## Q-ary LDPC Decoders with Reduced Complexity

X. H. Shen & F. C. M. Lau Department of Electronic and Information Engineering, The Hong Kong Polytechnic University, Hong Kong Email: shenxh@eie.polyu.edu.hk & encmlau@polyu.edu.hk

## Abstract

Q-ary low-density parity-check (LDPC) codes achieve exceptional error performance at the expense of computation simplicity. Solutions to accelerate the decoding process have become one of the focuses in literature. In this paper, a decoding method is proposed, based on the subcode concept, to speed up the dominant iterative process. The method leads to speed improvement with moderate error-performance penalty.

## **Index Terms**

Bit error rate, complexity, LDPC code, q-ary LDPC code, subcode.



**Francis C.M. Lau** received the BEng (Hons) degree in electrical and electronic engineering and the PhD degree from King's College London, University of London, UK, in 1989 and 1993, respectively.

He is a Professor and Associate Head at the Department of Electronic and Information Engineering, The Hong Kong Polytechnic University, Hong Kong. He is also a Fellow of IET and a senior member of IEEE. He is the co-author of *Chaos-Based Digital Communication Systems* (Heidelberg: Springer-Verlag, 2003) and *Digital Communications with Chaos: Multiple Access Techniques and Performance Evaluation* (Oxford: Elsevier, 2007). He is also a co-holder of three US patents and one pending US patent. He has published over 230 papers. His main research interests include channel coding, cooperative networks, wireless sensor networks, chaos-based digital communications, applications of complex-network theories, and wireless communications.

He served as an associate editor for *IEEE Transactions on Circuits and Systems II* in 2004–2005 and *IEEE Transactions on Circuits and Systems I* in 2006–2007. He was also an associate editor of *Dynamics of Continuous, Discrete and Impulsive Systems, Series B* from 2004 to 2007, a co-guest editor of *Circuits, Systems and Signal Processing* for the special issue "Applications of Chaos in Communications" in 2005, and an associate editor for IEICE Transactions (Special Section on Recent Progress in Nonlinear Theory and Its Applications) in 2011. He has been a guest associate editor of *International Journal and Bifurcation and Chaos* since 2010 and an associate editor of *IEEE Circuits and Systems Magazine* since 2012.