信号处理 2013, 29(5) 550-556 DOI: ISSN: 1003-0530 CN: 11-2406/TN

论文与技术报告

低复杂度校验节点调度的LDPC串行译码算法

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摘要：

置信传播算法（BP）是低密度校验码（LDPC）一种常用的译码算法。为了改善动态调度算法（IDS）在提高BP算法译码性能时复杂度较高的缺陷，提出了一种基于校验节点的串行消息更新策略（Min2-CSBP）。该策略定义了一种基于校验节点的可靠度测度并能近似表征对应的校验节点的可靠程度。可靠度测度仅用于确定消息更新的次序，而在消息更新的计算中仍然采用精确的概率值。每次迭代中对可靠度按升序排序并按此顺序进行消息更新。随后，对Flood算法、CSBP算法、NW-RBP算法及Min2-CSBP算法进行了复杂度对比。仿真结果表明：在使用LDPC短码时，Min2-CSBP算法比Flood算法及CSBP算法显著提高了误码率性能，并减少了迭代次数。

关键词： 编码；低密度校验码；消息传递算法；串行译码；动态调度算法；低复杂度

Low-Complexity Check-Node-Based Serial Scheduling Belief Propagation for LDPC Codes

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Abstract:

Compared to classic channel coding, Low-density parity-check (LDPC) codes have proved to be very powerful channel coding schemes with a broad range of applications. However, as maximum-likelihood decoding is too complex to implement, suboptimal decoders have to be employed .One of the most popular decoding algorithms of LDPC codes is belief propagation (BP) decoding. Informed Dynamic Scheduling (IDS) can provide a better BER performance, but hard to implement due to high computational complexity increased. In order to improve the convergence, a simple low-complexity sequential check-node-based scheduling strategy is proposed. A new check-node-based reliability measure is defined, which represents the degree of reliability approximately. The reliability measure is used for ordering while the actual message updates still use the exact BP equations. During an iteration , the schedule strategy finds an update sequence, which is arranged by the new defined reliability measure in ascending order. Complexity is compared among those algorithms. Mechanism why the new strategy works effective is presented. Simulation shows that the new approach significantly improve the BER performance using short-length block LDPC codes and reduce iterations.

Keywords: Channel coding Low-density parity-check codes Message passing algorithm Serial decoding Dynamic scheduling algorithm Low complexity

收稿日期 2012-09-17 修回日期 2013-03-10 网络版发布日期 2013-05-25

DOI:

基金项目:

国家自然科学基金资助项目（No.61271204）

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