

### 一种基于TCM的信道编码与物理层网络编码的联合设计

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## An Improved Joint Design of Physical Layer Network Coding and Channel Coding Based on Trellis Coded Modulation in Two-way Relay Channel

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摘要

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**摘要** 该文在双向中继信道中基于网格编码调制(Trellis Coded Modulation, TCM)提出了一种信道编码与物理层网络编码的联合实施机制。该机制采用TCM, 将编码和调制统一考虑, 提高了编码序列的自由距离, 从而获得更高的编码增益。此外, 利用卷积码和MAC-XOR网络编码的线性性质, 使得中继节点只要直接估计网络编码的码字, 这样中继节点进行TCM译码的复杂度减少了50%。该机制同时考虑信道编码技术、调制技术以及物理层网络编码三者联合设计的问题, 既提高信息传输率, 又保证了可靠性。

**关键词:** 网格编码调制 物理层网络编码 联合设计

**Abstract:** A new scheme of joint channel coding and Physical layer Network Coding (PNC) is proposed for multiple-access channel based on Trellis Coded Modulation (TCM) in the Multiple Access Control (MAC) stage of the investigated two-way relay scenario. As a result of the adoption of TCM that combines channel coding with modulation, the scheme improves the free distance of the coding sequence, thus more encoding gain is obtained. In addition, the proposed scheme takes advantage of the linearity of convolutional code and MAC-XOR NC so that digital bits of network coding can be estimated directly. In this way the complexity of the decoding at the relay node is reduced by almost 50%. The proposed scheme considers the problem of joint design of channel coding, modulation and PNC, so that the system not only increases the information transmission rate, but also guarantees the reliability.

**Keywords:** Trellis Coded Modulation (TCM) Physical layer Network Coding (PNC) Joint design

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