

Context-based Coding for VQ Indices

李國陽、張世旭

E-mail: 9707429@mail.dyu.edu.tw

ABSTRACT

In image compression using vector quantization, the compression rate of the index file produced from encoding image by the codebook could be improved by proceeding lossless compression. A simple and fast lossless compression design to encode the vector quantized indexes for 2-D images is proposed in this paper. Based on the connections in the index neighborhood, the context model of an index is first classified into one of seven classes. The index is coded with a context designed for that class. The index is compared with the previously encoded indices in a predefined search order to check whether the current index value can be found in the neighboring region or be in the memory array which records the n different indexes of previously encoded indexes. If the current index satisfies the conditions, it can be encoded by lesser bits and therefore yields a better compression. Otherwise, the current index is encoded by the prefix code and the original index. The computation complexity of the proposed method is quite low and its memory requirement is small. Experimental results show that the proposed scheme achieves better compression efficiency than lossless index coding scheme proposed by Chen and Yu in 2005. The newly proposed algorithm achieves significant reduction of bit rate.

Keywords : Image Compression ; Lossless Compression ; Vector Quantization ; Index Coding

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.....	xii	第一章 前	
言.....	1	第二章 相關文獻介紹.....	4 2.1
Tree-I 類型.....	7	2.2 Tree-II 類型.....	11 2.3
Tree-III 類型.....	14	2.4 Tree-IV 類型.....	17 2.5 編碼
結果.....	20	第三章 提出的方法.....	24 3.1 新定
義的Tree-IV 類型.....	26	3.2 Tree-V 類型.....	29 3.3 Tree-VI
類型.....	33	3.4 Tree-VII 類型.....	36 - viii - 3.5 編碼
結果.....	39	第四章 實驗結果與討論.....	41 4.1 實驗
結果.....	41	4.2 討論一.....	46 4.3 討論
二.....	50	第五章 結論與未來研究的方向.....	51 參考文
獻.....	53		

REFERENCES

- [1] Y. Linde, A. Buzo, and R. Gray, "An Algorithm for Vector Quantizer Design," IEEE Transactions on Communications, vol. 28, no. 1, pp. 84-95, Jan. 1980.
- [2] P.Y. Chen and C.T. Yu, "Lossless Vector-Quantised Index Coding Design and Implementation," IEE Proceedings-Circuits, Devices and Systems, vol. 152, no. 2, pp. 109-117, 8 April 2005.
- [3] Y. Gong, M.K.H. Fan, and C.M. Huang, "Image Compression Using Lossless Coding on VQ Indexes," Proceedings of Data Compression Conference, DCC 2000, pp. 583, 2000.
- [4] M.F. Abdel-Latif, T.K. Abdel-Hamid, M.M. Doss and H. Selim, "Utilizing Index Usage Maps for VQ Index Compression," Proceedings of the Fourth IEEE International Symposium on Signal Processing and Information Technology, pp. 291-295, 18-21, Dec. 2004.
- [5] X. Wu, J. Wen, and W.Y. Ng, "Context-Based Entropy Coding of VQ Indexes," 1997 IEEE International Symposium on Information Theory, pp. 57, 29 Jun - 4 Jul 1997.
- [6] K. Somasundaram and S. Domic, "Adaptive Index Coding Scheme for VQ Indices Compression," ICCTA '07, International Conference

on Computing: Theory and Applications, pp. 639-644, March 2007.

- [7] C.H. Hsieh, J.C. Tsai, and P.C. Lu, " Noiseless Coding of VQ - 54 - Index Using Index Grouping Algorithm, " IEEE Transactions on Communications, vol. 44, no. 12, pp. 1643-1648, Dec. 1996.
- [8] C.H. Hsieh and J.C. Tsai, " Lossless Compression of VQ Index with Search-Order Coding, " IEEE Transactions on Image Processing, vol. 5, no. 11, pp. 1579-582, Nov. 1996.
- [9] S.J. Lee, K.H. Yang, C.W. Kim, and C.W. Lee, " Efficient Lossless Coding Scheme for Vector Quantisation Using Dynamic Index Mapping, " Electronics Letters, vol. 31, no. 17, pp. 1426-1427, 17 Aug. 1995.
- [10] Y. Gong, " Classified Context Quantization of VQ Indexes for Image Compression, " IEEE International Conference on Acoustics, Speech, and Signal Processing, Proceedings, ICASSP ' 05, vol. 2, pp. 393-396, 2005.
- [11] M.F. Abdel-Latif, T.K. Abdel-Hamid, M.M. Doss, and H. Selim, " Utilizing Repeated Adjacencies of Vector Quantization Indices in Image Compression, " IEEE International Symposium on Signal Processing and Information Technology, 2004 Proceedings of the Fourth, pp. 287-290, 18-21 Dec. 2004.
- [12] E.C. Liu and T.C. Wang, " An Improvement on Lossless Compression of VQ Indexes, " Global Telecommunications Conference, GLOBECOM 98, The Bridge to Global Integration, vol. 3, pp. 1699-1704, 1998.
- [13] E.C. Liu and T.C. Wang, " Lossless Compression of VQ Indexes Using Search-Order and Correction Codes, " IEEE Workshop on - 55 - Signal Processing Systems, pp. 202-209, 8-10 Oct. 1998.
- [14] C.W. Chao, C.H. Hsieh, and P.C. Lu, " Lossless Compression Scheme for Vector Quantization Indexes, " Seventh IEEE International Symposium on Personal, Indoor and Mobile Radio Communications, PIMRC '96, vol. 3, pp. 987-990, 15-18 Oct. 1996.