



**THE CHINESE UNIVERSITY OF HONG KONG**  
Department of Information Engineering

*Seminar*

**How to produce a turbo equalization system with  
complexity  $O(\log L)$ ?**

by

**Professor Defeng Huang**  
School of Electrical, Electronic and Computer Engineering  
University of Western Australia

**Date : 4 July, 2011 (Mon.)**  
**Time : 11:00am-12:00noon**  
**Venue : Room 833, Ho Sin Hang Engineering Building**  
**The Chinese University of Hong Kong**

Abstract

Following the great success of turbo codes in 1993, turbo equalization was conceived as an approach for achieving bandwidth efficient digital communications over inter-symbol interference channels. However, for more than 15 years, the prohibitive complexity of turbo equalization has prevented it from practical use, in particular, its use in time-variant inter-symbol interference channels with a large number of channel taps, e.g., for high-speed wireless communications and underwater acoustic communications.

Recently, a group of researchers from the information theory community have proposed a graph based approach to signal processing, namely, Gaussian Message Passing in factor graph. Powered by this graphical approach and through proper approximations, we have managed to reduce the complexity of turbo equalization, including the Soft-Input and Soft-Output equalizer and the channel estimator, to the level of  $O(\log L)$  per symbol per iteration, where  $L$  is the number of channel taps. In this talk, how this has been achieved will be presented and the ramification of this progress will also be discussed.

Biography

Dr. Huang received the B.E.E.E. and M.E.E.E. degree in electronic engineering from Tsinghua University in 1996 and 1999, respectively, and the PhD degree in electrical and electronic engineering from the Hong Kong University of Science and Technology (HKUST) in 2004. Currently, he is an associate professor with School of Electrical, Electronic and Computer Engineering at the University of Western Australia.

**\*\* ALL ARE WELCOME \*\***

Host: Professor Angela Yingjun Zhang (Tel: 2609-8465, Email: yjzhang@ie.cuhk.edu.hk)  
Enquiries: Information Engineering Dept., CUHK (Tel.: 2609-8385)