On the Performance of S-ALOHA and CSMA/CA Random Access Strategies for Data Exchange in Query-Based Wireless Sensor Networks: An Interest-Based Approach

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Major applications of Wireless Sensor Networks (WSNs) are related to safety applications like emergency warnings, rescue operations, and surveillance operations in military among others. In these systems, efficient data dissemination among nodes is of primary importance for the acceptable performance of the network. In this work, the transmission of short messages for different MAC strategies to operate in static and mobile WSNs is studied. Also, the proposal of two MAC hybrid strategies to improve the system performance in terms of energy consumption, successful packet transmission and delay is developed. Numerical results prove that the use of only CSMA/CA or S-ALOHA as the access strategy does not provide the best results for the performance of the system. However, the combined use of these two protocols can increase the success packet transmission and decrease both the data exchange delay and power consumption. Also, the impact of different backoff schemes is investigated. Finally, this paper considers an interest-based approach for the data dissemination where nodes are only interested in certain information from other nodes in the system, analogous to people only interested in certain information from their friends list.

Index Terms—Wireless Sensor Networks, short message transmission, CSMA/CA, S-Aloha, energy consumption, data exchange