

算法研究

一种改进的快速IMP伪码捕获方法

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摘要:

针对迭代信息传递 (IMP) 伪码捕获算法中寄存器状态选取单元存在复杂度高且缺乏理论依据的问题, 提出了一种改进的迭代伪码捕获算法。首先在分析译码得到的后验信息概率分布特性的基础上, 定义基于后验信息的评价函数来衡量PN码的寄存器状态估计向量的可靠性。然后, 按可靠度从高到低的顺序依次选取状态估计向量作为寄存器状态, 进而生成本地PN码并进行相关验证。若相关值大于门限, 则宣布捕获成功, 操作停止; 否则, 选取下一个估计向量进行相同操作。若已用完所有的状态估计向量, 则宣布捕获失败。最后利用长m序列为例进行理论分析及仿真, 结果表明改进算法在一定程度上降低了运算复杂度, 大大提高了收敛速度, 同时捕获性能提高了大约 1~3dB, 特别适合于扩频通信系统中长PN序列的快速捕获。

关键词: IMP算法; PN码捕获; 后验对数似然比

An Improved approach to rapid PN code acquisition using IMP

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Abstract:

Considering that high computational complexity exists and it is hard to find the theory to refer when we select register state for the rapid PN code acquisition algorithm based on iterative message passing (IMP), a modified rapid PN code acquisition algorithm based on IMP is proposed. Based on the analysis of the probability density function of posterior information, an evaluation function is constructed to measure the reliability of estimation vector of register state using a posteriori probability log-likelihood ratios (APP LLR). Then we select the estimation vector according to the reliability from high to low as register state to perform correlation test. If the correlation value is greater than the threshold value, the acquisition is successful and the acquisition procedure is stopped. Otherwise, the same operation is performed for the next estimation vector. If all the correlation values are smaller than the threshold, the acquisition fails. Finally, analysis and simulations are performed based on several m-sequences with large order. Results show that the complexity of modified algorithm is reduced to some extent, the convergence property is improved substantially and acquisition performance can be improved about 1~3 dB. This algorithm can be applied to the rapid PN acquisition, especially in spread-spectrum communication system with long PN code.

Keywords: Iterative message passing algorithms PN code acquisition APP LLR

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