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JPEG IMAGE COMPRESSION USING DIFFERENT WAVELET TRANSFORMS ANTI FORENSICS

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ABSTRACT

Image and compression plays a vital role in Medical and Banking purposes.so in this paper we are discussing about image compression using different wavelet transforms and we can also find the compression ratio. There are two methods one is the compression method and another one is the Lifting method. In compression method, there are different types of wavelet transforms they are Haar wavelet, Biorthogonal wavelet, Meyer wavelet, Symlet wavelet etc.. It is already Existing method. Lifting method is a Newly proposed method includes 5/3 & 9/7 wavelet transforms. By using this Lifting method we can get a better compression ratio compared to Existing method. As JPEG is a lossy compression method we can reveal the traces in the compression using Anti- Forensics. So we are using Lifting method to overcome the losses in the compression.

Keywords: Image compression, Wavelet transform, Existing method, Lifting method.

INTRODUCTION

There are two types of compression ,they are lossy compression and lossless compression.For lossless compression we are using this lifting technique. By using existing system we may loss some image while revealing the image,so we are praposing this new method to overcome the loss.If there is any loss in the image we can recover it by using anti forensic technique.The availability of low-cost digital cameras, together with the widespread adoption of multimedia sharing platforms, has made the acquisition and the dissemination of digital images a virtually costless job. For this reason, images have become a popular and easy means to convey information. At the same time, producing photorealistic forgeries of original content has become a rather simple task, even for non professional users. However, in some circumstances they could be used for malicious purposes, e.g., when the doctored images are employed as evidence in courtrooms, or as material for propaganda, etc. In those cases, forgeries may aim at discrediting somebody's reputation or at altering facts to influence the public opinion. In order to limit the hazards connected to misuse of digital images, in the past few years a variety of digital image forensic techniques have been proposed by the forensic community. Differently from *watermarking* or *hashing*, these methods do not rely on extrinsic information embedded into the image at the moment of acquisition, or received by a secure server upon demand. In fact, the questioned image is typically the only source of information available to the forensic analyst. Therefore, forensic techniques analyze the image content in order to find traces left by specific acquisition, coding or editing operations, which could be telltale of malicious tampering. The footprints left by JPEG compression play an important role in detecting possible forgeries, since JPEG is by far the most widely used image compression standard. To achieve lossy compression, a JPEG encoder quantizes each discrete cosine transform (DCT) coefficient of an image to multiples of a quantization step size, specified by the JPEG quantization matrix. When an image is decoded, the distribution of reconstructed DCT coefficients differs from the original, i.e., it exhibits a characteristic comb-like shape, which might reveal the original quantization matrix. This fact enables several forensic analysis tasks, including the identification of which camera took a picture, or the detection of double JPEG compression. Nevertheless, this anti-forensic approach is not exempt from leaving behind traces of its own. In this work, we build on the observation that the anti-forensic dither is a noisy signal which cannot replace the image content lost during quantization.

Types of Image Compression:

There are 2 types of image compression

1. Lossy Compression
2. Lossless Compression

Lossy Image compression:

Lossy compression provides higher levels of data reduction but result in a less than perfect reproduction of the original image. It provides high compression ratio. Lossy image compression is useful in applications such as broadcast television, in videoconferencing, which a certain amount of error is an acceptable trade-off for increased compression performance.

Lossless Image compression:

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It is the only acceptable amount of data reduction. And it provides low compression ratio while ompared to lossy. In which it's inter pixel redundancies are reduced and coding the representation to elimate coding redundancies.

Image Compression Standards:

Some of the Image Compression Standards are:

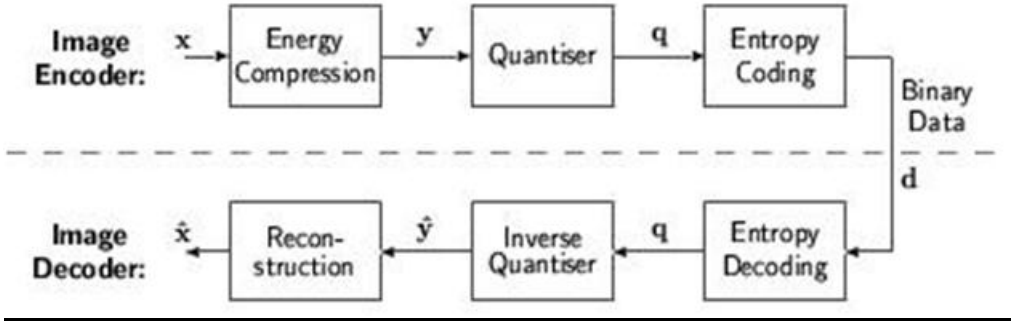
- JBIG1
- JBIG2
- JPEG-LS
- DCT based JPEG
- Wavelet based JPEG2000

JPEG2000 is widely used and standard to support lossy and lossless compression of single-component. The basic compression functionalities are

1) Progressive recovery of an image by fidelity or resolution.
2) Random access to particular regions of an image
3) A flexible file format with provision for specifying capacity information
4) Good error resilience due to its excellent coding performance, In JPEG2000 has a very large potential application base.

The main advantage of JPEG2000 over other standards, first it would addresses a number of weakness in the existing JPEG standard. Second, it would provide a number of new features not available in the JPEG standard

Block Diagram



Different Traditional wavelet Transform:

Haar Transform:

The Haar sequence was proposed in 1909 by Alfred haar (79). Haar used this functions to give an example of a countable orthonormal system for the space of square-integrable functions on the real line. The study of wavelets, and even the term "wavelet",did not come until much later. As a special case of the Daubechies wavelet, It is also known as D2.The Haar wavelet is also the simplest possible wavelet. The technical disadvantage of the Haar wavelet is that it is not continuous, and therefore not differentiable. This property can, however, be an advantage for the analysis of signals with sudden transitions, such as monitoring of tool failure in machines.

Daubechies wavelet:

In general the Daubechies wavelets are chosen to have the highest number A of vanishing moments,(this doesnot imply the best smoothness) for given support width N=2A,and among the 2A-1 possible solutions the one is choosen whose scaling filter has external phase. The wavelet transform is also easy to put into practice using the fast wavelet transform. Deubechies wavelets are widely used in solving a broad range of problems, e.g. self-similarity properties of asignal are fractal problems, signal discontinuities

Biorthogonal Wavelet:

Biorthogonal wavelets extend the families of orthogonal wavelets. It is a well-known fact in the filter theory community that symmetry and perfect reconstruction are incompatible(except for the Haar wavelet) when the same FIR filters are used for decomposition and for reconstruction process. To circumvent this difficulty two wavlets are introduced instead of one.

Coiflet wavlet:

Coifelts are discrete wavelets designed by Ingird Daubechies, at the request of Ronald Coifman to have scaling functions with vanishing moments. The wavelet is near symmetric their wavelet functions have N/3 vanishing moments and scaling functions N/3-1 and has been used in many applications using Calderon-Zygmund Operators. Both the scaling function(low-pass filter) and the wavelet function (High-pass filter)must be normalised by a factor 1/2.below are the coefficients for the scaling functions for C6-30. The wavelet coefficients are derived by reversing the order of the scaling function coefficients and then reversing the sign of

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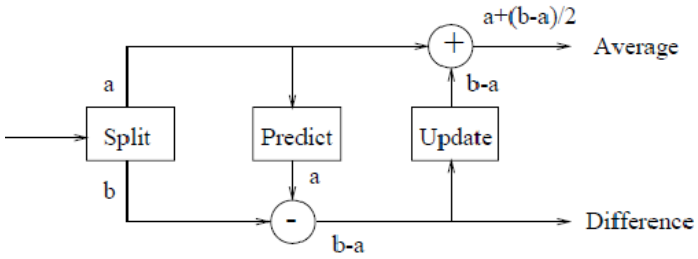
second one. Mathematically, this looks like Bg = (-1)kCN-1-k where k is the coefficient index, B is a wavelet coefficient and C a scaling function coefficient. N is the wavelet index.

Symlet Wavelet:

Symlets constitute a family of almost symmetric wavelets proposed by Daubechies by modifying the construction of the dbN. Apart from the symmetry, the other properties of the two families are the similer. Symlets of order 2 to 8. The idea of construction consists of re-using the mo function introduced fir dbN.considering lmo(w)2 as a function w of the variable z=e. We can module different from 1 go in pairs: if z is a rooy then z is also a root. By constructing U so that its roots are alla of module<1 we construct the Daubechies wavelets dbN. The filetr U has a minimal phase.Another option, attained by optimizing factorization so that the filetr U has an almost linear pahse, production much more symmetric filetrs: the symlets

Lifting scheme Method:



Steps involve in Lifting Scheme Technique

Lifting scheme is a technique for constructing second generation wavelet transform. And it is a method for decomposing Wavelet transforms into a set of stages. There are three stages in lifting scheme method

a) Split step
b) Predict step
c) Update step

In proposed compression system general block diagram is as follows:

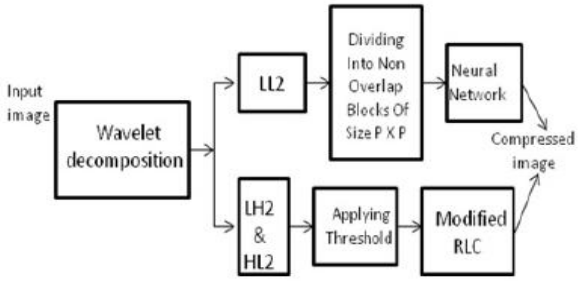


Fig-7: Proposed compression system

Lifting based algorithms using 5/3 and 7/9 wavelet transforms:

The basic principal of the lifting scheme is to break up the poly phase matrices for the wavelet filters into a sequence of the upper and lower triangular matrices and convert the filter Implementation into banded matrix multiplication. The 5/3 wavelet transform is adopted in JPEG2000 standard to implement lossless compression of images, Which can be obtained a by one a stage of lift scheme method.

Algorithm for proposed method:

1. Reading the image from the data base.
2. Applying wavelet on image.
3. Discarding sub bands LH1,HL1, and HH1 of first level and HH2 of second level. Dividing LL2-sub band into non overlapping sub blocks of size p x p.
4. Applying Thershold to LH2 & HL2- sub bands to discard insignificant coefficients.
5. Encode the threshold coefficients using Modified run length coding.
6. Sub blocks of LL2-sub band is given as input to neural network for transform.

Generally the image is first divided into four bands. They are low low low, low high, high low, high high. The compression process only low low band allows and then it again divided into sub bands.

Here , these are four types .The process is continued as compression is done .

1. Mean Square Error
2. signal to noise ratio
3. peak signal to noise ratio
4. compression ratio

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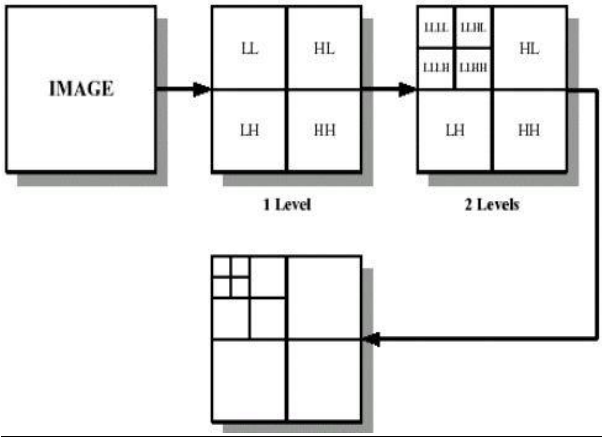
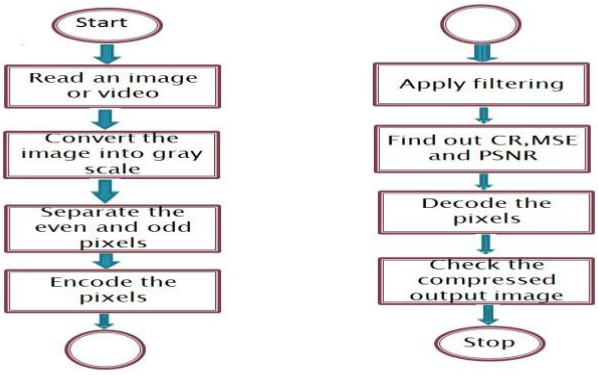
Block Diagram for Image and video compression:



Flow Chart:



Flowchart for image and video compression

Algorithm:

Step1: Read an image or video.

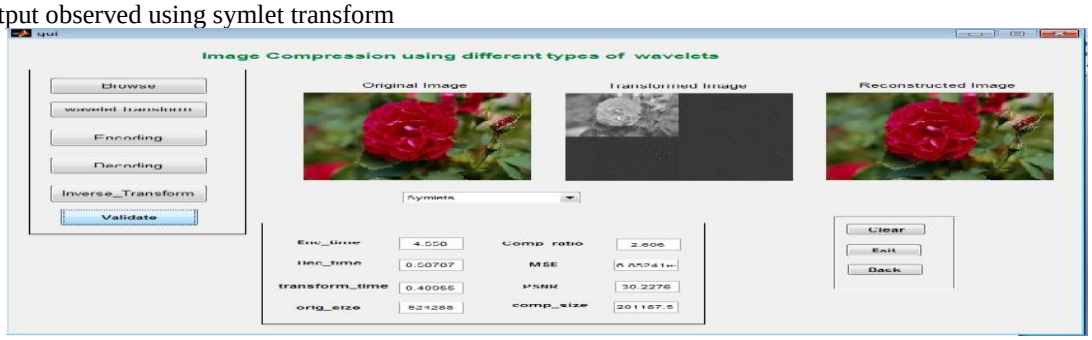
Step2: Convert the image into gray scale.

Step3: Seperate the even and odd pixels of the image.

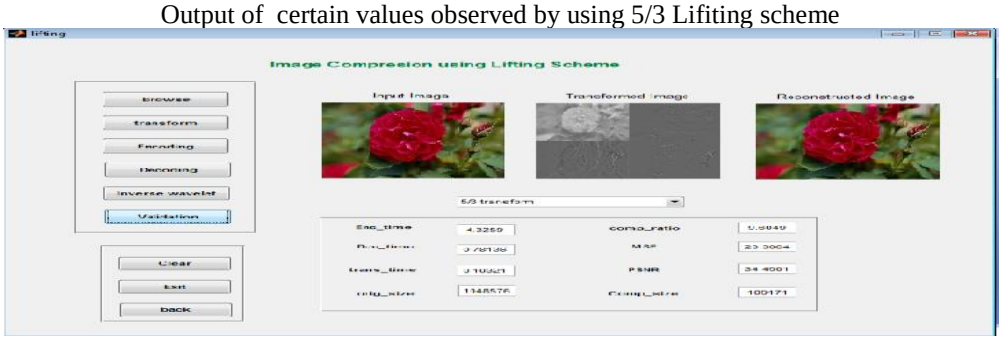
Step4: Encode the odd and even pixels.

Step5: Apply filtering to the pixel.

Output observed using symlet transform



Output of certain values observed by using 5/3 Lifiting scheme



These are values observed by using 9/7 Lifiting scheme

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Adavantages:

- Improves low bit-rate compression performance and continous-tone.
- Improves lossless and lossy compression because able to compress large images.
- Uses single decompression architecture.
- Transimission in noisy environments.
- Protective image Security.

Applications:

- Banking area
- Medical applications
- Industrial applications

CONCLUSION

JPEG quality factor. Future research will investigate the problem of compression anti-forensics in JPEG compression leaves characteristic footprints which can be potentially exploited by the forensic analyst to perform tampering detection, source identification, etc. Recently, it has been shown that an adversary might conceal such foot prints by adding a properly designed dithering noise signal in the DCT domain. Our analysis proves that]removing traces of JPEG compression is more difficult than previously thought. Furthermore, our approach differs from conventional ste no graphic techniques in that specifically uses anti-forencis.

FUTURE SCOPE

The compression algorithm is more time to compress the video. It is used a less date size video,even it taken more time for compression. So it may be used and modified in future.

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