

Public Abstract

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Ph.D.

Optimum Receiver Design and Performance Analysis for Wireless Communication

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The hostile wireless environment poses numerous challenges to the achievement of high speed reliable mobile communications. This dissertation is devoted to the optimum receiver design and theoretical performance analysis of wireless communication systems operated over fading channels, and this objective is incarnated by means of design, analysis and simulation of a broad range of wireless communication systems under various practical system configurations. A statistical discrete-time system model is proposed for wireless communication systems operated in wideband doubly selective (both time-selective and frequency-selective) fading environment, and it provides a generic analysis and simulation framework for the design and evaluation of wireless communication systems. Based on the statistical properties of the discrete-time model, optimum receivers are developed for various wireless systems with practical configurations, and theoretical performance analyses are carried out to investigate the effects of channel estimation error, doubly selective fading, receiver timing phase offset, and co-channel interference on system performance. The theoretical performance expressions presented in this dissertation provide a set of analytical tools for communication system design and evaluation. In addition, all of the analytical results presented in this dissertation are rigorously verified through extensive numerical simulations, and excellent agreements are observed between the simulation results and theoretical expressions.