

A Hybrid, Dynamic Traffic-Adaptive MAC Protocol for Wireless Sensor Networks

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Abstract—For wireless sensor network applications, such as Structural Health Monitoring (SHM), data traffic adaptive becomes more and more important for Medium Access Control (MAC) protocol design. In this work, we present a new hybrid MAC protocol. This protocol is able to adapt for both low and high traffic load. For better energy efficiency and network scalability, we use improved Carrier Sense Multiple Access (CSMA) for handling low data traffic where hidden node problem is resolved for better performance under interference. When high traffic load is transmitted in the network, to achieve a low data retransmission rate and low interference, a receiver initiated burst transmission protocol is implemented for continuous multiple data relay. Minimum overhead is used in this burst traffic to control the flow rate as well as to resolve the interference. Hop by hop data retransmission is only used for missing segment of the burst data. This protocol has been evaluated in an indoor testbed, and it is now being tested in a real SHM application in Ronghu Bridge, Wuxi, Jiangsu province, China. It is robust against interference and achieves over 16% lower data retransmission rate and over 38% lower energy consumption, especially in burst traffic, comparing to TinyOS supported CSMA protocol.

Keyword—Wireless Sensor Networks, MAC protocol, Hybrid, Traffic Adaptive, Burst Transmission, Structural Health Monitoring



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