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通信与网络

QPSK调制下最大平均互信息量化在 LDPC译码中的应用

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摘要:

对低密度奇偶校验(low-density parity-check, LDPC)码在四进制相移键控(quaternary phase shift keying, QPSK)调制下的译码算法进行了深入研究, 分析和推导了最大平均互信息量化的具体方法。在QPSK调制下, 通过此方法量化初始消息, 最终使每次迭代的变量消息和校验消息都是整数, 实现了基于整数运算的最小和译码算法。仿真结果表明, 其性能与基于高精度浮点数的和积译码算法大约相差0.39 dB, 同时该算法中所有变量都用固定长度的整数表示, 便于硬件实现, 在其译码性能比和积译码性能下降不大的情况下, 大大缩短了译码时间。

关键词: 低密度奇偶校验码; 四进制相移键控调制; 最大平均互信息量化; 最小和算法; 整数运算

Application of maximum average mutual information quantization in LDPC decoding under QPSK modulation

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Abstract:

The decoding algorithm of low-density parity-check (LDPC) codes in quaternary phase shift keying (QPSK) modulation is in-depth studied. The specific method of the maximum average mutual information quantization is analyzed and deduced. With this method to quantify the initial message, each iteration of the variable messages and check messages becomes integer, then the min sum decoding algorithm based on integer arithmetic is implemented. Simulation results show that the performance of the min-sum decoding algorithm with maximum average mutual information quantization is about 0.39 dB worse than the performance of high-precision floating-point sum-product decoding algorithm. At the same time all the variables in the algorithm are fixed-length integers, so it is easy to implement in hardware. Although the decoding performance is slightly worse than sum product decoding performance, the decoding time is greatly reduced.

Keywords: low-density parity-check (LDPC) code quaternary phase shift keying (QPSK) modulation maximum average mutual information quantization min-sum algorithm integer operation

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