应用

# 基于SAMP重构算法的OFDM系统稀疏信道估计方法

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摘要：

为了提高OFDM系统稀疏信道估计的精度和减少导频子载波的数目，本文将OFDM系统频率选择衰落信道时域稀疏冲激响应的参数估计问题转化为压缩感知理论中在稀疏度未知及存在噪声干扰情形下复数稀疏信号的重构问题，提出了分别基于基追踪降噪（BPDN）和稀疏度自适应匹配追踪（SAMP）的两种OFDM系统稀疏信道估计方法。在导频数和信噪比均相同的情形，与传统的最小二乘法（LS）、匹配追踪-最小二乘法（MP-LS）的信道估计方法相比，仿真结果表明所提出的两种方法无须将信道的稀疏度作为先验知识，并具有归一化均方误差小和误比特率低的优点。在所提出的两种方法中，基于SAMP的方法比基于BPDN的方法具有运行速度快、性能更接近Cramer-Rao界的优点，且导频子载波仅为系统子载波的12.5%，信噪比约大于10dB时，采用基于SAMP的方法在信道稀疏度未知的情形也能获得满足实际应用的误比特率。

关键词： 稀疏信道估计；稀疏度自适应匹配追踪；正交频分复用

# SAMP Construction based Sparse Channel Estimation for OFDM Systems

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Abstract:

In order to improve the precision of sparse channel estimation and decrease the pilot numbers in OFDM systems, the paper transforms the estimation of sparse frequency selective fading channel in time-domain for OFDM systems into the reconstruction of complex sparse signal existing the noise interference and without the prior information of the sparsity in compressed sensing. We proposed two methods of sparse channel estimation based on basis pursuit denoising (BPDN) and sparsity adaptive matching pursuit (SAMP) for OFDM systems. Under the same conditions, we compared the two methods with the other channel estimation methods including conventional least square (LS), MP-LS which firstly estimate the positions of the most significant taps through match pursuit (MP), then to estimate the numerical value of the positions by LS method. Simulation results show that the proposed methods do not require the prior information of sparsity, and have the merits of smaller normalized mean square error, lower bit error ratio. Between the two proposed methods, the one based on SAMP has the merits of running faster, nearer to the Cramer-Rao bound than the another, and the BER of the developed method based on SAMP can satisfy the practice applications when the pilot subcarriers is 12.5% of the all carriers and SNR is higher than 10 dB.

Keywords: sparse channel estimation　sparsity adaptive matching pursuit (SAMP)　orthogonal frequency-division multiplexing (OFDM)

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