

Survey on Digital Watermarking

Jyoti¹, Jyoti Rani²

^{1,2}Computer Science Engineering Department, Giani Zail Singh PTU Campus, Bathinda, India

Abstract: *With the rapid development and wide use of the Internet, information transmission faces a big confront of security. People need a protected and safe way to spread information. Digital watermarking is a procedure of data hiding, which provide security of data. The Digital watermarking method provides the quick and inexpensive distribution of digital information over the Internet. This technique provides new ways of ensuring the adequate security of copyright holders in the rational property dispersion process. The property of digital watermarking images allows insertion of additional data in the image without altering the value of the image. This message is secret in unused visual space in the image and stays below the human visible threshold for the image. This paper presents a watermarking technique which least significant bit (LSB), its steps and its process with matlab images. The benefits of the LSB are its simplicity to embed the bits of the message directly into the LSB plane of cover-image and many techniques using these methods.*

Keywords: Watermarking, spatial domain, frequency domain, spread spectrum, LSB

1. Introduction

The technique digital watermarking is used for extracting the hidden data and to hide the data within the carrier signal. The hidden data can be text, image, audio and video. Such hidden messages are a group of bits describing information pertaining to the signal or the name of the author. The piece of information which we can insert is called watermark which can't be easily known to third person. Digital watermarking is a process which adds the data without change in its visual appearance. A digital watermark can be unique to each copy or common to multiples to many copies. There are many techniques used for security purposes like cryptography, hashing, access control, but for the copyright protection watermarking is the only technique used. It can be visible or invisible watermarks. It is widely used for the security purposes like ownership, copyright protection, authenticity etc.

2. Classification of Watermarking

The classification of Digital Watermarking techniques as:

- Text Watermarking
- Image Watermarking
- Audio Watermarking
- Video Watermarking

Three types of Digital watermarks as follows:

- Visible watermark
- Invisible-Robust watermark
- Invisible-Fragile watermark

3. Techniques of Digital Watermarking

3.1 Frequency Domain Watermarking

In order to produce high quality image in the frequency or transform domain technique by first transmute the real image into the frequency domain by using DCT, DWT and DFT. It is applied to the selected or lower frequencies carry crucial

elements of the real image because high signals will be missed during compression or scaling.

3.2 Spread Spectrum

In the spread spectrum watermark can be applied to the perceptual regions of the data despite the risk of potential fidelity distortions. In this extraction is done without using real unmarked images. Spread spectrum can be used for spatial as well as frequency domain.

3.3 Spatial Domain Techniques

The term spatial domain refers to the aggregate of pixels composing an image. In spatial domain technique the watermark is directly embedded in the pixel values and there is no transformations are done on the host signal. In the pixel domain combination with the host signal is on the basis of simple operations. In this visual imperceptibility is being maintained. The detection of the watermark can be done with expected data from receiving signals. The comparison is done between the original image and watermarked image during the extraction process. The spatial domain process is denoted by

$$G(x,y)=T[f(x,y)]$$

The mainly used algorithm in spatial domain is LSB.

4. LEAST Significant Bit

The simplest algorithm in the spatial domain is the Least Significant Bit (LSB). In the digital image processing, information can be inserted into every bit of image information or the busiest areas of an image can be calculated so as to hide such messages in less perceptible parts of an image. Two techniques were presented to hide the data in the Spatial domain of images from them. These methods were based on the pixel value's LSB modifications. The algorithm proposed by Kurah and McHughes to embed in the LSB and it was known as image downgrading. An example of the less perceptible is Least Significant Bit insertion. During insertion each 8-bit pixel's least significant

bit is overwritten with a bit from the watermark. The process of embedding is easy and effective. It also explains the working of an 8-bit grayscale image and their effects of changing in an image. If we use a grayscale bitmap image which is 8-bit, then we need to read the file and then add data to the least significant bits of each pixel. In a grayscale image each pixel is represented by 1 byte having 8 bits. It can represent 256 gray colors between black which is 0 to the white which is 255. The process of encoding uses the Least Significant Bit of each of these bytes, which is from the bit on the far right side. If data is encoded in only the last two significant bits of each color component it not to be detectable. The human retina having the limiting factor in viewing images. For example, only the least significant bit of each pixel will be used for embedding information. If the pixel value is 148 which is 10010010 in binary and the watermark bit is 1 then the value of the pixel will be 10010011 in binary which is 147 in decimal (change the underlying pixel).

5. Related Work

In this we will look into the review of digital watermarks used for images. It describes the previous work which had been done on digital watermarking using LSB and other technique. Gaurav Bhatnagar et al presented a semi-blind reference watermarking method based on the singular value decomposition (DVT) and discrete wavelet transform (DWT) for authenticity and copyright protection. In the embedding process, their algorithm altered the original image into the wavelet domain and a sub image is formed by using wavelet coefficients and directive contrast.

Hau Luo et al projected a self-embedding watermarking method for digital images. They used the cover image as a watermark in their proposed algorithm. It produces the watermark by halftoning the host image into halftone image, and then the watermark is permuted and embedded in the LSB of the host image. The watermark can be extracted and inverse permuted.

Wen-Chao Yang et al used the Public Key Infrastructure (PKI), Public Key Cryptography and watermark techniques to make a testing and verifying means of digital image. The main design of their paper is to embed encryption watermarks in the least significant bit (LSB) of cover images.

Gil-Je Lee et al undertook a new LSB digital watermarking method by using random mapping function. The main idea behind their proposed algorithm is to embed watermark randomly in the coordinates of the image by using random functions to be more robust than the traditional LSB method.

Saeid Fazli et al proposed a watermarking scheme by using SSIM Quality Metrics. In their algorithm, they used significant bit planes of the watermark image rather than the lower bit-planes of the asset picture.

Baisa L. Gunjal et al, presented a generalized algorithm for DWT, CDMA based, DCT-DWT combined approach. The main idea of them on paper is to concentrate on quality

factors needed for good quality watermarking. In their paper as per IOS norms JPEG2000 DCT is replaced BY DWT.

Abdullah Bamatraf et al, proposed a new LSB based digital watermarking method with the combination of LSB and inverse bit. Their algorithm is also tested using Peak signal-to-noise ratio (PSNR) and the result is compared with traditional LSB and maintains the quality of watermarked image. Their paper also shows the results when combining different positions and the combination between the LSB.

Amit Jain et al, proposed a new LSB digital watermarking technique by using inverse bit. In their algorithm first insert watermark into least significant bit place and then the inverse of least significant bit (LSB), is to insert second least significant bit. Their algorithm is flexible with the length of the watermark text.

Gurpreet Kaur et al, presented an image watermarking using LSB algorithm using two parameters standard deviation and mean. Image watermarking can do either by text is used for secret message or by image is used for secret image. Different parameters are compared like PNSR, MSE, entropy, mean and standard deviation.

6. Conclusion

There are different techniques used in watermarking for security of images. Frequency domain, Spatial domain and spread spectrum. In this paper spatial domain method of the LSB is used for security of images, which is easy and simple and more effective method. The process of the LSB is simple and easy when we use in MATLAB. A different image in MATLAB tells dissimilar process steps and their outcome. In future LSB may also apply on other type of data and test on different type of images.

References

- [1] G. J. Lee, E. J. Yoon, And K.Y. Yoo, "A new LSB based Digital Watermarking Scheme with Random Mapping Function", in 2008 IEEE DOI 10.1109/UMC.2008.33
- [2] Saied, A. Kasmani, Naghsh-Nilchi., "A New Robust Digital Image Watermarking Technique Based on Joint DWT-DCT Transformation", Convergence and Hybrid Information Technology, 2008. ICCIT '08. Third International Conference, Vol. 2, pp: 539-544, Nov. 2008
- [3] S. Fazli, and G. Khodaverdi, "Trade-off between Imperceptibility and robustness of LSB Watermarking using SSIM Quality Metrics" in 2010 IEEE DOI 10.1109/ICMV.2009.68
- [4] L. Robert and T. Shanmugapriya, "A Study on Digital Watermarking Techniques", International Journal of Recent Trends in Engineering, Vol. 1, No.2, pp. 223-225, 2009
- [5] H. Varma, A. Singh, and R. Kumar, "Robustness of Digital Image Watermarking Techniques against brightness and rotation attacks", International Journal of Computer Science and Information Security, Vol.1, 2009

- [6] B. Surekha, Dr GN Swamy, "A Spatial Public image Watermarking", International journal of Security and its Applications, Vol. 5 No.1, January,2011
- [7] Bamatraf, R. Ibrahim and M. N. M. Salleh , "A new Digital Watermarking using LSB and Inverse bit" Journal of Computing, Vol. 3, April 2011, ISSN2151-9617
- [8] M. Kaur, S. Jindal, and S. Behal, "A Study of Digital Image Watermarking", IJREAS ,Vol. 2, pp-126-136February,2012
- [9] D. Chopra, P. Gupta, S. Gaur, and A. Gupta., "LSB based Digital Image Watermarking for Gray Scale Image", IOSR Journal of Computer Engineering, Vol. 1(Sep-Oct. 2012), pp 36-41 ISSN 2278-0661, IBSN 2278-8727
- [10] Preeti Gupta, "Cryptography based digital image watermarking algorithm to increase security of watermark data", International Journal of Scientific & Engineering Research, Vol. 3, September 2012,ISSN 2229-5518
- [11] Singh, S. Jain, and A. Jain., "Digital Watermarking Method using Replacement of Second Least Significant Bit (LSB) with Inverse of LSB", International Journal of Emerging Technology and Advanced Engineering, Vol. 3, February 2013, ISSN 2250-2459, ISO 9001:2008
- [12] Kaur Gurpreet and Kaur Kamaljit, "Implementing LSB on Image Watermarking using Text and Image", International Journal of Advanced Research in Computer and Communication Engineering, Vol. 2, April 2013

Author Profile



Er. Jyoti received the B. Tech degree in Computer Science Engineering from MIMIT, Malout, India in 2012. Now I am doing M.Tech from PTU GZS campus. I have learnt Oracle, SQL server, C++. I have done my major project in ASP.net. During my project I have deal with visual studio and SQL server also.



Er. Jyoti Rani received the B.Tech and M.tech degrees from SLIET Longowal, India and Punjabi University, Ptiala respectively. Her area of specialization is Image Processing. She has a teaching experience of approx 15years.