# 對離散餘弦轉換系數使用鄰近關係編碼之影像壓縮


## 洪毓懋、張世旭

E-mail: 9607394@mail.dyu.edu.tw



**摘 要**

本文提出一個對離散餘弦轉換係數使用鄰近關係編碼。主要 的壓縮步驟為：(1)將影像切割為8*8大小的區塊，分別對每一個區塊作離散餘弦轉換(DCT)；(2)求出適合的量化係數，將 DCT係數量化；(3)利用直流係數(DC)預測交流係數(AC)， 得到AC誤差係數；(4)對DC係數使用訊號誤差編碼(DPCM)， 得到DC誤差係數；(5)對DCT係數使用Context編碼。Context 編碼的模式分別有：(1)零編碼(2)精練編碼(3)可變長度編 碼。由於進行壓縮時會重新計畫量化係數，不需要額外的量化表，使得利用量化系數比使用固定量化表的壓縮效果好。在使用算數 編碼時配合鄰近關係能有效的提升壓縮的效率。並且根據離散餘 弦轉換的特性，利用直流係數對交流系數預測可以提升壓縮的效 率。由於經過以區塊為基礎的函式轉換，因此當影像過度壓縮後， 重建影像將會產生明顯的區塊效應(Blocking Effect)。而使用後 處裡的步驟能夠提高壓所的影像品質，並且能提升視覺上的效果。



關鍵詞 : 離散餘弦轉換，漸進式壓縮，崁入式離散餘弦轉換， 鄰近關係編碼，交流係數預測


**目錄**


第1章 緒論..... 1 1.1 影像壓縮簡介..... 1 1.2 研究動機與目的..... 2 1.3 文獻探討..... 3 1.4 論文架構..... 5 第2章 相關研究..... 6 2.1 EZDCT 和ezhdct..... 6 2.2 EBCOT..... 9 2.3 算數編碼..... 12 第3章 演算法架構..... 15 3.1 編碼流程..... 16 3.1.1 DCT轉換與係數分類..... 16 3.1.2 DCT係數量化..... 17 3.1.3 交流係數預測..... 17 3.1.4 直流係數預測..... 19 3.1.5 嵌入式編碼流程..... 19 3.1.6 未重要係數編碼..... 20 3.1.7 精煉編碼..... 23 3.1.8 Run-length Coding..... 23 3.2 解碼流程..... 27 第4章 針對區塊效應進行後處理..... 28 4.1 邊的探測..... 28 4.2 區塊契合..... 29 第5章 實驗結果比較..... 31 第6章 結論與未來工作..... 38 參考文獻..... 39


**參考文獻**


[1] J. In, S. Hsiarani and F. kossentini, “ On RD optimized progressive image coding using JPEG, ” IEEE Transactions on Image Processing, Vol. 8, No. 11, Nov. 1999, pp.1630-1638, Nov. 1999.

[2] Ying Chen and Pengwei Hao, “ Integer Reversible Transformation to Make JPEG Lossless, ” IEEE International Conference on Signal Processing, Vol.1, pp. 835- 838, Sept. 2004.

[3] D.M. Monro and G.J. Dickson, “ Zerotree coding of DCT coefficients, ” International Conference on Image Processing, Vol. 2, pp. 625-628, Oct 1997.

[4] T.D. Tran, “ The binDCT: fast multiplierless approximation of the DCT, ” IEEE Signal Processing Letters, Vol. 7, No. 6, pp.141-144, Jun. 2000.

[5] A. Said and W.A. Pearlman, “ A new, fast, and efficient image codec based on set partitioning in hierarchical trees, ” IEEE Transactions on Circuits and Systems for Video Technology, Vol. 6, No. 3, pp.243 - 250, June 1996.

[6] Chao Xu, “ EBCOT-based discrete wavelet transform scheme with row-overlapped Z-scan, ” IEEE Transactions on Consumer Electronics, pp. 451-452, Jane 2005.

[7] William A. Pearlman, Asad Islam, Nithin Nagaraj, and Amir Said, “ Efficient, low-complexity image coding with a set-partitioning embedded block coder, ” IEEE Transactions on Circuits and Systems for Video Technology, Vol.14, No.11, pp.1219 - 1235, Nov. 2004.

[8] Amir Said, “ Arithmetic Coding, ” in Lossless Compression Handbook, （K. Sayood, Ed.）, Academic Press, San Diego, CA, 2003.

[9] Amir Said, Introduction to Arithmetic Coding Theory and Practice,Hewlett-Packard Laboratories Report, HPL-2004-76, Palo Alto, CA, April 2004.

[10] Jooheung Lee, N. Vijaykrishnan, M.J. Irwin, and R. Chandramouli, “ Block-based frequency scalable technique for efficient hierarchical coding, ” IEEE Transactions on Signal Processing, Vol. 54, No. 7, pp. 2559- 2566, July 2006.

[11] Hyun Wook Park and Yung Lyul Lee, “ A postprocessing method for reducing quantization effects in lowbit-rate moving picture coding, ”

IEEE Transactions on Circuits and Systems for Video Technology, Vol. 9, No. 1, pp.1051-8215, Feb. 1999.
[12] Ying Luo and Rabab K. Ward, “ Removing the blocking artifacts of block-based DCT compressed images, ” IEEE Transactions on Image Processing, Vol. 12, No. 7, pp. 838- 842, July 2003.
[13] Geoffrey Davis and Sumit Chawla, “ Significance Tree Quantization of the Discrete Cosine Transform, ” IEEE International Conference on Image Processing, Vol. 1, pp. 600-603, Oct. 1997.
[14] Junqiang Lan and Xinhua Zhuang, “ Embedded image compression using DCT based subband decomposition and SLCCA data organization, ” IEEE Workshop on Multimedia Signal Processing, pp. 81-84, Dec. 2002.
[15] Jiankun Li, Jin Li and C.-C. J. Kuo, “ An embedded DCT approach to progressive image compression, ” IEEE International Conference on Image Processing, Vol. 1, pp. 201-204, Sept. 1996.
[16] D. Nister and C. Christopoulos, “ An embedded DCT-based still image coding algorithm, ” IEEE International Conference on Acoustics, Speech, and Signal Processing, Vol.5, pp.2617-2620, May 1998.
[17] Yan Yusong, Wang Chunmei, Su Guangda, and Shi Qingyun, “ Invertible Integer DCT Applied on Progressive until Lossless Image Compression, ” IEEE International Symposium on Image and Signal Processing and Analysis, Vol. 2, pp. 1018-1023, Sept. 2003.
[18] Yan Yusong, Wang Chunmei, Su Guangda, and Shi Qingyun, “ Invertible integer DCT applied on progressive until lossless image compression, ” Image and Signal Processing and Analysis, vol. 2, pp.1018- 1023, Sept. 2003.
[19] R. Singh and A. Ortega, “ Lookahead Search for Lossy Context-Based Adaptive Entropy Coding, ” International Conference on Image Processing,Vol. 3, pp. 845-848, Sep. 2000.
[20] Wilhelm Berghorn ,Tobias Boskamp,Markus Lang,and Heinz-Otto Peitgen, “ Context Conditioning and Run-Length Coding for Hybrid, Embedded Progressive Image Coding, ” IEEE Transactions on Image Processing,Vol. 10,No. 12,Dec. 2001.
[21] Bruno Aiazzi, Luciano Alparone, and Stefano Baronti, “ Context Modeling for Near-Lossless Image Coding, ” IEEE Signal Processing Letters, Vol. 9, No. 3, March 2002.
[22] Debin Zhao, Dapeng Zhang, and Wen Gao, “ Embedded Image Coding Based on Hierarchical Discrete Cosine Transform, ” Journal of Software, Vol.12, No.9, pp. 1287-1294, Sept. 2001.
[23] C. Tu and T.D. Tran, “ Context-based entropy coding of block transform coefficients for image compression, ” IEEE Transactions on Image Processing, Vol.11, No.11, pp.1271-1283, Nov. 2002.
[24] C.A. Gonzales, L. Allman,T. McCarthy, P. Wendt, and A.N. Akansu, “ DCT coding for motion video storage using adaptive arithmetic coding, ” Signal Processing: Image Communication, Vol. 2, No. 2, pp. 145-154, 1990.
[25] Shizhong Liu and Alan C. Bovik, “ Foveation embedded DCT domain video transcoding, ” Journal of Visual Communication and Image Representation, Vol.16, No.6, pp. 643-667, December 2005.
[26] R. Ashin, A. Morimoto and R.Vaillancourt, “ Image compression with multiresolution singular value decomposition and other methods, ” Mathematical and Computer Modelling, Vol. 41, No. 6-7, pp. 773-790, May 2005.