Dual level Image watermarking Approach and Edge detection technique

Jagwinder Singh
Chitkara University (punjab), India

Mohit Garg
Chitkara University (punjab), India

Abstract--There exists one major problem associated with the distribution of any digital images are the most important issue of the copyright protection and the proof of rightful ownership. To deal with these problems the concept of image watermarking came into existence .In this paper dual level image watermarking technique is used .Canny edge detection technique has been used .Here we used L.S.B technique for multi-level atermarking. quality of image has been checked in the form of psnr and cc values have also been computed.

Keywords: - Image watermark, SVD, Edge detection technology.

I. Introduction

Digital watermarking technology has been playing an important role in protecting copyrights in digital information such as images, audio, and video which can be accurately copied and arbitrarily distributed much more easily. In addition, the availability of powerful image processing tools has also provided opportunities to manipulate and tamper with Digital images for the misuse of intellectual property. Therefore, how to protect the content of digital images for image authentication is an urgent issue.

Over the last few years, the technology of digital watermarking has gained prominence and emerged as a leading candidate that solve the fundamental problems of legal ownership and content authentications for digital multimedia data (e.g. audio, image, video). A digital watermark is a sequence of information containing the owner's copyright for the multimedia data. Watermark is inserted invisibly in another image (host image) so that it can be embedded at later times for the evidence of rightful ownership. Digital image watermarking techniques can be categorized into one of the two domains i.e. spatial and transform according to the embedding domain of the host image. The simplest technique in the spatial domain methods is to insert the watermark image pixels in the least significant bits (LSB) of the host image pixels. Watermarking is more secure and robust in transform domain to the attacks. The information is needed by the detector in the classification of watermarking schemes.

Based on the information required ,there are 3 types of watermarking techniques (i) Non-blind schemes require both the original image and the secret key(s) for watermark embedding, (ii) Semi-blind schemes require the secret key(s) and the watermark bit sequence,(iii) Blind schemes require only the secret key(s).

II. Edge Detection

Edge detection is the method of localizing pixel values or intensity changes. The edge detection has been used by several areas such as segmentation, target tracking and object recognition etc. Therefore, the edge detection is main parts of image processing. There mostly exist several edge detection approaches {Sobel, Prewitt, Roberts and Canny}.These methods have been offered for identifying changes in images. Early methods determined the best gradient operator to detect sharp intensity variations. Normally apply derivative operation on image for identifying edge. Derivative based approaches can be characterized into two sets, specifically first and second order derivative approaches. First order derivative based methods depend on calculating the gradient some directions and merging the result of each gradient. To calculate the value of the gradient magnitude and orientation is estimated using two differentiation masks. Following figure shows the output of applying edge detection technique.

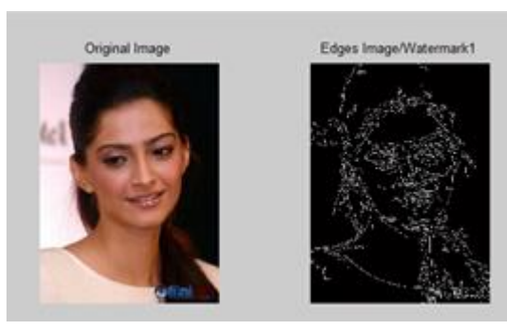

Figure 1: Extracting edges

III. LSB Watermarking

L.S.B technique is used for a grey scale image.It is a simple technique. We use a grey scale 8- bit image .We read in the file and data is added to least significant bits of each pixel. Each pixel is formed of 1 byte consisting 8 bits. The LSB's of each of these bytes is encoded. Since only last two significant bits are encoded , it will not be detectable to human eye.

In the following figure edges of the original image are embedded in the original image using L.S.B technique producing watermarked image 1.

DOI-10.18486/ijcsnt.2015.4.2.07
ISSN-2053-6083

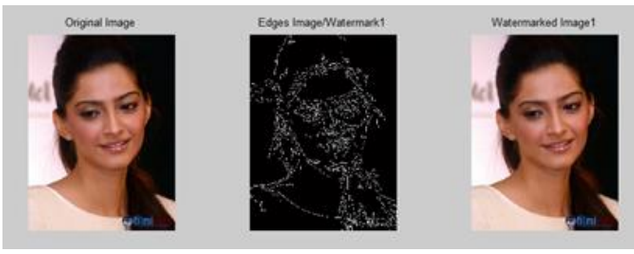

Figure 2: L.S.B Watermarking

IV. Singular Value Decomposition (SVD)

The Singular Value Decomposition is one of the most useful tools of linear algebra with several applications to multimedia which includes Image compression, watermarking and other Signal Processing. Given a real matrix, A (m, n); $1 \leq m \leq M$, $1 \leq n \leq N$, it can be decomposed into a product of three matrices given by equation1.

$$A = USV^{\top} \quad (1)$$

Where U and V are orthogonal matrices,
The main property of SVD based watermarking is that the largest of the modified singular values change very little for most types of attacks like transpose, flip, rotation, scaling and translation.
The diagonal entries of S are called the singular value of A, the columns of U are called the left singular vectors of A, and the columns of V are called the right singular vectors of A. This decomposition is known as the Singular Value Decomposition (SVD) of A.

Following figure shows embedding another image in the watermark image 1 using SVD technique to produce watermarked image 2.

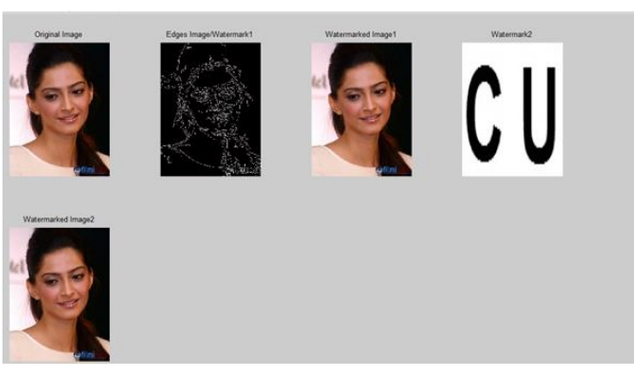

Figure 3: S.V.D watermarking

V. Proposed Watermarking Algorithm

Proposed watermarking algorithm is an improvement over the existing combined approach of LSB –DCT watermarking.

1) Take an image.
2) Apply edge Detection technique on Original Image Using Canny Edge Detection Operator.
3) Take the edges of original image from step no. 2 as watermark1 image.
4) Replace LSB of Original Image by MSB of watermark1 image (edge of original image).
5) Display original image and watermarked1 image.
6) Consider Watermarked1 image as original image for SVD Watermarking
7) Load any other new image as a watermark.
8) Apply SVD Watermarking, to find watermarked2 image.
9) Applying inverse SVD we find watermark2 and original image (watermarked1 image).
10) Apply Inverse of LSB to find watermark1 (edge of original image) and original image.

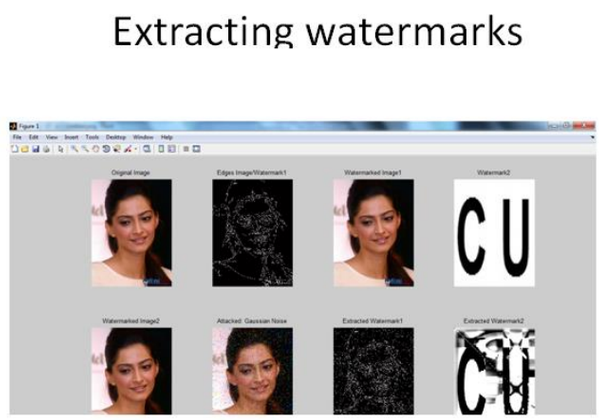

Figure 4: Extracted watermarks

PSNR AND CC VALUES OF THE PROPOSED ALGORITHM

PSNR & CC on applying SVD technique		
PSNR	**68.5833**	**49.6655**
CC	**1**	**0.99923**

VI. Conclusion

In this paper, SVD and edge detection is used for watermarking for the purpose of high authentication of original image and security of image. Mat lab version 7.10.0 tool has been used .Implementation is done using 384*512 image. In this paper, we check quality of image in the form of psnr and cc values have also been computed. Now a day's image watermarking is the largest area of research. In this paper we concentrate only on dual-level image based data security using SVD and edge detection technique on watermarking. In future, we aim to develop an application that removes the effect of noise on cover object and recover watermark image.

Acknowledgment

Thanks to my Guide and family member who always support, help and guide me during my dissertation.

References

[1.] C.Cachin "An Information-Theoretic Model for Steganography", Proceedings of 2nd Workshop on Information Hiding, MIT Lab. for Computer Science (May- 1998).

[2.] R.Gonzalez and Woods, "Digital Image Processing", 1998.

[3.] Q. Zhang, Z.Ji, W. Zhu, J. Lu and Y.-Q. Zhang, "Joint power control and source-channel coding for video communication over wireless," IEEE VTC'01, New Jersey, October 2001

[4.] Mandhani , N.K. (2004), "Watermarking Using Decimal Sequences", Master thesis submitted to the Graduate Faculty of the Louisiana State University, India

[5.] SarajuP.Mohanty, K.R. Ramakrishnan, Mohan Kankanhalli" A Dual Watermarking Technique for Images"

[6.] Baisa L. Gunjal , R.R. Manthalkar" an overview of transform domain robust digital image watermarking algorithms" Journal of Emerging Trends in Computing and Information Sciences, ISSN 2079-8407 Volume 2 No. 1

[7.] Abdullah Bamatraf, Rosziati Ibrahim and Mohd. NajibMohd. Salleh" A New Digital Watermarking Algorithm Using Combination of Least Significant Bit (LSB) and Inverse Bit" journal of computing, volume 3, issue 4, April 2011, ISSN 2151-9617

[8.] Tribhuwan Kumar Tewari, VikasSaxena" An Improved and Robust DCT based Digital Image Watermarking Scheme" International Journal of Computer Applications (0975 – 8887) Volume 3– No.1, June 2010.

[9.] S.S. Bedi, GS Tomar &ShekharVerma, "NPT Based Video Watermarking with non-overlapping Block Matching", Springer-Verlag Berlin Heidelberg Transactions on Computational Science, Vol.11, LNCS 6480, pp. 270 – 292, 2010.

[10.] SOBEL, I., Camera Models and Perception, Ph.D. thesis, Stanford University, Stanford, CA, 1970.

[11.] PREWITT, J., Object Enhancement and Extraction, Picture Processing and Psychopictorics (B. Lipkin and A.Rosenfeld, Ed.), NY, Academic Pres, 1970.

[12.] ROBERTS, L. G., Machine Perception of Three-Dimensional Solids, in optical and Electro-Optical Information Processing (J. Tippett, Ed.), 159-197, MIT Press, 1965.

[13.] CANNY, J., A Computational Approach to Edge Detection, IEEE Transactions on Pattern Analysis and Machine Intelligence, 8, 679-700, 1986.

[14.] ZIOU, D. And TABBONE, S., Edge Detection Techniques - An Overview, Technical Report, No. 195, Dept. Math &Informatique, University de Sherbrooke, 1997.

[15] SOBEL, I., An Isotropic 3×3 Gradient Operator, Machine Vision for Three –Dimensional Scenes, Freeman, H., Academic Pres, NY, 376-379, 1990.

[16] S.S. Bedi, ShekharVerma& G.S. Tomar, "An Adaptive Data Hiding Technique for Digital Image Authentication", International Journal of Computer Theory and Engineering, Vol. 2, No. 3, pp 338-344, June, 2010.