

论文

AWGN信道下Turbo码解码算法的选择

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摘要:

在加性高斯白噪声 (AWGN) 信道下, 采用最大后验概率(MAP)算法的Turbo码解码是误比特率最低的算法。为了降低运算量实现快速解码, Log-MAP算法、Max-Log-Map算法和线性Max-Log-Map算法分别对MAP算法进行了不同程度的简化。本文简单介绍了基于MAP算法的Turbo码解码原理, 从纠正函数的角度出发归纳和比较了三种MAP类简化算法, 通过纠正函数从理论上对算法性能以及对信噪比估计误差的敏感度进行了分析, 对分析结果进行了仿真验证。综合解码性能和运算量, 提出了Turbo码解码的算法选择方案, 以及实用, 简易的Turbo码解码参数设置建议。

关键词: Turbo码 Log-MAP算法 Max-Log-MAP算法 线性Max-Log-MAP算法 信噪比估计误差

Turbo-Decoding Algorithm Selection on AWGN Channels

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Abstract:

For Turbo decoding on the additive white Gaussian noise (AWGN) channel, the optimal algorithm in term of bit error rate (BER) is symbol by symbol maximum a posteriori (MAP) algorithm. In order to reduce the computational complexity and to implement the MAP decoding algorithm, a number of simplified MAP-based methods have been proposed recently, e.g. the Log-MAP algorithm, the Max Log-MAP algorithm and the linear Max Log-MAP algorithm. This paper introduces the basic principle of MAP-based turbo decoding. In addition, by the means of the so called correction function, these simplified MAP-based approaches are categorized and compared, while the performance and sensitivity to the signal to noise ratio (SNR) offsets of those simplified algorithms are also theoretically investigated. Further, all the results are verified with a number of computer simulations. By considering both the performance and the computational cost, Turbo decoding algorithm selection suggestion as well as a practical and easy parameter configuration are proposed.

Keywords: Turbo codes Log-MAP algorithm Max-Log-MAP algorithm Linear Max-Log-MAP algorithm Signal-to-Noise Ratio estimation error

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