

论文与技术报告

一种信道编码与物理层网络编码的联合设计

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摘要:

基于正交振幅调制(QAM)设计了一种信道编码与物理层网络编码的联合实施方案,该方案巧妙的引入了一种去噪映射机制,即重新安排QAM调制的星座映射,中继节点对接收数据去噪后直接映射为对应数字比特流的异或。同时,利用卷积码和MAC-XOR网络编码(Network Coding, NC)的线性性质,使得中继节点只需直接估计网络编码的码字,因此中继节点的解调/译码的复杂度减少50%。在此基础上对该方案的误比特率性能进行分析。仿真结果表明了该方案的有效性,即与已有的物理层网络编码方法相比,在没有增加译码复杂度的基础上,该方案的信息容量有了显著提高。

关键词: 物理层网络编码; 信道编码; QAM映射; 联合设计

A New Joint Design of Physical Layer Network Coding and Channel Coding for Wireless Networks

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Abstract:

In this paper we consider a two-way relaying system, where two source terminals A and B desire to exchange information through a relay node R. To decode the superimposed signal from A and B efficiently, we proposes a practical scheme of joint physical network coding (PNC) and channel coding for multiple-access channel based on QAM modulation in the multiple access (MAC) stage of the investigated two-way relay scenario. The proposed scheme employs a denoising-mapping plan ingeniously, where the relay node first denoises the received mixture from A and B, and then maps it to the binary XOR of the corresponding digital bits after rearranging the constellation of QAM modulation. In addition, the scheme takes advantage of the linearity of convolutional code and MAC-XOR NC code so that digital bits of network coding can be estimated directly. In this way the complexity of the demodulation/decoding at the relay node is reduced by almost 50%. Also the BER (Bit Error Rate) performance of the proposed scheme is analyzed in this paper. Simulation experiments are done and performance comparisons are conducted. Our results show that the proposed scheme outperforms the current PNC strategies significantly in terms of the channel capacity without added the complexity of decoding.

Keywords: Physical layer network coding channel coding QAM mapping joint design

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