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基于盲源分离的Multi-Rate DS/CDMA信号 扩频序列盲估计

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Blind Source Separation Based Blind Estimation of the Spreading Sequences for Multi-Rate DS/CDMA Signals

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摘要 通过分析Multi-Rate DS/CDMA信号特性,建立的Multi-Rate DS/CDMA系统模型与线性混合的盲源分离模型一致,针对异、同步信号的不同特性,提出不同循环分段降维方法:对异步系统而言,采用2倍扩频周期为间隔对接收信号进行分割,利用Fast-ICA算法盲估计同一扩频周期用户的扩频序列,基于矢量2范数基础上估计各用户失步时间,并依此截取得到各用户的实际扩频序列,然后,循环至次大扩频周期进行盲估计,同时根据估计波形相似度归一化衡量函数消除最大周期分段序列,求解次大周期用户扩频序列,直至循环结束。对同步系统则以单倍最大扩频周期为间隔对接收信号进行分割,然后进行盲估计及降维处理。理论分析和仿真结果验证了本文方法的有效性。

关键词： 变增益　Multi-Rate DS/CDMA信号　扩频序列盲估计　盲源分离　非合作通信

Abstract： The characteristics of the Multi-Rate DS/CDMA signals are analyzed in this paper, and two dimension-deflation methods with different loop durations are presented in accordance with the signal characteristics in synchronous and asynchronous systems. For the asynchronous system, the received signals are divided into two-spreading-period-length temporal vectors; the Fast-ICA algorithm is used to estimate the spreading sequences blindly with the same spreading period. The estimated spreading sequences are obtained according to the desychronous time, which is calculated based on the 2-norm of vector. The normalization weight function of the estimated waveform similarity ratio is exploited to separate the spreading sequences with different spreading periods. For the synchronous system, the process is the same with the algorithm described above, except that the received signals are divided into one-spreading-period-length temporal vectors. Finally, theory analysis and simulation results demonstrate the validity of the new method.

Keywords： variable spreading gain　Multi-Rate DS/CDMA signal　blind estimation of the spreading sequence　blind source separation　non-cooperative communication

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