具有自我修復之影像浮水印技術

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摘 要

隨著科技的進步，數位媒體資料能利用網路廣泛的傳播，但由於網路公開的特性，使得數位媒體資料可能遭到竄改而破壞其內容及品質。本篇論文目的為將遭受篡改或是有資料流失的影像，能夠偵測出破壞並復原影像內容以提高影像品質。 為了使影像能在遭受破壞或是資料流失之後，依然能夠將其修復並提高其品質，我們設計將額外資料藏入影像中，藏入的資料必須保證能維持原圖於一定的品質之上，當有藏入資料的影像遭受竄改後，我們便能利用所藏入的額外資料來修復並提高影像品質。 本論文使用密匙建立機密基底，以此基底對影像進行轉換到頻域(frequency domain)，在頻域裡將重要係數及最相似鄰近區塊方向碼(similar neighboring-block direction code)一起作為復原資料藏入影像頻域中，利用頻域中所藏入的復原資料與最相似相鄰區塊方向碼來進行影像修復。在資料的藏入方面，首先原圖的擁有者使用密匙一產生一組正交基底，此基底包含低頻到高頻的特性。接下來將原始影像分割成各區塊，各區塊都以此正交基底進行轉換到頻域中。我們取出各區塊的低頻係數(視為影像的重要係數)並重建還原區塊，以此區塊計算與其最相似鄰近區塊方向碼。使用者利用密匙二把重要係數及最相似鄰近區塊方向碼用亂數打散後，藏入頻域，最後將包含復原資料的頻域使用一開始所產生的基底作反轉換，得到包含復原資料的影像。 在影像竄改恢復方面，首先合法使用者使用密匙一產生一組 與資料藏入階段相同之正交的基底。將可能被竄改的影像分割成各區塊，各區塊以此正交基底進行轉換到頻域。使用密匙二反亂數打散取出頻域中各區塊所隱藏之的重要係數及最相似鄰近區塊方向碼，利用重要係數重建重要係數還原影像。將可能被竄改的影像、重建之重要係數還原影像及最相似鄰近區塊方向碼送入還原程序，最後可以得到一張還原影像，使得還原後的影像在空間領域(spatial domain)之影像值較遭受攻擊後之影像接近原始影像。 在這篇論文中，我們提出一個使用密匙相依的基底轉換法(Key-Dependent Basis Transform, KDBF)來確保藏入的資料較能忍受攻擊，並且提出以最相似鄰近區塊方向碼協助偵測影像是否被竄改及提升影像自我修復的品質，實驗結果證明所提出的方法確實能提高遭破壞影像之影像訊號雜訊比(Peak Signal to Noise Ratios, PSNR)。

關鍵詞 : 數位浮水印、密鑰相依的基底轉換、正規正交基底、自我修復、離散餘弦轉換

目錄

參考文獻

[1] C. C. Chang, K. F. Hwang and M. S. Hwa ng, “ A block based digital watermarks for copy protection of images, ” Proceedings of the Fifth Asia-Pacific Conference on Communications and Fourth Optoelectronics and Communications Conference (APCC/OECC 99'), pp. 977-980, Beijing, China, October (1999).

[2] C. C. Chang, and H. C. Wu, “ Computing Watermarks from Images Using Quadtrees, ” Proceeding of the Second International Workshop on Multimedia Network Systems, pp123-128, Japan, July, (2000).

[3] Kundur, D. and Hatzinakos, “ Towards a Telltale Watermarking Technique for Tamper-Proofing, ” Proceeding of International Conference on Image Processing, 1998, Vol. 1, pp. 409-413 (1998).

[4] Kundur, D. and Hatzinakos, D. “ Digital Watermarking for Telltale Tamper Proofing and Authentication, ” Proceedings of the IEEE, Vol.

877, pp.1167-1180, July (1999).
[5] Jiri Fridrich, “ Image Watermarking for Tamper Detection, ” IHW'98 - Proc. of the International Information hiding Workshop, April (1998).
[6] Jiri Fridrich, “ Methods for Detecting Changes in Digital Images, ” Proc. of The 6th IEEE International Workshop on Intelligent Signal Processing and Communication Systems (ISPACS'98), Melbourne, Australia, 4-6 November (1998). - 34 - [7] Jiri Fridrich, “ A Hybr Tamper Detection in [8] ontents, pp.428-437, San Jose, [10] mpere, Finland, September 5-8 (2000). urnal of Electronic Imaging, May (2002). nuary rid Watermark fo Digital Images, ” ISSPA'99 Conf., pp. 301-304, Brisbane, Australia, August 22-25 (1999). Jiri Fridrich, “ Methods for Tamper Detection in Digital Images, ” Proceedings of Multimedia and Security Workshop at ACM Multimedia, pp. 19-23, Orlando, FL, October 30-31 (1999).
[9] Jiri Fridrich, Miroslav Goljan and Nasir Memon, “ Further Attacks on Yeung-Mintzer Fragile Watermarking Scheme, ” Proc. SPIE Photonic West, Electronic Imaging 2000, Security and Watermarking of Multimedia C California, January 24-26 (2000). M. Barni, F. Bartolini, Jiri Fridrich and A. Piva, “ Digital Watermarking for the Authentication of AVS Data, ” EUSIPCO 2000, Ta [11]Jiri Fridrich, Miroslav Goljan and Arnold C. Baldoza, “ New Fragile Authentication Watermark for Images, ” ICIP'2000, Vancouver, Canada, September 10-13 (2000).
[12]Jessica Fridricha, Miroslav Goljanb and Nasir Memonc, “ Cryptanalysis of the Yeung-Mintzer Fragile Watermarking Technique, ” Jo [13]Jiri Fridrich, “ Security of Fragile Authentication Watermarks with Localization, ” Proc. SPIE Photonic West, Vol. 4675, Electronic Imaging 2002, Security and Watermarking of Multimedia Contents, pp. 691-700, San Jose, California, Ja - 35 - (2002). Jiri Fridrich and Miroslav Goljan, “ Images with Self-Correcting Capabilities, ” ICIP'99, Kobe, Jap[14] an, October 25-28 (1999). 588, [16] -2507, October [18] CE Trans. Inf. & [19] oustics, [20] [15]M. Iwata and A. Shiozaki, “ Index Data Embedding Method Utilizing Quantitative Relation of Wavelet Coefficients, ” IEICE Trans. Fundamentals, Vol. E84-A, No. 10, pp. 1582-1 October (2001). Hsiang-Chen Huang, Feng-Hsing Wang and Jeng-Shying Pan, “ A VQ-Based Robust Multi-Watermarking Algorithm, ” IEICE Trans. Fundamentals, Vol. E85-A, No. 7, pp. 1719-1726, July (2002).
[17] M. Kuribayashi and H. Tanaka, “ A New Digital Watermarking Scheme Applying Locally the Wavelet Transform, ” IEICE Trans. Fundamentals, Vol. E84-A, No. 10, pp. 2500 (2001). Minho Jo and Hyoung Do Kim, “ A Digital Image Watermarking Scheme Based on Vector Quantisation, ” IEI System, Vol. E85-D, No. 6, pp. 1054-1056, June (2002). S. Tsekeridou and I. Pitas, “ Embedding Self-Similar Watermarks In The Wavelet Domain, ” 2000 IEEE Int. Conf. on Ac Systems and Signal Processing (ICASSP'00), Vol. 4, pp. 1967-1970, Istanbul, Turkey, 5-9 June (2000). Kostopoulos, I., Gilani, S.A.M., Skodras, A.N., “ Colour Image Authentication Based on a Self-Embedding Technique, ” 2002 14th International Conference on Digital Signal Processing, Vol.
[21] Lin, Kang, May 2-4 (2001). October 7-10 (2001).
[24] -Wesley (1992).
[26] 國立中[27] 2, pp. 733 -736 (2002). Guowei Wu, Yafei Shao, Li Zhang and Xinggang “ Reconstruction of Missing Blocks in Image Transmission by Using Self-Embedding, ” Proceeding of 2001 International Symposium on Intelligent Multimedia, Vidio and Speech Processing, Hong [22] Peter Meerwald und Andreas Uhl, “ Watermark Security via Wavelet Filter Parameterization, ” IEEE Signal Processing Society 2001 International Conference on Image Processing, Greece, [23] Anil K. Jain, Fundamentals of Digital Image Processing, Prentice Hall (1989). R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison [25] Gene H. Golub and Charles F. van Loan: Matrix Computations, 2ND Edition, The John Hopkins University Press (1989). 呂博文，「應用向量量化來防護數位影像的被竄改」， 正大學，資訊工程研究所碩士論文(2001)。陳同孝、張家銘、陳彥圖，「以邊緣為特徵值之影像竄改偵測與還原系統」，第十二屆全國資料安全會議，國立台中技術學院，資訊管理系(2002)。