可變動影像區塊之小波轉換

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摘 要

小波轉換(wavelet transform)可提供具有對影像多重解析(multiresolution)的功用，所以被廣泛地使用在影像壓縮技術上。而為了增加影像的壓縮比率，一般將小波轉換後的小波係數經由向量量化(vector quantization)來進行壓縮，而使用向量量化的主要原因是由於它具有很高的壓縮比率，而且在解壓縮時也相當容易。但在實用上，影像壓縮法除了壓縮比率外，編碼速度也是考量的重點。所以在本論文中，我們提出用四分樹分割法作為影像的前處理(preprocessing)，將影像的背景和細節部份分割成尺寸大小不同的區塊，然後經小波轉換後，再將每一個子頻帶區塊的小波係數能量值(variance)，做為位元分配的依據。而依照分配到的位元選擇最適當的編碼簿(codebook)，並由編碼後所得到的失真值來調整位元率。這樣的壓縮方式下，在低位元率時依然保有良好的視覺品質，而且由於編碼簿變得較小，所以運算速度也相對的加快許多。本文所提方法的成果與效能及處理時間將於模擬結果處展示。

關鍵詞 : 四分樹分割 ; 小波轉換 ; 位元分配 ; 向量量化

目錄

參考文獻

[1]A. Gersho and R. M. Gray,“ Vector Quantization and Signal Processing, ” Kluwer Academic Publishers, 1991.

[2]A. Gersho,“ On the Structure of Vector Quantizers, ” IEEE Trans. On Inform. Theory, vol. 28, no. 2, pp. 157-162, Mar. 1982.

[3]A. K. Jain,“ Fundamemtal of Digital Image Processing, ” Prestice-Hall, Englewood Cliffs, NJ, 1989.

[4]M. Antonini, M. Barlaud, P. Mathieu, and I. Daubechies,“ Image Coding Using Wavelet Transform, ” Image Processing, IEEE Transactions on, volume: 1 issue: 2 , Apr 1992.

[5]Ching Yang Wang, Shih Jao Liao, and Long Wen Chang,“ Wavelet Transform Coding Using Variable Blocksize Vector Quantization with Optimal Quadtree Segmentation, ” TENCON '97. IEEE Region 10 Annual Conference. Speech and Image Technologies for Computing and Telecommunications', Proceedings of IEEE, volume: 2 , 2-4 Dec 1997.

[6]C.-T. Chen,“ Adaptive Transform Coding via Quadtree-Based Variable Blocksize DCT, ” In Proc. IEEE Int. Conf. Acoust., Speech, Signal Processing, pp. 1854-1857, 1989.

[7]G. J. Sullivan and R. L. Baker,“ Efficient Quadtree Coding of Images and Video, ” IEEE Trans. Image Processing, vol. 3, pp. 327-331, May 1994.

[8]N. Mohsenian and N. M. Nasrabadi, “ Edge-Based Subband VQ Techniques for Images and Video, ” Circuits and Systems for Video Technology, IEEE Transactions on, volume: 4, pp. 53-67 issue: 1 , Feb 1994.
[9]N. M. Nasrabadi and R. A. King, “ Image Coding Using Vector Quantization : a Review, ” IEEE Trans. On Communication, vol. 36, no. 8, pp. 957-971, Aug. 1988.
[10]K. Ramchandran and M. Vetterli, “ Best Wavelet Packet Bases in a Rate-Distortion Sense, ” Image Processing, IEEE Transactions on, volume: 2 issue: 2 , pp. 160-175 Apr 1993.
[11]Y. Shoham and A. Gersho, “ Efficient Bit Allocation for an Arbitrary Set of Quantizers, ” IEEE Trans. Acoustics, Speech, and Signal Processing, vol. 36, pp. 1445-1453, September 1988.
[12]J. Vaisey and A. Gersho, “ Variable Block-Size Image Coding, ” Acoustics, Speech, and Signal Processing, IEEE International Conference on ICASSP '87., volume: 12 , pp. 1051-1054 Apr 1987.
[13]J. Vaisey and A. Gersho, “ Image Compression with Variable Block Size Segmentation, ” Signal Processing, IEEE Transactions on, volume: 40 issue: 8 , pp. 2040-2060 Aug 1992.
[14]R. M. Gray, “ Vector Quantization, ” IEEE Acoust., Speech, Signal Processing Magazine, Apr. 1984.
[15]R. C. Gonzalez and P. Wintz, “ Digital Image Processing, ” Addison Wesley,Reading,MA,1997.
[16]C. Y. Teng and D. L. Neuhoff, “ A New Quadtree Predictive Image Coder, ” image processing 1995 . Proceeding, international Conference on, vol.2 , pp. 73 — 76 , 1995.
[17]R. Distasi, M. Nappi and S. Vitulano, “ Image Compression by B-Tree Triangular Coding, ” IEEE Trans on Commu, vol.45,no.9 ,pp. 1095-1100,Sep.1997.
[18]J. C. Wu and D. G. Daut, “ Adaptive Non-Stationary DPCM Image Coding with Variable Blocksize, ” in the 1997 symposium on Visual Communications and Image Processing, SPIE vol. 3024,pp. 447-458,Feb.1997.
[19]O. Rioul and M. Vetterli, “ Wavelets and Signal Processing, ” IEEE Signal Processing Magazine, October 1991, pp. 14-35.
[20]W. K. Pratt, “ Digital Image Processing, ” Wiley-Interscience, New York, 1978.
[21]R C. Gonzalez and R E. Woods, “ Digital Image Processing, ” Addison-Wesley Publishing Company, 1992.
[22]B. Porat, “ A Course in Digital Signal Processing, ” John Wiley & Sons, 1997.
[23]Y. Linde, A. Buzo and R. M. Gray, “ An Algorithm for Vector Quantizer Design, ” IEEE Trans. on Communication, vol. COM-28, no. 1, pp. 84-95, Jan. 1980.
[24]L. Torres and J. Huguet, “ An Improvement on Codebook Search for Vector Quantization, ” IEEE Trans. on Communication, vol. 42, no. 2/3/4, Feb. 1994.
[25]S. Mallat, “ A Theory for Multiresolution Signal Decomposition: the Wavelet Representation, ” IEEE Trans. on tern Analysis and Machine Intel, vol-11, no. 7, pp. 674-693, July 1989.
[26]P. H. Westerink, D. E. Boekee, J. Biemond and J. W. Woods, “ Subband Coding of Images Using Vector Quantization, ” IEEE Trans. Comm, COM-36(6), 713-719, 1988.
[27]M. Vetterli and C. Herley, “ Wavelets and Filter Banks: Theory and Design, ” IEEE Trans. Sig. Proc, Sept. 1992, pp. 2207-2232.
[28]Yu-Chen Hu and Chin-Chen Chang, “ Variable Rate Vector Quantization Scheme Based on Quadtree Segmentation, ” Consumer Electronics, IEEE Transactions on, volume: 45 issue: 2, pp. 310-317 May 1999.
[29]李朝欽, “ Image Fusion Using Wavelet Transform with Quadtree Segmentation, ” 大葉大學電機工程系碩士論文, June, 2001.
[30]邱俊德, “ Image Compression by Self-Organized Kohonen Map, ” 大葉大學電機工程系碩士論文, June, 1999.