進階雙預測器dpcm影像傳輸系統

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摘 要

本論文係針對雙預測器誤差脈衝編碼調變（Double Predictor Differential Pulse Code Modulation，DP-DPCM）的影像資料壓縮編碼法加以改進，以增加影像資料的傳輸速度；我們利用四分樹的影像分割（Quadtree segmentation）概念，將影像切為不同尺寸大小的小區域影像方塊，影像資料變化大的區域被分割成較小的區域，使細節（details）部分的資訊得以被各別處理；而影像資料變化小的區域，即背景部分，則被切割成較大的區域。在切割影像的前處理（pre-process）後，輸入至預測器的小區域影像方塊中，鄰近像素點間的差異降低，藉由這特點改進預測器預測誤差分佈的範圍，進而達到縮小量化器階數的目的及降低位元使用率。另一方面，不同於傳統DPCM的架構，改採雙預測器DPCM的原因，則在於考慮無誤差、雜訊（error free）的影像傳輸通道中，傳統DPCM容易受限於過大的量化誤差回授後的影響，導致預測準確率大幅下降；而雙預測器的優點則能夠避免過大的量化誤差回授產生的影響。所以，本論文提出的概念和方法，可以在不增加太多複雜度（complexity）下，就提升整個系統的效能（performance），約比傳統的DPCM作法多出5?6dB的SNR值。

關鍵詞 : 影像壓縮 ; 四分樹影像分割法 ; 可變大小方塊分割 ; 誤差脈衝編碼調變 ; 雙預測器誤差脈衝編碼調變

目錄

參考文獻

[1] N.S. Jayant and P. Noll, Digital Coding of Waveforms, Englewood Cliffs, NJ, Prentice-Hall, 1984.

[2] Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing, Addison-Wesley Publishing Company, 1992.

[3] 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.

[4] D.G. Daut, D. Zhao and J.-C. Wu, “ Double Predictor Differential Pulse Code Modulation Algorithm for Image Data Compression, ” Opt.

Eng., vol. 32, no. 7, pp.1514-1523, July 1993.
[5] D.G. Daut and J.-C. Wu, “ Adaptive Cosine Transform Image Coding with Variable Block Size and Constant Block Distortion, ” in The 1996 Symposium on Visual Communications and Image Processing, SPIE vol. 2727, pp. 1104-1115, March. 1996.
[6] J. Vaisey, and A. Gersho, “ Image Compression with Variable Block Size Segmentation, ” IEEE Trans. on Signal Processing, vol. 40, no. 8, pp. 2040-2060, Aug 1992.
[7] C.S. Won, “ Variable block size segmentation for image compression using stochastic models, ” Image Processing 1996 Proceedings., International Conference on Volume: 3 , pp. 975-978, 1996.
[8] C.T. Chen, “ Adaptive Transform Coding via QuadTree-Based Variable Blocksize DCT, ” Proc. ICASSP, pp.1854-1857, May 1989.
[9] 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.
[10] C.Y. Teng and D.L. Neuhoff, “ A new quadtree predictive image coder, ” Image Processing 1995. Proceedings., International Conference on Vol.2 , pp. 73 —76, 1995.
[11] M.C. Rost and K.Sayood, “ An Edge Preserving Differential Image Coding Scheme, ” IEEE Trans. on Image Processing, vol.1, no. 2, pp. 250-256, 1992.
[12] M. J. Sabin, “ DPCM Coding of Spectral Amplitudes without Positive Slope Overload, ” IEEE Trans. on Signal Processing, vol. 39, no. 3, pp. 756-759, Mar. 1991 [13] C.-Y. Chang and J.-J. Leou, “ Detection and Elimination of 2-d Transmission Error Patterns in DPCM Images, ” IEEE Trans. on Commu., vol. 44, no. 10, pp.1251-1256, Oct. 1996 [14] Z. Nasseri and M. Kanefsky “ Doubly Adaptive DPCM, ” IEEE Trans. on Info. Theory, vol. 36, no. 2, pp.414-420, March 1990.
[15] Z. Wang and D. Zhang, “ A Novel Approach for Reduction of Blocking Effects in Low-Bit-Rate Image Compression, ” IEEE Trans. on Commu., vol. 46, no. 6, pp.732-734, June 1998.
[16] L.H. Zetterberg, S. Ericsson and C. Couturier, “ DPCM Picture Coding with Two-Dimensional Control of Adaptive Quanti-zation, ” IEEE Trans. on Commu., vol. COM-32, no. 4, pp. 457-462, Apr. 1984.
[17] Y.P. Huang and H.C. Chu, “ Practical Consideration for Grey Modeling and Its Application to Image Processing, ” The Journal of Grey System, pp. 217-233, 1996.
[18] H. Huang and J. Wu, “ Grey System Theory on Image Processing and Lossless Data Compression for HD-Media, ” Journal of Grey System Theory and Practice, vol. 3, no. 2, pp. 9-15, Nov. 1993.
[19] N.P. Mort, M. Hegde, and N. Arora, “ DPCM Encoding of Regenerative Composite Processes, ” IEEE Trans. on Info. Theory, vol. 40, no. 1, pp. 154-159, Jan. 1994 [20] D.H. Kang, J.H. Choi, Y.H. Lee, and C. Lee, “ Application of a DPCM System with Median Predictors for Image Coding, ” IEEE Trans. on Consumer Electronics, vol. 38, no. 3, pp. 429-435, Aug. 1992.
[21] L. Ke and M. W. Marcellin, “ Near-Lossless Image Compression: Minimum-Entropy, Constrained-Error DPCM, ” IEEE Trans. on Image Processing, vol. 7, no. 2, pp. 225-228, Feb 1998.
[22] G. Deng and L.W. Cahill, “ AMBTC-DPCM-QUAD-TREE Hybrid Coding of Still Images, ” IEEE Region 10 Conference, Tencon 92 11th-13th, pp. 484-487, Nov. 1992.
[23] D.H. Lee and D.L. Neuhoff, “ Quantized Predictive Coding, ” IEEE Trans. on Commu., pp. 548-551, 1991.
[24] C.H. Kuo nad C.F. Chen, “ A prequantizer with the human visual effect for the DPCM, ” Signal Processing:Image Communication, pp. 433-442, 1996.
[25] P. Monet and E. Dubois, “ Block Adaptive Quantization of Images, ” IEEE Trans. on Commu., vol. 41, no. 2, pp. 303-306, Feb. 1993.
[26] F. Hartung and B. Girod, “ Statistical optimization of switched two-level quantizers with application to DPCM encoding of color video, ” Acoustics, Speech, and Signal Processing 1996. ICASSP-96. Conference Proceedings., 1996 IEEE International Conference on Vol. 4 , pp. 1974 —1977, 1996.
[27] M.K. Ibrahim and A. Aggoun, “ DPCM edge detection using local histogram, ” Image Processing and its Applications 1992. International Conference, pp. 542 —545, 1992.
[28] Y.L. Lee, H.C. Kim, and H.W. Park, “ Blocking Effect Reduction of JPEG Images by Signal Adaptive Filtering, ” IEEE Trans. on Image Processing, vol. 7, no. 2, pp. 229-234, Feb 1998.
[29] S. Aissa and E. Dubois, “ 2-D-CELP Image Coding with Block-Adaptive Prediction and Variable Code-Vector Size, ” IEEE Trans. on Image Processing, vol. 5, no. 2, pp. 369-373, Feb. 1996.