Joint Adaptive Modulation and Adaptive MAC Protocols for Wireless Sensor Networks

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Abstract

This paper introduces cognitive MAC-layer techniques to wireless sensor networks (WSN) to optimize Network survivability. We compare Adaptive Modulation (AM) over flat-fading channels, with data rate and transmit power being varied according to channel conditions with two variants: Adaptive Modulation with Idle mode (AMI) and a new Adaptive Sleep with Adaptive Modulation (ASAM) which dynamically adjusts the transmission and sleep modes based shared global information on channel conditions. These introduced cognitive methods assume power allocation schemes that improve energy efficiency and this node life assuming multi-hop relay networks. Simulation results indicate that a notable reduction in energy consumption can be achieved by jointly adapting the data rate and the transmit power in WSNs. The proposed ASAM algorithm can considerably improve node lifetime compared to AM and AMI. The optimal power control values and optimal power allocation factors are further considered for multi-hop relay networks, respectively, thus reducing the need for higher layer network protocols in local switching.
References


Index Terms

Computer Science Wireless

Keywords

Cognitive WSNs Adaptive Modulation Cross-layer protocols