Abstract

Sensor networks require robust and efficient communication protocols to maximise the network lifetime. Radio irregularity, channel fading and interference results in larger energy consumption and latency for packet transmission over wireless channel. Cooperative multi-input multi-output (MIMO) schemes can combat the fading effects in wireless sensor network (WSN) and can significantly improve the communication performance. More over, the traffic offered to the sensor network is highly dynamic and an inefficiently designed medium access control (MAC) protocol however, may diminish the performance gains of MIMO operation. Hence, this paper proposes a distributed threshold based MAC protocol for cooperative MIMO transmissions using space time block codes (STBC) to maintain stability even under higher traffic loads. The protocol uses a thresholding scheme that is updated dynamically based on the queue length at the sending node to achieve lesser energy consumption and minimise packet latency ensuring the stability of transmission queues at the nodes. STBC techniques are applied for MIMO data transmission to utilise the inherent spatial diversity in wireless systems. Simulation results are provided to evaluate the performance of the proposed MAC protocol and are compared with fixed group size cooperative MIMO MAC.
protocols with and without STBC coding. Results show that the proposed protocol outperforms cooperative MIMO MAC protocols that use fixed group sizes. STBC technique for the proposed MAC protocol provides significant energy savings and minimises the packet delay by leveraging MIMO diversity gains.

Reference


Index Terms

Computer Science

Wireless Sensor

Networks

Key words

Cooperative transmission

Energy efficiency

Diversity gain

Packet delay

Thresholding scheme