

论文

一种低信噪比TDMA信号的载波同步算法

王军杰, 彭华, 曹鹏

解放军信息工程大学, 河南

摘要:

本文深入研究了基于FFT运算进行相位扩展的宽范围自相关函数法和宽范围L&R算法,分析了这两种载波频偏估计算法的性能。在此基础上,本文结合TDMA信号的前导字和CZT(chirp z transform)算法的高频率分辨率特性,设计了适于低信噪比信号的宽范围载波同步改进算法。该算法利用TDMA信号的前导字进行数据辅助(DA)型载波同步,有效地缩小了低信噪比信号的频偏范围;再利用CZT算法进一步缩小频偏范围,最后利用非数据辅助型(NDA)自相关函数法得到精确的载波频偏。改进算法的计算复杂度略高于宽范围自相关函数法,而远低于宽范围L&R算法。通过仿真比较,改进算法对低信噪比(SNR)环境(3-6dB)中的信号具有良好且稳定的估计性能。

关键词: 载波同步 低信噪比 TDMA CZT算法

An improved algorithm of carrier synchronization for TDMA signal under low SNR

WANG Jun-Jie, PENG Hua, CAO Peng

Information Engineering University, Zhengzhou Henan

Abstract:

To analyze the carrier estimation performance, wide-spectrum auto-relation algorithm and wide-spectrum L&R algorithm, which can realize wide frequency offset range estimation based FFT algorithm, are discussed in this paper. Based on the discussion, combining the pilot of TDMA signal with vivid frequency distinguishability of CZT(chirp z transform) algorithm, an improved algorithm which fits for carrier synchronization of low signal to noise ratio(SNR) signal with large carrier offset range is designed. The data aided(DA) carrier synchronization using the pilot of TDMA signal can efficiently shorten the carrier offset range of low SNR signal, then using the CZT algorithm to reduce the frequency offset range further, the accurate carrier frequency offset will be gotten by non-data-aided(NDA) auto-relation algorithm finally. The complexity of the improved algorithm is a little higher than wide-spectrum auto-relation algorithm, but much lower than wide-spectrum L&R algorithm. Comparing with other algorithms, simulation results show that the improved algorithm has a good and steady performance under low SNR(3-6dB).

Keywords: carrier synchronization low SNR TDMA CZT algorithm

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通讯作者:

作者简介:

作者Email: andrew2022@163.com

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