SC 12 Propagation modeling for mobile wireless communications: Overview and examination of the dynamic vehicle-to-vehicle

Course Lecturer Dr. David W. Matolak

Course Description

This tutorial will provide participants with knowledge of wireless channel characteristics and how to model them, for physical- and higher-layer mobile communication system investigations. The course consists of two main parts: Part I covers general principles and fundamentals of channel modeling, including path loss, multipath fading, and shadowing for terrestrial and other (satellite, aeronautical) environments, along with classical WSSUS modeling approaches; Part II covers modern topics including MIMO extensions, quasi-deterministic modeling, some "atypical" channels, correlated scattering and statistical non-stationarity. This leads to an in-depth discussion of a currently hot topic in channel modeling, the vehicle-to-vehicle (V2V) channel. We describe the unique features of the V2V setting, several types of V2V models, and example measurement and simulation results. Both tapped-delay line and geometry-based models are described. We also provide a short summary of the work of the IEEE Vehicular Technology Society's Committee on Standardized V2V Channel Models (of which the course organizer/lecturer is a founding member).

Participants in this tutorial should have an electrical engineering background, preferably a bachelor's degree or higher in electrical or computer engineering. Persons with physics or mathematics degrees may also benefit from the course. A good knowledge of probability and statistics, linear systems, and modulation, is recommended. Anyone who must evaluate, specify, compare, or deploy wireless systems over channels in multiple environments—including V2V—would benefit from this course. Graduate students and researchers who are interested, but not expert in this topic, should also benefit.

Biography

David W. Matolak is a professor in the School of Electrical Engineering and Computer Science at Ohio University, where he has been a faculty member since 1999. He has approximately 20 years of experience working on various types of communication systems, including work experience with private industry, federal government organizations, and academia. His areas of expertise and current interest are wireless channel measurement and modeling, spread-spectrum and multicarrier wireless transmission, aeronautical communications, and ad hoc networking. While at Ohio University, he has conducted sponsored research for multiple organizations, including NASA, the NSF, the Air Force/DARPA, the FAA, and the NIST. Dr. Matolak received the B.S. degree from The Pennsylvania State University in 1983, the M.S. degree from The University of Massachusetts in 1987, and the Ph.D. degree from The University of Virginia in 1995, all in electrical engineering. In the past, he was with the Rural Electrification Admin., Washington, D.C.; the UMass LAMMDA Laboratory, Amherst, MA; AT&T Bell Laboratories, North Andover, MA; the Univ. of Virginia's Communication Systems Laboratory, Charlottesville, VA; Lockheed Martin Tactical Communication Systems (now L3 Communications), Salt Lake City, UT; the MITRE Corporation, McLean, VA; and Lockheed Martin Global Telecommunications, Reston, VA. His work has spanned such areas as specialized rural telephony

systems, high-capacity point-to-point microwave link design, microwave transmission line and antenna analysis and design, block equalization algorithms for dispersive mobile channels, spread-spectrum wireless local loop system engineering, satellite and aeronautical communication system vulnerability assessments, and satellite communication engineering. He was a visiting professor at the NIST Boulder Laboratories in summer 2009, at the University of Malaga, Spain in June 2010, and at NASA Glenn Research Center in summer 2011. He is a member of Sigma Xi, a senior member of the IEEE, and serves as Associate Editor for the IEEE Transactions on Vehicular Technology.