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Editorial

Radio Wave Propagation and Wireless Channel Modeling 2013

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Mechanisms about radio wave propagation are the basis for the research of wireless channel modeling. Typical wireless channel models for typical scenarios are of great importance to the physical and higher layers design. With the development of some new techniques such as vehicle-to-vehicle communications, wireless relay technique, wireless chip technique, wireless body area network (WBAN), and massive multi-input multi-output (MIMO) technique, novel wireless channel models should be developed to cater for these new situations.

Unlike the traditional views, a more general concept of wide-sense V2X (WSV2X) communications was proposed in the article titled "*Propagation and wireless channel modeling development on wide-sense vehicle-to-X communications*." WSV2X includes not only V2V and vehicle-to-infrastructure (V2I) communications, but also train-to-train (T2T) and train-to-infrastructure (T2I) communications. The review of propagation scenarios, wireless channel features, the channel standardization, and modeling philosophies related to WSV2X is presented in this paper to give some rough inspirations of the joint research of the V2X and T2X scenarios.

Different from the traditional assumption that the wireless channel is wide-sense stationary uncorrelated scattering (WSSUS), Dr. Y. Li et al. propose a non-WSSUS channel model for V2V communication systems. The model is based on the tapped-delay line (TDL) structure and considers the correlation between taps both in amplitude and phase. Using the relationship between the correlation coefficients of complex Gaussian, Weibull, and uniform random variables (RVs), the model is used to reflect the non-WSSUS properties of V2V channels.

As for the research on the vehicular ad hoc networks (VANETs), the impact of vehicles as obstacles has been neglected. In the article titled "*Line-of-sight obstruction analysis for vehicle-to-vehicle network simulations in a two-lane highway scenario*," Dr. T. Abbas et al. considered the LOS obstruction caused by other vehicles in a highway scenario. A car-following model is used to characterize the motion of the vehicles driving in the same direction on a two-lane highway. The position of each vehicle is updated by using car following rules together with the lane-changing rules for the forward motion. The presented traffic mobility model together with the shadow fading path loss model takes into account the impact of LOS obstruction on the total received power in the multiple-lane highway scenarios.

Dr. M. M. Olama et al. talk about the wireless channel modeling for ultrawideband (UWB) indoor wireless channels. In their article, a general scheme for extracting mathematical UWB indoor channel models from the noisy received signal measurements is presented. The UWB channel models are represented in a stochastic state-space form with high approximation to the measured data.

As for the key techniques related to wireless channels, Dr. Y. Li et al. present a special rectangular cloak design based on the transformation electromagnetic (TE) technique to improve the signal coverage under serious wireless channel conditions. TE technique paves a new way for controlling the propagation direction of the radio signal. A cloak covering the surface of the obstacle is designed to improve the coverage performance in a shadow area. The material parameters of the cloak are calculated by the TE technique. This scheme can

be used to improve the reliability of the radio coverage in a shadow area.

Dr. J. Mar et al. present a pilot-aided channel estimation scheme to enhance the channel estimation accuracy under multiple-input multiple-output orthogonal frequency division multiplexing (MIMO-OFDM) fading channels. Based on the adaptive path number selection mechanism, the number of paths can be scalable and adaptively changed with the characteristics of MIMO-OFDM fading channels. The fine channel estimation formulas for all data subcarriers can be derived.

By compiling these papers, we hope to enrich our readers and researchers with respect to these particularly common, yet usually highly treatable, wireless channel modeling techniques and the channel models.

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