International Journal for Rapid Research in Engineering Technology & Applied Science
ISSN (Online): 2455-4723
Vol 2 Issue 5 June 2016

Sturdy Reversible Watermarking Using Composite Technique With Emboss Filter

Tejaswita Salunkhe*, Chhaya Nayak**,

Computer Science Engineering, RGTU, Indore, Madhya Pradesh, India*
Computer Science Engineering, RGTU, Indore, Madhya Pradesh, India*
pteju147@gmail.com*, chhaya2007@gmail.com**

Abstract: Protection of digital media become unavoidable in today's world. Due to increase in need to secure digital media from unauthorized access, many watermarking techniques are developed in this paper, we propose a new algorithm for color images along with reversible watermarking. With the help of Discrete Wavelet Transform, watermark embedding and extraction is carried out. Along with Emboss Filter, discrete wavelet transform and discrete cosine transform are used as a composite technique to protect the image from illegitimate users. The Watermarked image's quality is enhanced by using a composite technique with Emboss filtering. At last we test proposed algorithm on various images with the performance parameter PSNR .The results authenticate that the proposed algorithm improves the quality of cover image

Keywords: Reversible Watermarking, Discrete Wavelet Transform, Emboss Filter, Discrete cosine transform, PSNR

I Introduction

For distribution of digital media, Internet is the best system. With the increase in use of Internet, Need for transmission and rage of digital images have increased at the same time Intellectual property rights issue arises. Hence for providing authorised access one of the widely used concept is Watermarking. Watermarking is the procedure of embedding a watermark which can be an image or text or binary sequence or a multimedia object into a multimedia data**.**

In this paper, image is used as a digital media. For performing image watermarking, two images required. One image is inserted into another image to protect itself from misuse. The image which is inserted into another image is called the watermark image or the useful information which is to be hidden from unauthorized access. A new concept called as reversible watermarking in which when we extract the watermark we get the host media as it is. The host media is same as it maintains the quality of host media and watermark. Many reversible watermarking methods for various media has been proposed, they assume that transmission channel is lossless.

The main aim of robust reversible watermarking is not only to recover the watermark and host media without distortion but also improve quality of watermarked image. Basically Reversible watermarking methods proposed that can be classified into two groups: Histogram rotation based methods and histogram distribution constrained methods. Histogram Rotation based methods rotates centroid vectors of two random zones in non-overlapping blocks and embeds watermark. Thus it resists attack of JPEG compression with robustness. But at the same time they are vulnerable to noise which results in poor quality of watermarked image. The watermarked image is then go through Emboss filter The quality of the watermarked image is measured by two performance metrics are Mean-Squared Error and Peak Signal-to-Noise Ratio.

1.1 Discrete Wavelet Frequency:

For showing robust results DWT technique is used. At first, DWT filters divides an image into four solution sub bands. These sub bands are denoted as LL, LH, HL and HH. Among these four sub bands, LL band of DWT has greatest magnitude. This LL band describe the coarse level coefficients of image while LH, HL, HH bands describe the finest scale of wavelet coefficients. Due to advantage of greatest magnitude and high resolution edges and patterns of an image are indicated. DWT technique is the most commonly used technique in image watermarking, audio and video watermarking [1].

1.2 Discrete Cosine Frequency:

The image is separated into three frequency coefficients by DCT. These frequency coefficients vary from low, high to middle frequency coefficients. Middle frequency is the best embedding region for sturdy results. Generally

visibility of the image is not affected as the image is embedded in the middle frequency components of discrete cosine frequency. Location of image where watermark is to be embedded is also describe by DCT. Imperceptible results is one of the important characteristic of middle frequency [2]

1.3 Emboss Filtering:

The Emboss filter, turns your image to gray scale and relief is more marked, looking like metal. This is the plugin for MIPF developed to apply an emboss effect to images.

1.4 Performance parameters:

The value of MSE is obtained as:

MSE= $\frac{1}{M\times N}\sum_{i=0}^{M-1} \quad \sum_{j=0}^{N-1}[I(i,j)-K(i,j)]^2$

Where M,N= size of image

i, j= Pixel Co-ordinate

I= Watermarked image

K=Watermarked image after applying Emboss filter

The value of PSNR is obtained as:

PSNR= $10\log_{10}\left(\frac{MAX\ I^2}{MSE}\right)$

Where MAX I= Maximum possible values of image. In this experiment it is taken. It is expressed in terms of logarithmic decibel scale. [8]

Paper is organized as follows. Section II describes related work. The concept of embossing and system architecture is given in Section III. Section IV presents experimental results showing results of images tested. Finally, Section V presents conclusion.

II Related Work

Pitas I and Nikolaidis N, states many kinds of data hiding methods useful for copyright protection. Many spatial domain techniques that work with pixel values of image directly are described by author. Their results shows that frequency domain techniques give better and robust results in comparison with spatial domain watermarking techniques. [3] Ganic, E. and Eskicioglu. described a combination of DWT and SVD techniques. At first DWT technique is applied on original image and image is decomposed into four sub bands. Singular value decomposition is performed on each of the decomposed band after modifying the singular values. The modifications develop the development of the watermarking scheme by displaying robust results on wide range of attacks.[1] Rawat K.S. et.al, presents a review on digital image watermarking methods against piracy of colour images. Different types of watermarks are described in this paper with its applications. The review has proved that the frequency domain methods gave better robustness against spatial domain methods [7] Run R.S. ET. Al, propose two methods with DWT and DCT to improve the reliability and robustness of the watermarked image. The results have proven that this method solve a problem of false positiveness. [4] Divecha N.H. et.al, proposed a hybrid technique with SVD-DWT-DCT. The results have proved that this hybrid technique gives robust watermarked images. The results are taken on the basis of Normalized coefficients as a performance parameter [6].

All this research work have been done on reversible image watermarking gave acceptable results. But this paper concentrates on up quality of watermarked image by victimization impress filter. This paper shows the acceptable values of the PSNR of the watermarked image.

III Proposed Work

In this section the methods used are discussed. Here we introduce technique when image can be inserting into anther image by using concept of watermark without affecting original images. As we know that in medical field, Many times a doctors takes opinions of another expert doctor. For this 1st doctor has to send patients information to 2nd doctor. Here situation may occurs when patient is very important person like Politicians or Bureaucrat. Because of this doctor wants to hides particular patients information. For this reason this system is proposed. The main aim of the system is to develop a system where doctor is sending patients report as watermark in cover image. At the another end doctor 2 retrieves original image and watermark. Here proposed algorithm regarding system.

3.1 Proposed Algorithm

Input: An image I_1 i.e. cover image

An Image I_2 i.e. an image to hide [2]

Output: Image I_w i.e. watermarked image

Image I_e i.e. Watermarked image after applying emboss filter.

Steps:

1. Upload I_1 and I_2
2. Perform watermarking
3. Apply Emboss Filter on Watermarked image.
4. Calculate PSNR value

i) MSE= Mean Squared Error.

MSE= $\frac{1}{M\times N}\sum_{i=0}^{M-1} \quad \sum_{j=0}^{N-1}[I(i,j)-K(i,j)]^2$

Where M,N= size of image

i,j= Pixel Co-ordinates

I= Watermarked image

K=Watermarked image after applying Emboss filter

ii) PSNR= Peak Signal to Noise ratio.

PSNR= $10\log_{10}\left(\frac{MAX\ I^2}{MSE}\right)$

Where MAX I= Maximum possible values of image

5. Show output i.e. I_W and $I_{E\ to}$ user.

3.2 Working of Emboss Filter

Basically Embossing refers to many techniques for creating a raised pattern on material.

Embossing RGB to HIS

$$H= COS^{-1}\left[\frac{0.5[(R-G)+(R-B)]}{\sqrt{(R-G)+(R-B)(G-B)}}\right] \quad (1)$$

$$S=1-\frac{3}{R+G+B}[\min(R,G,B)] \quad (2)$$

$$I=\frac{R+G+B}{3} \quad (3)$$

Emboss method is mainly applied to intensity component. The contrast of Intensity component is reduced.

$$f_{mod}(x,y) = f_I(x,y) \quad (a)$$

intensity component is weighted by parameter, $\alpha<1$

$$f_{I,avr}=\frac{1}{M\times N}\sum_{x=0}^{M-1}\sum_{y=0}^{N-1} f_I(x,y)$$

$$f_{mod,avr}=\frac{1}{M\times N}\sum_{x=0}^{M-1}\sum_{y=0}^{N-1} f_{mod}(x,y) \quad (b)$$

Mean value of original & intensity component.

$$f_{con,}(x,y)= f_{mod}(x,y)+(f_{I,avr}- f_{mod,avr}) \quad (c)$$

Weighted intensity component is shifted by the difference between the mean value. Here embossing is used for getting more accurate results so before continue we look what is the exact concept of embossing.

IV Experimental Results

Consider following example.

Fig 1 Pepper.png

Fig 2 Report.jpg

Here cover image taken is the standard image "Pepper.png". Size of this image is 526 kb with dimension 512×512. Where as watermark to be inserted is "Report.jpg". Size of this image is 483 kb with dimension 1142×1669.

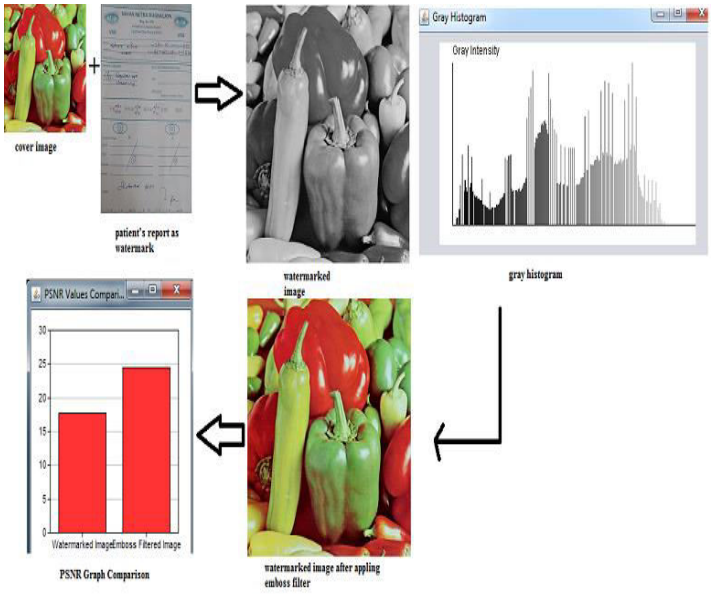

Fig 3.Collective Result of system

In above figure at first cover image and watermark to be inserted is shown. In second step Watermarked image and its gray histogram is shown. In third step watermarked image after applying emboss filter is displayed. At last graph of PSNR values of both images.

V Conclusion

We have implemented a sturdy reversible watermarking method with composite technique of emboss filter. Our algorithm successfully improves quality of Watermarked Image. We have applied our algorithm on many images and found that it successfully improves quality of watermarked image.

References

[1] Ganic, E. and Eskicioglu , A.M, "Robust DWT-SVD Domain Image Watermarking: Embedding Data in all frequencies", in International Journal of Computer Science and Engineering, Vol.1, pp.168-174, 2004

[2] Gunjal B.L and Mali S.N "Secured Colour image watermarking technique in DWT-DCT Domain" in International Journal of Computer Science, Engineering and Information Technology, Vol.1, No.3, pp. 36-44, 2011

[3] Nikolaidis, N and Pitas I, "Digital image watermarking: an overview", IEEE international conference on multimedia computing and systems, Vol. 1, pp.1–6, 1999

[4] Run RS, Horng SJ, Lai JL, Kao TW, Chen RJ,

"An improved SVD-based watermarking technique for copyright protection" in Experts systems with applications, Vol.39, pp-673- 689, 2012

[5] Ji-Hong Kim, Kwang-Eui Lee, and Ki-Ryong Kwon, "A New Embossing Method for Color Images", in International Journal of Computer Science and Network Security, VOL.10 No.2, 2010

[6] Divecha NH and Jani N.N, "Image watermarking Algorithm using Dct, Dwt and Svd", In Proceedings of National Conference on Innovative Paradigms in Engineering & Technology published by International Journal of Computer Applications, pp.13-16, 2012

[7] Rawat KS and Tomar DS, "Digital watermarking schemes for authorization against copying or piracy of colour images" in Indian Journal of Computer Science and EngineeringVol.1 No.4, pp.295-300, 2009

[8] Navnidhi Chaturvedi, and Dr.S.J.Basha, "Comparison of Digital Image watermarking Methods DWT & DWT-DCT on the Basis of PSNR" International Journal of Innovative Research in Science, Engineering and Technology Vol. 1, Issue 2, 2012