

Transformation of Image Using Wavelet Transform for Image Watermarking of Text in Binary Images

¹Himani Bhardwaj, ²Sunita Chaudhary, ²Meenu Dave, ¹Neha Goswami and ¹Amit Sanghi

¹Department of Computer Science and Engineering,
Marudhar Engineering College, Bikaner, India

²Department of Computer Science and IT, Jagannath University, Jaipur, India

Abstract: DWT and DCT compress the image and generates a decomposed image use of those decomposed band has been demonstrated in this study of watermarking. Image watermarking is important for transmission of secret data over communication channel. DWT ensures the security, however, text hiding is slightly different and uses the transformation the other way round and hence enhances the complexity and also, the dissolving capacity of the cover image as now the text data range gets equivalent to the image data range hence it gets settle down easily, on the other hand the secrete image still uses the DWT technique to get its range altered and hence, the images gets settled down easily without revealing any information.

Key words: DWT, DCT, images, security, transformation, capacity

INTRODUCTION

Digital watermarking is tactics which provides security to multimedia content like image, text, video and audio. In this technique, information embedded in digital content and use some algorithm for watermark procedure. In this we use two phase of watermark embedding and extraction, extraction is the reverse process of embedding algorithm (Van Schyndel *et al.*, 1994). So, in this study to achieve high robustness we are using combine image and text within an image using transform based techniques. We use transform based techniques because it gives good result than spatial domain (Yumin *et al.*, 2006). Watermarks with combine image and text enhances the text security and gives robustness. So, for better robustness, it is best way to use mutual image and text watermark (Kai *et al.*, 2008).

MATERIALS AND METHODS

Watermarking technique based on two domains spatial domain and transformation domain. Spatial domain algorithms are LSB, SSM and modulation based. Transformation techniques are better than spatial domain they are more robust than spatial. In this study we are discussing about frequency domain transformation. In this frequency domain, the watermark is embedded into

frequency factors of cover image. Frequency domain watermarking is extra robust than spatial domain watermarking because embedding of watermark into the altered frequency coefficients of the transformed image (Kougianos *et al.*, 2009). Frequency domain watermarking techniques are Discrete Fourier Transform (DFT), Discrete Cosine Transform (DCT) and Discrete Wavelet Transform (DWT).

Watermarks with both image and text upturn the text security and provide good robustness. So, for good robustness, this is better way to use combined image and text watermark (Kai *et al.*, 2008).

Discrete wavelet transforms: Discrete Wavelet Transform (DWT) is transformation tool which decomposes an image. Wavelet transformation provides both frequency and spatial description. This study defines suitability of DWT for image watermarking. This domain splits an image into three ways horizontal, vertical and diagonal (Mehta *et al.*, 2012).

Text algorithm using DWT: For enhancing the robustness text watermarking use both image and text watermark to secure the documents and data. Earlier text watermarking work was not used to encrypt the document. In this study, we encrypt the text document to for increase the security (Fig. 1).

In this technique watermark first embedded in text and after that text is encrypted and for extraction of watermark first text is decrypted and then watermark is extracted (Van Schyndel *et al.*, 1994). Embedding of watermark done by copyright owner and watermark key is generated. Extracted watermark proves authenticity so watermarking procedure follows two stages (Nathan *et al.*, 2013):

- Watermark embedding
- Watermark extraction

Text algorithm using DWT: In text algorithm the task is to make a separate function which can accept a text data of length 128 bits. A message box is created which only takes the string char values as a data type string. The 128 bit length is a standard length for experimental purpose. If the text data limit exceeds from 128 bit length then the extra text will be cut off however this length can be extended but 128 bit length is standard length. Now in the next step data will be embedded into the cover image whose size is 512×512.

Image algorithm using DWT: To apply DWT first of all we will do image analysis. we will take any size of image initially, let us, assume the image size is to be $m \times n \times 3$ initially. As the image is in RGB image next step should be the standardization of the images for easy calculations us take the image size to be 512×512×3 for the experimental value and for easy calculations (Fig. 2). `Y = imread('test(1).jpg');` `Y = rgb2gray(y)` `Rgb2gray` term change the color image into gray scale image. Now, the image size will be 512×512.

When we resized the image size we apply dwt and after that will do different types of functions and then we get our watermarked image.

DCT (Discrete Cosine Transform): Discrete Cosine Transform methods are robust than spatial domain. These are robust against image processing operations like brightness, cropping and low pass filter (Mehta *et al.*, 2012). They are costly and implementation is hard. It is based on two techniques global based or block based techniques. This technique not good for geometric attacks. DCT used in image processing and it uses in image processing, pattern recognition and data compression (Gosavi and Warnekar, 2010).

DFT (Discrete Fourier Transform): Fourier Transform (FT) is robust against geometric attacks like scaling, cropping, translation and rotation. Fourier transforms modifying its frequency coefficient. It decomposed image into sine or cosine form in DFT embedding done by two ways first is direct embedding and second is template based embedding. Template technique defines the concept of templates in this we embed template which find out transformation factor (Fig. 3). When image transformed first template is searched and then it resynchronize the image (Podilchuk and Delp, 2001; Xin-Peng *et al.*, 2005).

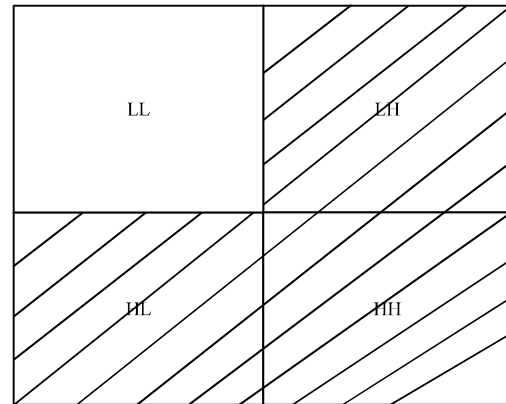


Fig. 1: Text algo

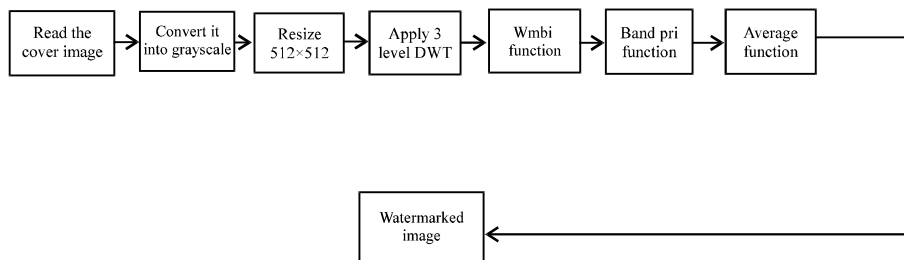


Fig. 2: Image decomposition and Bit insertion



Fig. 3: Original image



Fig. 4: Watermarked image



Fig. 5: Original text

RESULTS AND DISCUSSION

Image watermarking is a vast field of data security, data protection and for signing data and for many more fields too (Fig. 4-9). Image watermarking can also be used to transmit the secrete data from one end to another



Fig. 6: Original text length

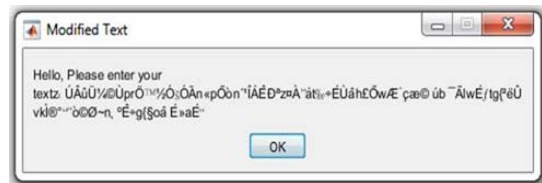


Fig. 7: Modifying text for embedding

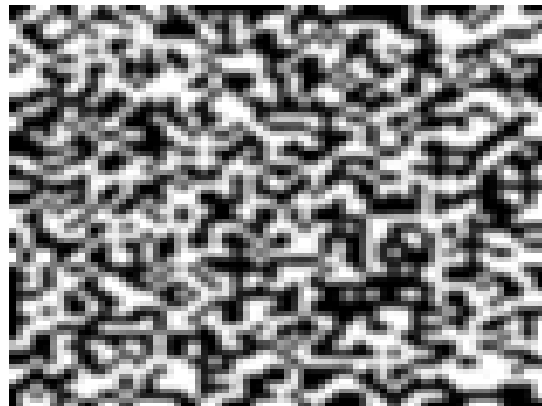


Fig. 8: Original secret image

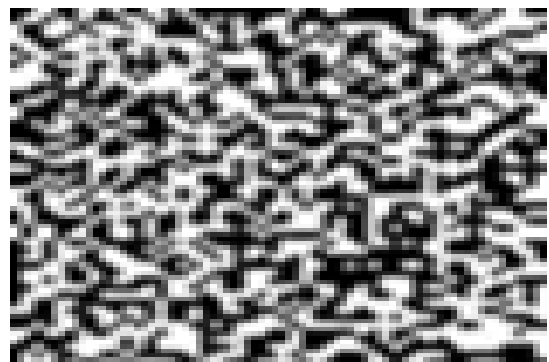


Fig. 9: Extracted secret image

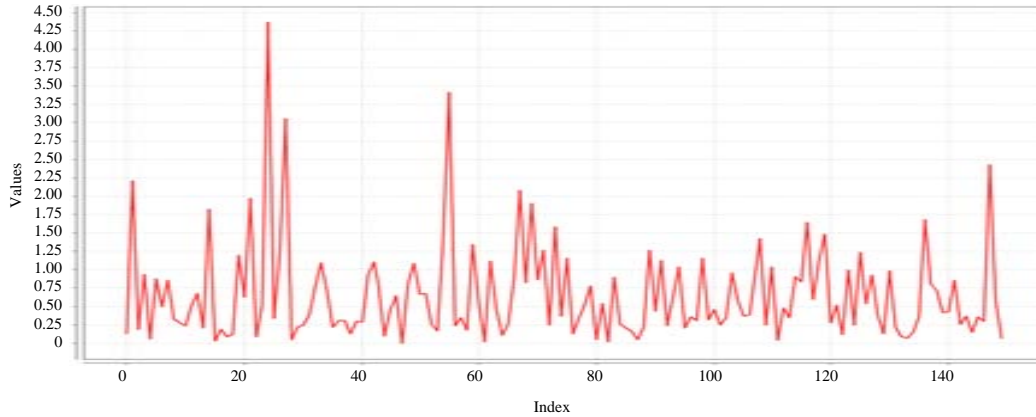


Fig. 10: MSE Graph for 150 (PSNR)

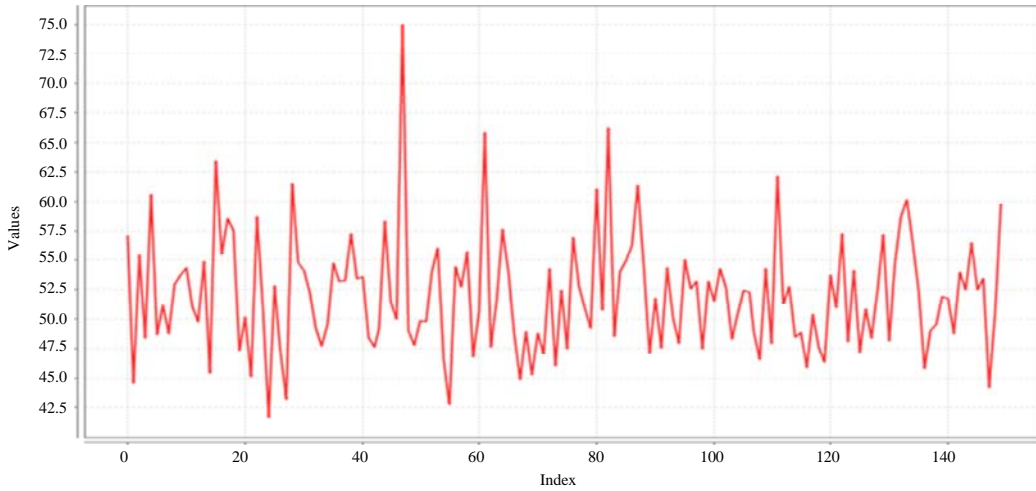


Fig. 11: PSNR for 150 images

end it may help the national security agencies too for sharing any confidential information with their other companions. In this study data hiding has been exhibited (Fig. 5-9). Image and text both are hidden behind a cover image of size 512×512, secrete image is of 48×48 and maximum length has been taken of 128 char length which makes it technically of length 1204 bits (Fig. 7-9).

Average PSNR calculated for the applied algorithm is 45.987db whereas the MSE is calculated to be 0.76. Many other parameters which are calculated are mention in Table 1. Execution time taken by the whole process and by the individual process has also been noted down and is presented in Table 2. Various images has been tested over the same algorithm and the generalized graphs have been generated (Fig. 10 and 11).

Extracted text data at MATLAB command window: Step10 done, hello, please enter your text.

Table 1: Parameters

Parameters	Values
MSE	0.7600
PSNR	45.9870
SSIM	1.0000
MAE	0.0310

Table 2: Execution time

Process name	Time (sec)
Gray scale conversion	0.110710
Image resize	0.086692
Level 1 band composition and store	2.709310
Image formation from the bands	2.573052
Image bits insertion	0.037658
Text bit insertion	0.010118
Overall process time	9.646472

CONCLUSION

Watermarking is developing in research area for copyright security and authentication of multimedia

content new watermarking procedure define the uses of both combined text and image. The watermark is required to prevent the original images and other documents over the internet.

REFERENCES

- Gosavi, C.S. and C.S. Wamekar, 2010. Study of multimedia watermarking techniques. *Intl. J. Comput. Sci. Inf. Secur.*, 8: 64-72.
- Kai, D., K.E. Wang and L.U. Changde, 2008. Research of color design method based on 3D semantic space. *Comput. Eng. Appl.*, 44: 106-108.
- Kougianos, E., S.P. Mohanty and R.N. Mahapatra, 2009. Hardware assisted watermarking for multimedia. *Comput. Electr. Eng.*, 35: 339-358.
- Mehta, M.G.N., M.Y. Kshirsagar and M.A. Tankariya, 2012. Digital image watermarking: A review. *Intl. J. Sci. Eng. Technol.*, 1: 169-174.
- Nathan, S.M., K. Pandiarajan and U. Baegan, 2013. Digital image watermarking basics. *IOSR. J. Electron. Commun. Eng.*, 8: 7-11.
- Podilchuk, C.I. and E.J. Delp, 2001. Digital watermarking: Algorithms and applications. *IEEE. Signal Process. Mag.*, 18: 33-46.
- Van Schyndel, R.G., A.Z. Tirkel and C.F. Osborne, 1994. A digital watermark. *IEEE Int. Conf. Image Process.*, 2: 86-90.
- Xin-Peng, Z., W. Shuo and Z. Kaiwen, 2005. *Digital Steganography and Steganalysis*. Tsinghua University Press, Beijing, China.
- Yumin, W., Z. Tong and H. Jiwu, 2006. *Information Hiding-Theory and Technology*. Tsinghua University Press, Beijing, China.