

Discrete Mathematics Seminar

Time:	Friday, 25 February 2011, 1:00-2:00 PM
Room:	329 Derrick Hall
Title:	Asymptotic Error Rates of Multi-Branch Diversity Combinings over Arbitrarily Corrected Fading Channels
Speaker:	Dr. Julian Cheng, School of Engineering, University of British Columbia—Okanagan

Abstract:

Multi-branch diversity combining is an efficient technique to overcome the adverse effect of multipath fading in wireless communication systems. In practical applications, diversity reception usually occurs over correlated branches due to insufficient antenna spacing. While an exact error rate performance analysis over correlated fading is tractable for maximal ratio combining, it is challenging for equal gain combining (EGC) and selection combining (SC). This is because, with the exception of some special cases, the probability distribution function at the output of EGC and SC combiners operating over correlated branches are generally unknown. In this talk, we study the asymptotic error rates of EGC and SC diversity receptions over N -branch arbitrarily correlated Rician fading. Of practical value, we derive new compact analytical results that can be used to provide rapid and accurate error rate and outage probability estimation. Of theoretical interest, we find new physical insights into the behaviour of transmission over correlated Rician fading channels. In the special case of Rayleigh fading, it is shown that the asymptotic error rates over arbitrarily correlated Rayleigh fading can be obtained by scaling the asymptotic error rates over independent branches with a factor $\det(\mathbf{M})$, where $\det(\mathbf{M})$ is the determinant of the normalized channel correlation matrix.

Bio:

Julian Cheng received the B. Eng. Degree (First Class) in electrical engineering from the University of Victoria, Victoria, BC, Canada in 1995, the M.Sc. (Eng.) degree in mathematics and engineering from Queen's University, Kingston, ON, Canada in 1997, and the PhD degree in electrical engineering from the University of Alberta, Edmonton, AB, Canada, in 2003.

He is currently an Assistant Professor with the School of Engineering, UBC Okanagan in Kelowna, BC, Canada. Previously, he worked for Bell Northern Research (BNR) and Northern Telecom (now NORTEL Networks), and taught at both University of Alberta and Lakehead University. His current research interests include digital communications over wireless channels, orthogonal frequency division multiplexing, spread spectrum communications, and statistical signal processing for wireless applications. Dr. Cheng is a registered Professional Engineer in British Columbia.