



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



Iterative Soft Decoding of Reed-Solomon Convolutional Concatenated Codes

by

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The Chinese University of Hong Kong

Abstract

Reed-Solomon convolutional concatenated (RSCC) code is a popular coding scheme whose application can be found in wireless and space communications. However, iterative soft decoding of the concatenated code is yet to be developed. This talk introduces a novel iterative soft decoding algorithm for the concatenated code, aiming to better exploit its error-correction potential. The maximum a posteriori (MAP) algorithm is used to decode the inner convolutional code. While the outer Reed-Solomon (RS) codes' soft-in-soft-out (SISO) decoding will be performed by the integrated adaptive belief propagation (ABP) algorithm and the conventional algebraic decoding algorithm. The outer SISO decoding feeds back both the deterministic and the extrinsic probabilities of RS coded bits, enabling the soft information to be exchanged between the inner and outer decoders. An EXtrinsic Information Transfer (EXIT) analysis will be conducted to shed lights on the iterative decoding behavior, which also leads to the design of the concatenated coding scheme. The iterative decoding performance will be shown, demonstrating its performance advantage over the existing decoding algorithms. In particular, the iterative decoding algorithm can deliver significant error-correction improvements for short RSCC codes, e.g., with a thousand bits. This makes RSCC code a competent coding scheme for some communication scenarios that carry short data packets and have strict signal processing latency and energy consumption budgets, e.g., the wireless sensor networks (WSN) and the high mobility communications (HMC). Comparison with the currently popular low-density parity-check (LDPC) code, turbo code and polar code will be presented, showing RSCC code's competency powered by the iterative decoding algorithm.

Biography

Dr. 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 of United Kingdom. From 2010, he joined the School of Information Science and Technology, Sun Yat-sen University of China, where he is now an Associate Professor. He is an Associate Head of the Department of Electronic and Communication Engineering. He is a committee member of the Chinese Institute of Electronics on Information Theory. From 2007 to 2010, he was a Research Associate with Newcastle University. He visited the Institute of Network Coding, the Chinese University of Hong Kong for a number of times during 2010-12. He was a recipient of the British Overseas Research Scholarship (ORS). Currently, he is a principle investigator of two National Natural Science Foundation of China (NSFC) projects and a co-investigator of the National Basic Research Program (973 program) project. He is a technical program committee member for various international conferences, including HMWC 2013 and ICC 2014. His primary research interests include: information theory, channel coding and wireless communications.

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