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论文与技术报告

基于DFT-BEM模型的LOFDM系统双散射信道最大多普勒扩展估计

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摘要：

栅格正交频分复用（Lattice Orthogonal Frequency Division Multiplexing, LOFDM）系统凭借特殊的网格时频结构和更大的欧式距离特性，在快速移动环境下展现了卓越的抗时变、抗多径能力。最大多普勒扩展作为LOFDM系统自适应策略的重要参数之一，准确的最大多普勒扩展估计对于LOFDM系统发送信号设计以及自适应策略实现十分重要。本文针对LOFDM系统的特殊信号结构以及双散射信道的快时变特性，采用DFT-BEM信道模型近似快时变信道响应，结合快时变信道下LOFDM系统块传输接收实现，利用梳状导频辅助估计多普勒域平均信道频率响应，在此基础上利用信道响应估计值的时间相关函数实现基于F范数的信道最大多普勒扩展估计；并提出基于子空间的最大多普勒扩展估计算法，降低了噪声对最大多普勒扩展估计性能的影响，在低信噪比条件下有效改善了估计性能。

关键词： 网格正交频分复用系统；基扩展；双散射信道；最大多普勒扩展估计

The Maximum Doppler Spread Estimation Based on DFT-BEM Model for LOFDM Systems in Doubly-Dispersive Channels

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Abstract:

The Lattice Orthogonal Frequency Division Multiplexing (LOFDM) system can achieve excellent performance in combating time-varying and multi-path fading in fast-moving environment via the special time-frequency Lattice (TFL) structure and the property of lager Euclidean distance. The maximum Doppler spread, or equivalently, the mobile speed, is a measure of the spectral dispersion of mobile fading channel. Accurate estimation of the mobile speed is of importance in LOFDM systems which require the knowledge of the rate of channel variations to achieve its transmission signal designing and adaptive strategy. In this paper, aiming at the special structure of LOFDM signals and fast time-varying characteristics of doubly-dispersive channels, the discrete Fourier transform based basis expansion models (DFT-BEM) is used to approach the real fast time-varying channel, and the Doppler domain averaging channel frequency response (CFR) is estimated by exploiting the comb-type pilots and the block transmission strategy. On the base of the time auto-correlation function of the CFR estimated value, the F-norm based maximum Doppler spread estimation is realized. On the other hand, the subspace based maximum Doppler spread estimation algorithm is proposed, which reduces the effect of noise on the estimation and effectively improves the performance of the algorithm at low signal-to-noise ratio (SNR).

Keywords: Lattice Orthogonal Frequency Division Multiplexing basis expansion model doubly-dispersive Channel maximum Doppler spread estimation

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