An Image Tampers Detection and Recovery Technique using Wavelet Transform and Judgment Table

林鴻志、張世旭

E-mail: 9601193@mail.dyu.edu.tw

ABSTRACT

The digital images were easier tampered by others in Internet. It’s a very important work to develop a mechanism to protect the digital images. The mechanism has recovery ability of tampered image with detect information, and hide that information into original image simultaneously. If hide more data in image, more image quality will damaged. Therefore this paper proposed an image tamper detection and recovery system based on Discrete Wavelet Transform (DWT). As an image performed DWT, it was divided into low frequency signals and high frequency signals. When an image for user input, the system will transforms the image from spatial domain to the frequency domain with DWT, and extracts some eigenvalues from low frequency signals (e.g. mean, upper mean, lower mean, bitmap values)of image, then embedding those information into middle frequency domain. After Inverse DWT it will gain a stego-image. If this stego-image was tampered, the system will collected three similar low frequency signals from hided place after DWT, and using the judgment table that included form three similar low frequency signals will judged the coefficient to recover the tampered image. The mainly advantage of this paper is need less information to hide, it will promote the quality of image efficiently.

Keywords : Discrete wavelet transform ; Image dectection and recovery technique ; Judgment table

Table of Contents

封面內頁 簽名頁 授權書 .....iii 中文摘要 .....iv ABSTRACT .....v 誌謝 .....vi 目錄 .....vii 圖目錄 .....ix 表目錄 .....xi 第一章 緒論 ...1 1.1研究動機 ...2 1.2研究目的 ...2 1.3文獻探討 ...3 1.4例證 .....6 1.5論文架構 ...6 第二章 相關研究 .....7 2.1技術描述 .....7 2.2偵測遭受破壞的區域 ....10 2.3還原遭受破壞的區域 ....11 第三章 提出的系統 .....13 3.1系統簡介 .....13 3.2擷取偵測及復原資訊 .....13 3.2.1離散小波轉換 .....13 3.2.2特徵值擷取 .....16 3.2.3特徵值嵌入 .....18 3.3偵測和還原遭受破壞的影像區域 .....19 3.3.1離散小波轉換 .....19 3.3.2建立係數重建表 .....20 3.3.3係數值擷取 .....23 3.3.4利用決策表進行偵測及復原 .....23 第四章 實驗及分析 .....28 4.1防偽影像與原始影像比較 .....30 4.2影像裁剪破壞 .....36 4.3影像修改破壞 .....41 4.4影像塗改破壞 .....47 4.5影像壓縮破壞 .....52 4.6誤判區域的原因及探討 .....59 第五章 結論與未來工作 .....64 5.1結論 .....64 5.2未來的工作 .....65 參考文獻 66

REFERENCES

[1]張真誠、陳同孝、黃國峰，“電子影像技術”，松崗電腦圖書資料股份有限公司。

[2]C. C. Chang, T. S. Chen, L.Z. Chung,“A Steganographic Method Based upon JPEG and Quantization Table Modification”, Information Sciences, pp. 123-138.

[3]Pfitzmann, B. ,“Information Hiding Terminology”, Lecture Notes in Computer Science, Vol. 1174, Berlin, Germany, Springer-Verlag.

[4]M. D. Swanson, M Kobayashi and Tewfik, A.H. ,“Multimedia Data Embedding and Watermarking Technologies”, Proceedings of the IEEE, pp. 1064-1087.

[5]W. Bender, D. Gruhl, N. Morimoto , and A. Lu,“Techniques for Data Hiding”, IBM System Journal, Vol. 35, No. 3-4, pp. 313-337.

[6]M. Wu and B. Liu,“ Watermarking for image Authentication”, IEEE International Conference on Image Processing, Vol. 2, pp. 437-441.

[7]李遠坤、陳玲惠，“數位影像之資訊隱藏技術探討”，資訊安全通訊，第五卷，第四期，第18-30頁。

[8]J. Fridrich and M. Goljan,“images with Self-Correcting Capabilites”, ICIP’99, Kobe, Japan, pp.25-28 [9]M. S. Fu and O. C. Au,“Data Diding Watermarking for Halfone Images”, IEEE Transactions on Image Processing, Vol. 11, Issue, 4, pp. 477-484.

[10]H. Jiwu and Y. Q. Shi,“Embedding Gray Level Images”, The 2001 IEEE International Symposium on Circuits and System, Vol.5, pp. 239-242.

[11]N. F. Johnson and S. jajodia,“Steganography: Seeing the Unseen”, IEEE Computer, February, pp.26-34.

[12]Y. K. Lee and L. H. Chen,“An Adaptive Image Steganographic Mode Based on Minimum-eooro LSB Replacement”, Proceedings of the

Ninth National Conference on Information Security, pp.8-15 [13]J. Wan and L. Ji,“ A Region and Data Hiding Based Error Concealment Scheme for Images ”, IEEE Transactions on Consumer Electronics. Vol.47, No. 2, pp. 257-262 [14]李遠坤、陳玲惠,“ 數位影像之資訊隱藏技術探討 ”, 資訊安全通訊, 第五卷, 第四期, 第18-30頁。
[15]吳炳飛、胡益強、瞿忠正、蘇崇彥,“ JPEG2000影像壓縮技術 ”全華科技圖書股份有限公司。
[16]張真誠、陳同孝、黃國峰,“ 數位影像處理技術 ”, 松崗電腦圖書資料股份有限公司。
[17]S. Walton,“ Image Authentication for a Slippery New Age ”, Dr.Dobb ’ s Journal, Vol.20, pp. 18-26 [18]K. F. Li, T. S. Chen, and S. S. Wu,“ Image tamper detection and recovery system based on discrete wavelet transformation ”, 2001 IEEE Pacific Rim Conference on Communications, Computers and signal Processing, Volume: 1, pp.164-167, August 2001.
[19]H. C. Wu and C. C. Chang,“ Detection and Restoration of Tampered JPEG Compressed Images ”, The Journal of System and Software, Vol. 64, No. 2, pp. 151-161 [20]K. L. Hung, C. C. Chang, and T. S. Chen,“ A Secure DCT-Based Technique for Recoverable Tamper Proofing ”, Optical Engineering , Vol. 40, No.9, pp.1950-1958 [21]T. S. Chen, J. Chen, and J. G. Chen,“ Tamper Detection and retrieval technique based on JPEG2000 with LL subband ”, 2004 IEEE International Conference on Networking, Sensing and Control, Volume:2, pp.1235-1240, 2004.
[22]S. Li and W. Li,“ Shape Adaptive Discrete Wavelet Transforms for Arbitrarily Shaped Visual Object Coding ”, IEEE Transactions on Circuits and Systems for Video Technology, Vol. 10, pp. 725-742 [23]P. L. Lin, C.K. Hsieh, and P. L. Huang,“ Hierarchical watermarking scheme for image authentication and recovery ”, 2004 IEEE International Conference on Multimedia and Expo, Volume: 2, pp. 963-966, June 2004.
[24]C. L. Wing, R. H. Hwang, T. S. Chen, and H. Y. Lee,“ Detecting and restoring system of tampered image based on discrete wavelet transformation and Block truncation coding ”, 2005 19th International Conference on Advanced Information Networking and Applications, Volume: 2, pp.79-82, March 2005.
[25]H. T. Chang and C. Y. Wu,“ Image authentication and tampering localization based on watermark embedding in the wavelet domain ”, 2004 7th International Conference on Signal Processing, Volume: 3, pp.2330-2333, August 2004.
[26]C. T. Chen and J. L. Chen,“ Multiresolution watermarking for digital images ”, IEEE Trans. Circuits and Systems II: Analog and Digital Signal Processing ”, Volume: 45, Issue: 8, pp.1097-1101, August 1998.
[27] S. L. Tsai, S. S. Wang ,and Y. L. Lin,“ Automatic Image Authentication and Recovery Using Fractal Code Embedding and Image Inpainting ”, pp.1-9.