The Electrical and Computer Engineering Program presents

ECEN Seminar Series

On the computation of the channel capacity in generalized fading environments

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Exact and asymptotic studies of the average error probability of wireless communication systems over generalized fading channels have been extensively pursued over the last two decades. In contrast, studies and results dealing with the channel capacity in these environments have been more scarce.

In the first part of this talk, we present a generic moment generating function-based approach for the exact computation of the channel capacity in such kind of environments. The resulting formulas are applicable to systems having channel state information (CSI) at the receiver and employing maximal-ratio combining or equal-gain combining multichannel reception. The analysis covers the case where the combined paths are not necessarily independent or identically distributed. In all cases, the proposed approach leads to an expression of the ergodic capacity involving a single finite-range integral, which can be easily computed numerically. In the second part of the talk, we focus on the asymptotic analysis of the capacity in the high and low signal-to-noise ratio (SNR) regimes. More specifically, we offer new simple closed-form formulas that give an intuitive understanding of the capacity behavior at these two extreme regimes. Our characterization covers not only the case where the CSI is available only at the receiver but also the case where the CSI is available at both the transmitter and receiver.

Mohamed-Slim Alouini was born in Tunis, Tunisia. He received the Ph.D. degree in electrical engineering from the California Institute of Technology (Caltech), Pasadena, CA, USA, in 1998. He was with the department of Electrical and Computer Engineering of the University of Minnesota, Minneapolis, MN, USA, then with the Electrical and Computer Engineering Program at the Texas A&M University at Qatar, Education City, Doha, Qatar. Since June 2009, he has been a Professor of Electrical Engineering in the Division of Physical Sciences and Engineering at King Abdullah University of Sciences and Technology (KAUST) Thuwal, Makkah Province, Kingdom of Saudi Arabia, where his current research interests include the design and performance analysis of wireless communication systems.

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