



THE ELECTRICAL AND COMPUTER ENGINEERING PROGRAM CORDIALLY INVITES YOU TO

Space Shift Keying Modulation for MIMO Systems

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Monday April 28, 2008

12:00-1:30 p.m.

Light lunch will be served at noon.

Lecture Hall 144



In this seminar, we introduce a modulation scheme, termed space shift keying (SSK), suitable for multiple-input multiple-output (MIMO) systems. SSK modulation, which is a fundamental component of spatial modulation, inherently exploits fading in wireless communications to provide better performance over conventional amplitude/phase modulation (APM) techniques. In SSK, only the antenna indices, and not the symbols themselves (as in the case of SM and APM), relay information. We illustrate SSK's strength by studying its interaction with the fading channel. We obtain tight upper bounds on uncoded bit error probability, and analytically demonstrate coded SSK's diversity advantage over APM. Capacity results are presented, with SSK gaining as much as 1 bit/s/Hz over APM techniques. Analytical and simulation results show performance gains (2-8 dB) over popular multiple antenna APM systems (including Bell Laboratories layered space time (BLAST) and maximum ratio combining (MRC) schemes), making SSK an excellent candidate for future wireless applications.

NOTE: This work has been submitted to IEEE Transactions on Wireless Communications for possible publication. It has been done jointly with my MSc student Jeyadeepan Jeganathan and Prof. Leszek Szczecinski of INRS-EMT, Montreal, Canada.

Ali Ghrayeb received the Ph.D. degree in electrical engineering from the University of Arizona, Tucson, AZ, in May 2000. He is currently an Associate Professor in the Department of Electrical and Computer Engineering, Concordia University, Montreal, Canada. He holds a Concordia Research Chair in High-Speed Wireless Communications. His research interests include wireless and mobile communications, error correcting coding, MIMO systems, CDMA systems, and coding and signal processing for data transmission and storage. He has co-instructed technical tutorials on Coding for MIMO Systems and on Synchronization for WCDMA Systems at several major IEEE conferences, including ICC and GLOBECOM. He co-authored a book titled *Coding for MIMO Communication Systems*, published by Wiley in November 2007. He serves as an Associate Editor for *IEEE Transactions on Vehicular Technology* and *Wiley Wireless Communications and Mobile Computing Journal*.

This lecture is part of *Electrify Your Education* colloquia series sponsored by the Electrical and Computer Engineering Program

