossy compression can often be much more substantial than what is possible with lossless data compression techniques.

MEDIAN FILTER

In image processing, it is often desirable to be able to perform some kind of noise reduction on an image. The median filter is a nonlinear digital filtering technique, often used to remove noise. Such noise reduction is a typical pre-processing step to improve the results of later processing (for example, edge detection on an image). Median filtering is very widely used in digital image processing because, under certain conditions, it preserves edges while removing noise. The main idea of the median filter is to run throughout the image entry by entry, replacing each entry with the median of neighbouring entries. The pattern of neighbours is called the "window", which slides, entry by entry, over the entire image. For 1D image, the most obvious window is just the first few preceding and following entries, whereas for 2D (or higher-dimensional) images such as images, more complex window patterns are possible (such as "box" or "cross" patterns). Note that if the window has an odd number of entries, then the median is simple to define: it is just the middle value after all the entries in the window are sorted numerically. For an even number of entries, there is more than one possible median.

Source Image　　Median Filtered Image

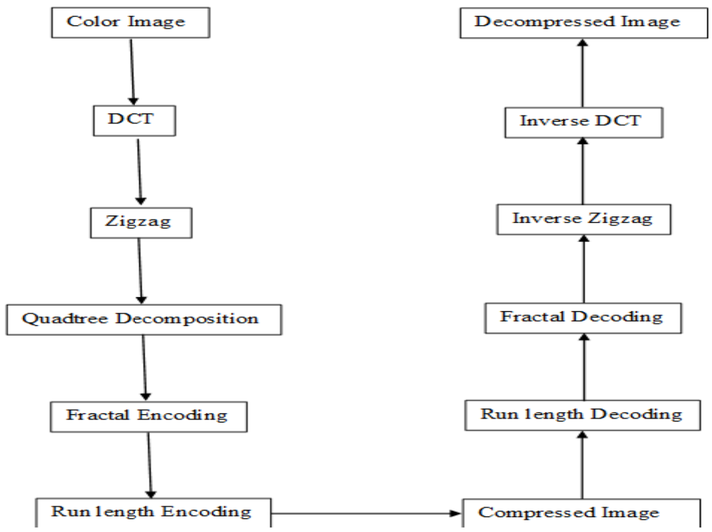
EXISTING SYSTEM

The color images are compressed by applying DCT to each channel (i.e.) the red, green and blue channel of the image.The discrete cosine transform (DCT) represents an image as a sum of sinusoids of varying magnitudes and frequencies.For an image, most of the visually important information about the image is concerted in just a few coefficients of the DCT.The compressed images are then decompressed by applying Inverse DCT inorder to get the original image.DCT compression is followed by Huffman encoding to compress the image. In the decompression process first Huffman decoding is applied and then Inverse DCT is applied to get the original image.A spatial as well as DCT based hybrid gray image demonstration approach was developed to compress the images. In the first phase, the decomposed bin tree of the input gray image has been represented using an S-tree Spatial Data Structure (SDS), according to the bin tree decomposition standard under the specified error. Homogeneous leaves and the non-homogeneous leaves are the two types into which the constructed S-tree SDS leaves have been partitioned. One rectangular or square homogeneous sub image with smooth or in other words low frequency content has been represented using the homogenous leaf whereas, one non-homogeneous sub image with non-smooth or in other words high frequency content has been represented using a non-homogeneous leaf. Thememory requirement has been reduced in the secondphase by encoding each non-homogeneous leaf by theDCT-based coding scheme.

PROPOSED SYSTEM

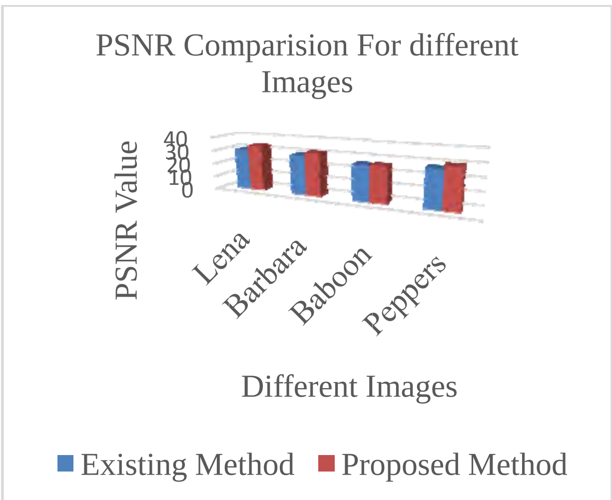
The Red, Green and the Blue channel of the image is separated. Median filter is applied to each channel and preprocessing is done. The filtered three channels are then combined again to get the color image. We mainly concentrate to combine the Fractal and DCT compression process to produce high compression rate for the input images. The compression process can applied in RGB space or YCBR space. The process is done in RGB color space.The compression process is started by compressing the color image using DCT. A discrete cosine transform (DCT) expresses a finite sequence of data points in terms of a sum of cosine functions oscillating at different frequencies. The image is converted into some data points and they were called the DCT coefficients. DCT has to be applied to the three channels of the preprocessed image separately and they have to combine again to view as a color image.Then zigzag process is applied to the DCT compressed image. The Zigzag scanning process exploits the zero components in the DCT coefficients.The Zigzag process has to be applied to the three channels separately and they have to be combined. Quad tree decomposition is then applied to the zigzagged DCT coefficients. Quad tree decomposition partition the zigzagged DCT coefficients by recursively subdividing it into four quadrants or regions. The Quad tree decomposition has to be applied to each channels separately and they have to be combined.Then fractal encoding and run length encoding were applied to the Quad tree decomposed coefficients. The encoded bits were reshaped to be displayed as image. The compression process produces the compressed image.The compressed image is then decompressed by applying the same procedures in reversible manner. The decompression process produces the original color image with less amount of distortion.The compression ratio is measured by calculating the ratio between the sizes the compressed and the original image.The accuracy of the process is measured by calculating the PSNR value between the original and the decompressed image. The obtained performance measures shows that the proposed scheme shows better results comparing to the existing algorithms that uses any of the single compression method to compress the compres the color image.

METHODOLOGY:



EXPERIMENTAL RESULTS:

Graph comparing Existing and proposed system based on the PSNR values obtained for different images used.

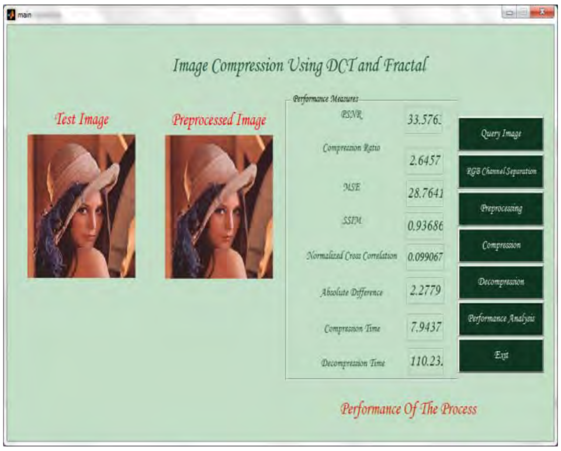


A table showing the obtained PSNR value for existing and the proposed method for different images tested

Table of PSNR value for existing and the proposed method:

Images	Existing Method	Proposed Method
Lena	30.087	33.5763
Barbara	28.965	31.3162
Baboon	25.763	26.4451
Peppers	27.654	29.9558

Screenshot:



CONCLUSION AND FUTURE ENHANCEMENT:

The proposed algorithm compress the input color images using different compression techniques and the color images are decompressed by reversing the compression algorithms.The combination of the different compression algorithms will make the compression more secure and the process can be employed in any of the transmission schemes.The compression ratio calculated describes that the proposed scheme compress the color image in a better way and the calculated PSNR value shows that the proposed scheme reduces the noises in the decompressed image in a better way.The process can be further developed by employing some other compression techniques such as SPIT technique and others.The time taken for the compression and the decompression process can be further reduced by employing some time optimization process.

REFERENCES:

[1] Alfalou A., Elbouz M., Jridi M., and Loussert M., "A New Simultaneous Compression and Encryption Method for Images Suitable to Recognize form by Optical Correlation," in Proceedings of SPIE, Berlin, vol. 7486, pp. 1-8, 2009.

[2] Al-Gindy A., Al-Ahmad H., Qahwaji R., and Tawfik A., "A Novel Blind Image Watermarking Technique for Colour RGB Images in the DCT Domain using Green Channel," in Proceedings of Mosharaka International Conference on Communications, Computers and Applications, Amman, pp. 26-31, 2008.

[3] Al-Gindy A., Al-Ahmad H., and Qahwaji R., Tawfik A., "Watermarking of Colour Images in the DCT Domain using Y Channel," in Proceedings of International Conference on Computer Systems and Applications, Rabat, pp. 1025-1028, 2009.

[4] Ames G., "Image Compression," International Journal of Advancements in Computing Technology, vol. 1, no. 2, pp. 205-220, 2002.

[5] Bovik Z. and Alan C., "A Universal Image Quality Index," IEEE Image Processing Letters, vol. 9, no. 3, pp. 81-84, 2002.

[6] Cabeen K. and Gent P., "Image Compression and the Discrete Cosine Transform," Mathematica Journal, vol. 4, no. 1, pp. 81-88, 2010.

[7] Chung K., Liu Y., and Yan W., "A Hybrid Gray Image Representation using Spatial- and DCT Based Approach with Application to Moment Computation," Journal of Visual Communicationand Image Representation Archive, vol. 17, no. 6, pp. 1209-1226, 2006.

[8] Dorfler P. and Mitra S., "Compression of Color Images without Visible Blocking Artifacts using a Modified DCT Computation Scheme," in Proceedings of International Conference on Image Processing and its Applications, Manchester, vol. 1, pp. 169-173, 2002.

[9] Gershikov E., Lavi-Burlak E., and Porat M., "Correlation-Based Approach to Color Image Compression," Journal in Image Communication, vol. 22, no. 9, pp. 719-733, 2007.

[10] Kesavan H., "Choosing a DCT Quantization Matrix for JPEG Encoding" available at: http://scien.stanford.edu/pages/labsite/1997/ee392c/demos/kesavan/, last visited 2010.