



THE CHINESE UNIVERSITY OF HONG KONG
Institute of Network Coding
and
Department of Information Engineering
Seminar



Iterative Soft-Decision Decoding of Algebraic-Geometric Codes

by

Professor Li CHEN (陳立教授)

Sun Yat-sen University, China

Date : 1 August 2012 (Wednesday)

Time : 2:30 - 3:30 pm

**Venue : Room 833, Ho Sin Hang Engineering Building
The Chinese University of Hong Kong**

Abstract

Algebraic-geometric (AG) codes have long been identified as a possible candidate to replace Reed-Solomon (RS) codes for error-correction. However, the current decoding algorithms have not fully exploited its error-correction potential. This talk will introduce a newly developed iterative soft-decision decoding algorithm for one of the most popular algebraic-geometric (AG) codes -- Hermitian codes. The algorithm is designed by integrating the two most powerful soft-decision decoding algorithms, the adaptive belief propagation (ABP) algorithm and the Koetter-Vardy (KV) list decoding algorithm. The ABP algorithm performs iterative decoding based on an adapted parity-check matrix of the Hermitian code to enhance the reliability of the soft received information. With the enhanced reliability, the KV algorithm performs soft-decision list decoding to obtain the original message. The parity-check matrix adaptation is bit reliabilities oriented, reducing the columns that correspond to the unreliable bits to weight-1 and preventing the propagation of the unreliable information. Re-grouping of the unreliable bits will be introduced to assist the ABP decoding. A complexity reducing ABP-KV decoding approach will also be proposed based on assessing the soft information provided by the ABP algorithm and determining whether the following KV decoding steps should be carried out. Geometric interpretation of the ABP algorithm will be shown, demonstrating the necessity of performing matrix adaptation and coupling the ABP algorithm with the KV algorithm. Finally, simulation results will be presented to show the performance advantage of the ABP-KV decoding algorithm. It outperforms the existing decoding algorithms for the Hermitian codes and the ABP-KV decoding of RS codes.

Biography

Li Chen received his BSc degree in applied physics from Jinan University, China in 2003, MSc degree in communications and signal processing and PhD degree in mobile communications in 2004 and 2008 respectively, both from Newcastle University, United Kingdom. He was a recipient of the British Overseas Research Scholarship (ORS). From 2007 to 2010, he was a research associate with Newcastle University, carrying out an Engineering and Physical Sciences Research Council (EPSRC) project collaborated with Cambridge University. From 2010, he joined Sun Yat-sen University where he is currently an associate professor. He is currently a principle investigator for a National Natural Science Foundation of China (NSFC) project. His primary research interests include: channel coding, information theory and wireless communications.

****ALL ARE WELCOME ****

Host: Professor Raymond W.H. Yeung (Tel: 3943-8375, Email: whyeung@ie.cuhk.edu.hk)
Enquiries: Department of Information Engineering, CUHK (Tel.: 3943-8388)