IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 6, June 2016

Technique for Image Watermarking Authentication Using Graph Theory and IWT

Mr. Rohit Singh[1], Mrs. Pancholi Bhavna K[1]

Electrical Engineering, Faculty of Technology and Engineering, Maharaja Sayajirao University of Baroda (MSU), Vadodara, Gujarat, India[1]

Abstract: Digital image watermarking algorithms used to protect the copyright of digital images and to verify multimedia data security. A signature image is embedded inside the host image. The media may be a image file, video file or audio file. Host cover file depends on the size of the information. The watermark embedding mainly divided into two different techniques, one is in spatial domain and another one is in transform domain. There is need to compress the cover image if its size is too large. A uncompressed digital images needs a lot storage capacity and bandwidth, so efficient transmission could not take place easily. The main objective to be consider in watermarking is its robustness and high imperceptibility, due to high imperceptibility viewer can easily read the host image and with robustness image is free from different attacks. In this paper, a transform domain embedding is used for color images. Here, integer wavelet transform is applied to each and every R, G, B planes of the image and then information is embedded separately in R, G, B planes. This method is highly capable, robust and simple.

Keywords: Digital Image watermarking, Integer wavelet Transform, Signature image, Graph Theory, LSB (Least Significant Bit).

I. INTRODUCTION

In a recent year, it becomes a regular need to create copy, transmit and distribute data as a part of widespread multimedia technology with the use of World Wide Web. Hence it is essential to do copyright protection to avoid piracy. Digital image watermarking provides the mechanism for the ownership authentication.

Image watermarking is the process of inserting hidden information in an image by introducing modifications of minimum perceptual disturbance. In contrast, Cryptography is an art of protecting data or information by transforming it into untraceable and unreadable form which is known as cipher text. Only a person, having a secret key is able to decrypt the data into original form or we can say that decipher the message. For higher security purpose we can use combine cryptography with watermarking. Basically we can divide the watermarking into two types – 1) spatial domain 2) Transform domain. Both of them have several data embedding techniques. When data embedded, some additional techniques can be implemented for improving efficiency and reduces the error.

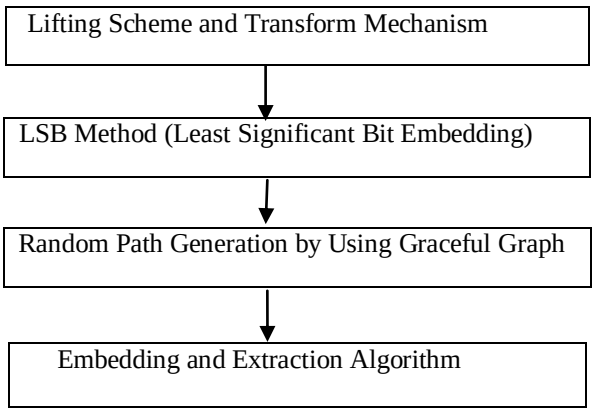
Digital images are defined by using a 2-Dimenetional matrix of the pixel generally gray images have 8 bits per pixel, whereas coloured image have 24 bits per pixel (RGB model). The spatial domain techniques secret data or information is directly merged with the bit of pixels on the cover image. Consequently, these methods are very simple and easy to implement for real time application.

The Least Significant Bit (LSB) is the most commonly used technique in the spatial domain image watermarking. In transform domain, there is various type of watermarking methods available like Discrete Cosine Transform, Visual Watermarking Techniques, Fourier Transform, etc. In this paper, I have used the Integer Wavelet Transform for watermarking and simultaneously I have used Graph Theory for random selection of pixels instead of using raster scanning method.

II. BACKGROUND

A. Haar Integer Wavelet Transform:

Haar integer wavelet transform is a wavelet transform among all of the basic wavelet transform. Wavelet transform have been deriving by using lifting method. General basic flow diagram of this paper as shown below:



We take the image and first decompose it into different level and after that we will analysis which part of image is suitable for doing embedding. Generally, Low Frequency

DOI 10.17148/IJARCCE.2016.5616

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 6, June 2016

(LF) components are generated by average of the integer coefficient and High Frequency (HF) components are generated by differencing method. In the 1st level of decomposition, an image gives Diagonal Coefficient (DC), Approximation Coefficient (AC), Vertical Coefficient (VC) and Horizontal Coefficient (HC). Among all the above coefficients, AC is more sensitive, so the embedding is not done in AA band rest all the other bands DC, VC and HC coefficients contains the edge information. So we can merge more information in these coefficients.

1) Lifting Scheme and Transform Mechanism:

Step I : Take a colour image of size M × N.

Step II: Consider the odd and even column separately and give the name as "OC" for odd column and "EC" for even columns. Now, we will find out High Frequency (HF) and Low Frequency (LF) components of the image. It is understood that the size of HF and LF is M/2 × N/2.

$$HF = OC - EC \quad (1)$$

$$LF = EC - [HF/2] \quad (2)$$

Step III: Now by using LF and HF coefficient we will generate a new matrix of size M × N and give the name "C".

Step IV: Then by using the row and column of this new matrix C and find the values of DC,VC and HC coefficients by using formula as below:

$$HC = LFodd - LFeven \quad (3)$$

$$AC = LFeven - \lfloor LH/2 \rfloor \quad (4)$$

$$VC = HFodd - HFeven \quad (5)$$

$$DC = HFeven - \lfloor HL/2 \rfloor \quad (6)$$

Where,

HFodd - is odd row of the HF,

LFodd - is odd row of the LF,

HFeven -is even row of the HF,

LFeven - is even row of the LF and

⌊ ⌋ - is denotes the Floor value.

B. LSB Method (Least Significant Bit Embedding):

LSB method is one of the very well-known techniques for information or data hiding. By using this technique least significant bits of particular pixels have been altered by changing the bit of secret signature information (data). The quality of host image after merging, by using LSB method depends on how many number of bits to be embedded. Here if move number of bits is embedded then the distortion has been higher in watermarked image.

Also if I have been equally distributed the signature image over the host image and also ensuring that the range of the data value must be preserved in limited range.

Mathematical expression for LSB method is given below:

$$S.I = (C.I - \text{mod}(C.I, 2p)) + S.D \quad (7)$$

$$S.D' = MOD(S.I, 2p) \quad (8)$$

Where,

p - total number of bits to be embedded, consider p=1 then we can say that one bit shall be embedded in C.I.

C.I - Pixel value of host image.

S.I - Pixel value of watermark image.

S.D - Decimal form of the secret data.

S.D' - Decimal form of the extracted watermark image data.

C. Random Path Generation by Using Graceful Graph:

It is basically the study of lines and points. In the graceful graph, we use vertices (V) and Edges (E); in which the set of points are vertices (V) and these points are interconnected to each other by lines. These lines are edges (E) and in graceful graph it is represented by G(V,E). In this paper, the coefficients or the pixels are taken as vertices and consider the transversal path between any two pixel are edges.

Let consider a tree with 'n' vertices, which is gracefully labelled. Here all vertices are been labelled with integer values [1....n].

Basic steps are given below for generating a graceful graph:

Step 1: select the x and y values based on the total number of Edges(E) . So, Total number of Edges is given by x+y.

Step 2: Then, select a number N, consider N=9 **Step 3**: Generate a unique sequence S1. SI sequence is [l+N, 2+N, ... ,x+N].

Step 4: Now, we have to generate a unique sequence S2 by reordering the sequence S1.

Step 5: Consider a sequence S3 that have been satisfied the following conditions.

Condition 1: Sequence should have been started with 9 and ended with 0, it means Decreasing order sequence

Condition 2: Total number of elements in this sequence is 'y'.

Step 6: By using S2 and S3, form a new sequence R2.

Step 7: Develop Rl sequence, and Rl is {1,2, 3, ... ,x+y}.

Step 8: By adding the elements of R2 and R1 generate a sequence R3.

Step 9: By using the R2 and R3 sequence develop the graceful graph.

Fig. 1: R1, R2, R3 Sequence Generation

DOI 10.17148/IJARCCE.2016.5616

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

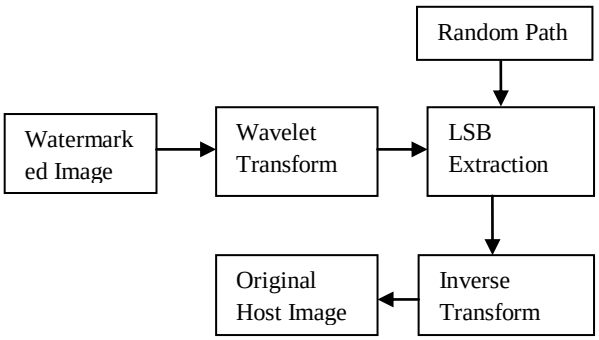
International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 6, June 2016

To develop a graceful graph consider the value of first element of R2 and R3, connect these elements to each other and give it label as 1; graceful graph would been completed when the last label valued is (x+y).
I have applied graceful graph method to the 8×8 image. So, 8×8 random patterns are generated.

Example: Take X = 23, Y = 40 and N = 9, by applying above step we generate R1,R2 and R3 sequences and these sequences is given in below:

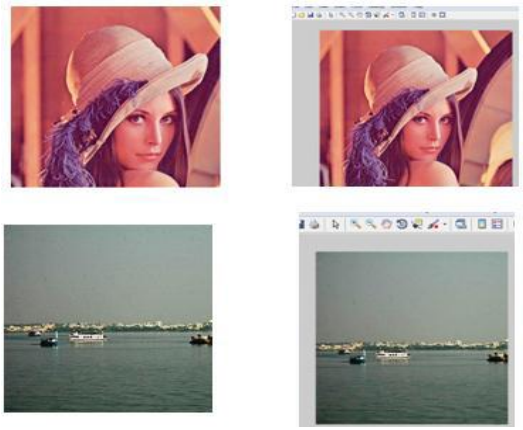
III. EXTRACTION ALGORITHM

Step 1: Receive watermarked image, and let the size of watermarked image be 256 x 256 x 3 pixels.
Step 2: Separate R, G, B planes.
Step 3: Then we can split the entire image in 16×16 blocks (which is non-overlapping).
Step 4: Haar IWT (Integer wavelet transform) is applied to each and every pixels of the 16 x 16 blocks. Wavelet Transformed output of the IWT contains AC 1, HC 1, VC 1 and DC 1 sub-bands, which is first level decomposed output.
Step 5: Now by using random matrix we can extract secret signature data from the integer wavelet co-ordinates.



IV. RESULTS AND DISCUSSION

We have performed many experiments on the image for evaluating the performance of the given algorithm. Here three RGB colour images and one gray scale image had been taken as a cover image for data embedded; all the images are of size 256 × 256. Random binary bit has been considered as a signature image (data) and then they are merged inside the cover image.



MSE (Mean Square Error) and PSNR are used to evaluate the visual quality of the output and also used for analytical performance of algorithm. Result shown in the figures contain group of watermarked images where visual perception is as good we cannot find any distinguish between them. It is for the good observation we have taken three coloured images and one gray scale image.

V. CONCLUSION

In this paper work, A High Imperceptibility, capacity and Robustness are achieved. By using this algorithm we improve MSE and PSNR of a watermarked image. We can even get high hiding capacity by merging more data on particular pixel. Watermarked image is same as the cover host image so we can say that it is a high Imperceptibility. By using random matrix we achieved high Robustness. Here we have used graceful graph method for random path which is less complex then others and also time independent. Above mentioned method can be also applied to the video and hence we will embedded more much information this modification is used for future extension.

REFERENCES

[1] Adnan M. Alattar, "Reversible watermark using the difference expansion of a generalized integer transform", IEEE Trans. On Image Processing, vol. 13, no.8, Aug, 2004.
[2] Daubechies I. "The wavelet Transform, time-frequency localization and signal analysis". IEEE Transactions on Information Theory. 1990; 36:961–1005.
[3] Bender, W., Gruhl, D., Morimoto N., & Lu, A., "Techniques for data hiding", IBM System Journal, vo1.35 Nos.3&4, pp. 313-336, 1996.
[4] S. Bhattacharya, T. Chattopadhyay, and A. Pal, "A survey on different video watermarking techniques and comparative analysis with reference to h.264/avc," in IEEE Trans. on Image processing , June 2006, pp.73-78.
[5] H. Ren-Junn, K. Chuan-Ho, and C. Rong-Chi, "Watermark in color image," Proceedings of the first International Symposium on Cyber Worlds, pp. 225-229,2002
[6] Chang, and Zhang, "Fuzzy-ART based adaptive digital watermarking scheme," iEEE Trans. on Circuits and Systems for Video Technology Vol. 25, No.1, pp.65-81, 2005.
[7] S. Mabtoul, E. Tbn-Elhaj and D. Aboutajdine, "A blind chaos-based complex wavelet domain image watermarking technique," International Journal on Computer Science and Network Security, Vol.6, No. 3, March 2006
[8] S. Poljak and M. Sura, "An algorithm for graceful labeling of a class of symmetrical trees", Ars Combin.,14 (1982) 57-66.

Copyright to IJARCCE
DOI 10.17148/IJARCCE.2016.5616