Optimal Data Scheduling and Admission Control for Backscatter Sensor Networks

Abstract:

This paper studies the data scheduling and admission control problem for a backscatter sensor network (BSN). In the network, instead of initiating their own transmissions, the sensors can send their data to the gateway just by switching their antenna impedance and reflecting the received RF signals. As such, we can reduce remarkably the complexity, the power consumption, and the implementation cost of sensor nodes. Different sensors may have different functions, and data collected from each sensor may also have a different status, e.g., urgent or normal, and thus we need to take these factors into account. Therefore, in this paper, we first introduce a system model together with a mechanism in order to address the data collection and scheduling problem in the BSN. We then propose an optimization solution using the Markov decision process framework and a reinforcement learning algorithm based on the linear function approximation method, with the aim of finding the optimal data collection policy for the gateway. Through simulation results, we not only show the efficiency of the proposed solution compared with other baseline policies, but also present the analysis for data admission control policy under different classes of sensors as well as different types of data.