International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2016): 79.57 | Impact Factor (2017): 7.296

Research on Joint Watermarking & Lossless Compression for Image

Bharti Verma[1], Somesh Dewangan[2], Sachin Harne[3]

[1]M.Tech Scholar, CSE, RSRRCET, Bhilai (CG) India

[2]Assistant Professor, CSE Department, RSRRCET Bhilai (CG) India

[3]Assistant Professor, CSE Department, RSRRCET Bhilai (CG) India

Abstract: ***In recent times, the transmission and storage of digital documents/information over the unsecured channel ar huge issues and nearly all of the digital documents ar compressed before they're hold on or transmitted to avoid wasting the information measure necessities. There ar several similar process operations performed throughout watermarking and compression that cause process redundancy and time delay. This demands development of joint watermarking and compression theme for varied transmission contents. during this paper, we tend to propose a way for image watermarking throughout JPEG compression to handle the best trade off between major performance parameters as well as embedding and compression rates, hardiness and embedding alterations against totally different familiar signal process attacks. The performance of the planned technique is extensively evaluated within the sort of peak signal to noise quantitative relation (PSNR), correlation, compression quantitative relation and execution time for various distinct circular function remodel (DCT) blocks and watermark sizes. Embedding is completed on DCT coefficients mistreatment additive watermarking.***

Keywords: Watermarking, Compression, Jpeg, DCT, Quantization, Checkmark attacks

1. Introduction

Image is basically a two Dimensional signal representation in Digital system. Normally Image which we take from the camera is in the analogue form. However for further processing, storage and transmission, images should have to be converted in to its digital form. A Digital Image is 2-Dimensional array of pixels. Basically compression of image is different than compression of digital data. We can use Data compression algorithm for Image compression but the result obtain from that process is less than optimal. Different types of images are used in bio medical, remote sensing and in technique of video processing which require compression for transmission and storage. Compression could be achieved by removing some redundant or extra bits from the image. Consider a dynamical system comprising an information source, which assembles uniformly sized chunks of binary images, and a channel that outputs them. Suppose these chunks resemble mosaic tiles, which when assembled in some way will reproduce and give meaning to the image conveyed by the mosaic. In light of that metaphor, assume that the procedure of generating those image chunks obeys a stationary stochastic process. For every time shift, the distribution of such chunks should remain the same. Consequently, the probabilities may be used to determine the compression terminus for each and every possible binary image that the fictitious source could assemble. An appropriate theoretical compression method could then be devised. This approach would lead to a (quasi-) universal and simple method for compressing binary images. For reasons that will be laid out in Section II, we specified the aforementioned chunks as non overlapping 8×8-bit blocks. It is appropriate to mention that 8×8 blocks have previously been used in to construct local geometrical primitives for a given binary image. In this work, we specify theoretical as well as empirical reasons for choosing non-overlapping 8×8 blocks. In order to construct a large sample of binary images, we considered collecting and partitioning binary images into 8×8 blocks to examine the overall system entropy. Entropy coders, such as Huffman and Arithmetic coding, add to the idea of developing a universal codebook comprising pairs of 8×8 blocks and their Huffman or Arithmetic codes. In order to achieve such a codebook, we constructed a system of binary images randomly collected from different sources and diverse as possible in their pixel representations. Thereafter, we eliminated images that contained salt-and pepper noise. This pre processing proved to be useful in constructing an unbiased codebook. Finally, we studied the relative probabilities of all blocks in the sample and, thus, we calculated the entropy of binary images based on the relatively large sample. We used the probability distribution of 8×8 blocks to construct Huffman and Arithmetic codes for all blocks with absolute frequency greater than 1.

1.1 Need of compression

An Uncompressed image occupies large amount of memory in storage media, and it takes more time to transfer from one device to another. So if we want to transfer or store digital image then we have to compress it first for fast speed of transfer and to store in a less space. Hence compression is very essential for modern multimedia application.

2. Compression Technique

In this paper we study different type of image compression techniques. The image compression techniques are classified into two categories.
A. Lossless compression technique.
B. Lossy compression technique

2.1. Lossless Compression Technique

In lossless image compression algorithm, the original data can be recovered exactly from the compressed data. It is used for discrete data such as computer generated data, text and certain kinds of image and video information. It can achieve only a modest amount of compression of the data and hence it is not useful for sufficiently high compression ratios. Lossless compression is preferred for artificial images such as drawing, comics etc.

2.2 Background and Related Work

Central to the projected technique during this work is that the plan of partitioning a atomic number 83nary image or the bi level layers of discrete-color pictures into non-overlapping 8×8 blocks. Partitioning binary pictures into blocks and encryption them, remarked as block cryptography, has been summarized in, whereby pictures are divided into blocks of wholly white (0-valued) pixels and non-white (1-valued) pixels. the previous blocks are coded by one single bit up to zero, whereas the latter are coded with a small amount price up to one followed by the content of the block during a row-wise order. Moreover, the stratified variant of the block cryptography depends in dividing a binary image into 8x8 blocks (typically, 16x16), that ar then drawn during a quad-tree structure. during this case, a zero-valued 8x8 block is encoded victimization bit 0, whereas alternative blocks ar coded with bit one followed by recursively-encoded blocks of pels with the based mostly case being one single pixel. it's prompt that block cryptography are often improved by resorting to Huffman cryptography or by using context based mostly models inside larger blocks. A hybrid compression technique supported stratified block cryptography is projected. Here, prognostic modelling has been used to construct miscalculation image as a results of the distinction between the expected and original pel values. Then, the error image is compressed victimization Huffman cryptography of bit patterns at very cheap stratified level. This work builds upon the concepts given. whereby block cryptography with Arithmetic cryptography has been used. within the context of discrete-color pictures, lossless compression strategies ar typically classified into two categories:

(i) Methods applied directly on the image, admire the graphics interchange format (GIF) or the moveable network graphics (PNG); and
(ii) Strategies applied on each layer extracted (or separated) from the image, admire TIFF-G4 and JBIG. during this analysis, we tend to concentrate on the second class. Previous add literature amounts to many lossless compression strategies for map pictures supported layer separation.

The quality JBIG2, that is specifically designed to compress bi-level knowledge, employs context-based modelling along side arithmetic cryptography to compress binary layers. In [8], a lossless compression technique supported linguistics binary layers is projected. every binary layer is compressed victimization context-based applied math modelling and arithmetic cryptography, that is slightly completely different from the quality JBIG2. A way that utilizes layer correlation between color separated layers is projected. Context-based modelling and arithmetic cryptography ar wont to compress every layer. associate degree extension of this technique applied on layers separated into bit planes is given in [10]. Moreover, alternative lossless compression standards, admire GIF, PNG, or JPEG-LS ar applied directly on the colour image.

Image compression is that the method supposed to yield a compact illustration of a picture, thereby reducing the image storage and transmission needs by reducing the number of knowledge needed to represent a digital image. each image can have redundant information. Redundancy suggests that the duplication of information within the image. Either it should be continuation pel across the image or pattern, that is recurrent additional oftentimes within the image. The compression happens by taking good thing about redundant data of within the image. Reduction of redundancy provides helps to realize a saving of cupboard space of a picture. compression is achieved once one or additional of those redundancies square measure reduced or eliminated. In compression, 3 basic information redundancies are often known and exploited. Compression is achieved by the removal of 1 or additional of the 3 basic information redundancies.

2.3 Inter Pixel Redundancy

"In image neighbour pixels are not statistically freelance. it's because of the correlation between the neighbor pixels of an image. this kind of redundancy is known as Inter-pixel redundancy. this kind of redundancy is sometime together brought up as abstraction redundancy. This redundancy is also explored in many ways that, one in all that's by predicting a constituent value supported the values of its neighbor pixels. thus on attempt to to so, the primary 2-D array of pixels is often mapped into a definite format, e.g., Associate in Nursing array of variations between adjacent pixels. If the primary image pixels is also reconstructed from the reworked data set the mapping is claimed to be reversible".

2.4 Coding Redundancy

"Consists in practice variable length code words chosen on match the statistics of the primary provide, throughout this case, the image itself or a processed version of its constituent values. this type of cryptography is commonly reversible and generally implemented practice operation tables (LUTs). samples of image cryptography schemes that explore cryptography redundancy unit the Huffman codes and thus the arithmetic cryptography technique".

2.5 Psycho Visual Redundancy

Many experiments on the sick person physical aspects of human vision have verified that the human eye does not respond with equal sensitivity to any or all or any incoming visual information; some things of information unit extra important than others. Most of the image cryptography algorithms in use these days exploit this type of redundancy, cherish the distinct cos transform (DCT) primarily based rule at the middle of the JPEG secret writing traditional.

2.6 Types of Compression:

Compression can be of two types: Lossless Compression, Lossy Compression.

2.6.1 Lossless Compression

In the methodology compression if no data is lost and additionally the particular duplicate of the primary image are going to be retrieved by decompress the compressed image then the compression is of lossless compression kind. Text compression is generally of lossless kind. lossless compression technique are going to be loosely classified in to two classes :

- Entropy based totally Encoding: throughout this compression methodology the rule first counts the frequency of incidence of each constituent inside the image. Then the compression technique replaces the constituents with the rule generated picture element. These generated constituents unit mounted for a definite picture element of the primary image; and doesn't depend on the content of the image. The length of the generated constituents is variable and it varies on the frequency of the sure picture element inside the initial image.
- Dictionary based totally Encoding: This secret writing methodology is in addition observed as substitution secret writing. throughout this methodology the encoder maintain a information structure observed as 'Dictionary'. this will be primarily a group of string. The encoder matches the substrings chosen from the primary constituent and finds it inside the wordbook; if a victorious match is found then the pixles is replaced by a connexion the lexicon inside the encoded file.

2.6.2 Lossy Compression

Lossy Compression is usually used for image, audio, video; wherever the compression method neglects some slighter information. the precise duplicate of the first file can't be retrieved from the compressed file. To decompress the compressed information we are able to get a more in-depth approximation of the first file.

2.6.3 Data Compression Techniques

Various reasonably compression algorithms are planned until date, in the main those rules is lossless algorithm. This paper examines the performance of the Run Length coding rule (RLE), Huffman coding rule and delta rule. Performance of on top of listed algorithms for compression pictures is evaluated and compared.

Proposed Methodology

In previous methodology separate cos remodel (DCT) with additive watermarking was used. DCT coefficients to deal with the optimum trade-off between major performance parameters that embrace embedding strength, compression rate and strength against varied attacks. The additive watermarking is enforced at the time of JPEG compression in 2 completely different ways:

1) Watermarking once getting DCT operation and
2) Watermarking

After quantisation operation. The performance of the tactic is evaluated in terms of PSNR, correlation (robustness), compression quantitative relation, completely different quantisation matrices (Qfactors for DCT), watermark and DCT block sizes. Further, the performance of the watermarking once quantisation is compared with watermarking once DCT. The experimental results are showing that the watermarking once quantisation performs higher in terms of PSNR, correlation and execution time. Further, the performance of the rule is tested with 'Checkmark' attacks.

The main motive of projected rule is to imbed the watermark mistreatment additive watermarking at the time of JPEG compression. the primary drawback is to pick out the situation within the JPEG encoder wherever the watermarking is to be embedded. The potential locations ar once DCT block or once quantisation of the DCT coefficients. The projected rule for additive watermarking at the time of JPEG compression is enforced considering the 2 potential variations (watermarking once DCT or once quantization).

Additive watermarking is lossy watermarking, the foremost easy methodology for embedding the watermark in spatial domain is to feature pseudo random noise pattern to the intensity of image pixels. The noise signal is typically integers like (-1, 0, 1) or generally floating purpose numbers. to confirm that the watermark may be detected, the noise is generated by a key, such the correlation between the numbers of various keys are terribly low. This disadvantage is avoided in current methodology.

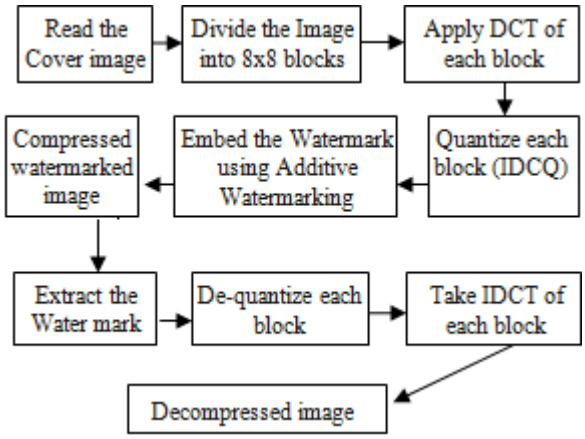

Figure 1: JPEG additive watermarking after quantization operation

We have used Run length encoding (RLE) instead of additive watermarking.

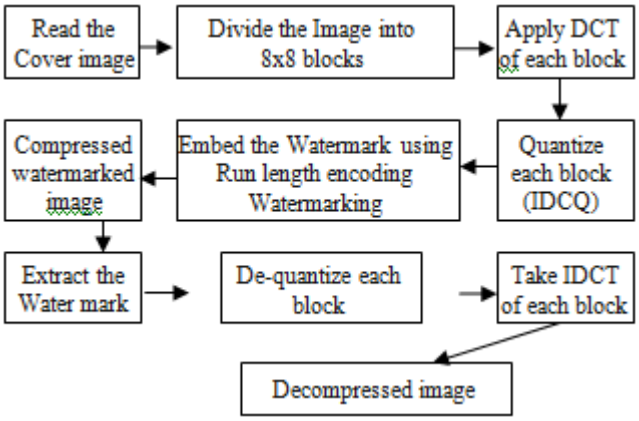

Figure 2: JPEG additive watermarking after quantization operation

Run-length secret writing (RLE) can be a very simple style of lossless info compression throughout that runs of data (that is, sequences throughout that the same info price happens in many consecutive info elements) unit keep together info price and count, rather than as a result of the first run. typically|this can be} often most useful on info that contains many such runs. Consider, let's say, simple graphic photos admire icons, line drawings, and animations. it is not useful with files that don't have many runs as a result of it's going to greatly increase the file size.

The run-length code represents the primary sixty seven characters in only eighteen. whereas the actual format used for the storage of images is usually binary rather than computer code characters like this, the principle remains the same. Even binary info files usually will be|is|may be} compressed with this method; file format specifications usually dictate repeated bytes in files as padding space. However, newer compression methods admire DEFLATE typically use LZ77-based algorithms, a generalization of run-length secret writing that will build the foremost of runs of strings of characters.

3. Result and Discussion

In this paper the performance of the projected joint watermarking and JPEG compression algorithmic program is evaluated in terms of PSNR, correlation (robustness), compression magnitude relation and hardiness against varied checkmark attacks. The quality grey scale cinematographer image of size 256×256 pixels as an imaginative image, watermarked image once DCT method and watermarked image once quantisation method severally. The binary image watermark of size 32×32, extracted watermark once DCT and extracted watermark once quantisation severally. the standard (Q)-factor indicates the standard of decompressed image, high Q-factor reflects finer quantisation and low compression magnitude relation. a decent trade-off between image quality and degree of compression is achieved by choosing letter = fifty. Variation in compression rate is performed simply by dynamical the values of this quality matrix. Performance of the projected joint watermarking and compression algorithmic program is evaluated by variable watermark size, DCT block size, and compression rate in terms of letter issue.

Size of the DCT block is chosen in such a way that every block can implant one pel price of the watermark.

4. Conclusion

The proposed method presented a fusion of watermarking and image compression technique for fast and secure data transmission applications to address the efficient trade-off between major performance parameters including embedding and compression rates, robustness and embedding alteration against different known signal processing attacks. The geometric attacks can't be applied on the compressed watermarked image as JPEG itself is treated as an attack, so any other attack can't be applied on it except noise. The performance of the proposed technique was extensively evaluated in the form of PSNR, correlation, compression ratio and execution time for different DCT blocks and watermark sizes. Further, experimental results demonstrated that the method was robust against JPEG and some Checkmark attacks with acceptable visual quality of the watermarked image and achieved high compression ratios. The suggested methods of data hiding along with compression techniques can be potentially used.

References

[1] Rohini Srivastava, Basant Kumar "Computationally efficient joint imperceptible image watermarking and JPEG compression: a green computing approach" 2017.
[2] Saif alZahir, "An Innovative Lossless Compression method for Discrete-Color Images" 2013.
[3] Yongjian Nian, "Distributed near lossless compression algorithm for hyperspectral images" 2014 .
[4] Walaa Z. Wahba " Lossless Image Compression Techniques Comparative Study" 2016.
[5] Akhand Pratap Singh, "A REVIEW ON LATEST TECHNIQUES OF IMAGE COMPRESSION" 2016.
[6] M. J. Zaki, "Scalable algorithms for association mining," Dalila Goudia, Marc Chaumont, "A Joint JPEG2000 Compression and Watermarking System Using a TCQ-Based Quantization Scheme" 2013.
[7] Jen-Chun Chang,, "A separable reversible data hiding scheme for encrypted JPEG bitstreams" 2017.
[8] Serdar C¸ iftc¸i, Ahmet O˘guz Aky¨uz,, "A Reliable and Reversible Image Privacy Protection Based on False Colors", DOI 10.1109/TMM.2017.2728479 IEEE 2017
[9] Jiaji Wu, "A two-stage lossless compression algorithm for aurora image using weighted motion compensation and ontext-based model" .doi.org/10.1016/j.optcom.2012.10.012
[10] Yongjian Nian, "Lossless and near-lossless compression of hyperspectral images based on distributed source coding" http://dx.doi.org/10.1016/j.jvcir.2014.06.008