Adaptive Transmission Power Control Scheme for Wireless Sensor Networks

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Wireless communication is the major energy consumer compared to computation and sensing operations performed by a battery-powered wireless sensor node [1]. The reduction of communication power consumption in Wireless Sensor Networks (WSNs) can be achieved using adaptive transmission power adjustment paradigms [2]. Although transmission reliability can be enhanced further by transmitting route discovery messages and data packets at unnecessarily high transmission power outputs, this may introduce excessive interference and collisions and wastes energy. The lifetimes of sensor nodes equipped with adaptive power control radio transceivers can be maximised if the intended recipient can receive the transmission of lower power while maintaining an acceptable communication reliability and network coverage. However, the surrounding environments together with energy restriction of the wireless sensor nodes make a reliable WSN routing a challenging task [3][4]. Given a limited energy supply, routing reliability and energy efficiency are the most two important issues in WSNs.

In this work, a new adaptive transmission power control scheme is proposed. This is a topology control scheme which tunes or adjusts the transmission output power of the sensor node to find the optimal transmission power that minimises energy dissipation, while preserving network connectivity and coverage. The proposal is guided by the empirical observations obtained from the testbed experiments conducted in our existing work [3][4]. The proposed scheme aims to dynamically change the transmission power output to the lowest possible transmission power level that can provide acceptable link qualities between communicated sensor nodes. Finally, this work aims to provide radio transceiver designers with the ability to adaptively control the transmission power rather than setting the transmission power output level during the network run time.

References:

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