Deep reinforcement learning online offloading for SWIPT multiple access edge computing network

ABSTRACT

More computation-intensive and low latency applications are emerging recently, and they are constrained by the computing power and battery life of internet of things (IoT). Simultaneous wireless information and power transfer (SWIPT) with mobile-edge computing (MEC) can improve the data processing capability of energy constrained networks. In this paper, a SWIPT-based MEC system is proposed, comprising a multi-antenna access point (AP), multiple single antenna low power IoT devices and a MEC server. The IoT devices exploit the harvested energy for either locally computing or offloading the tasks to the MEC server. Conventional numerical optimization methods are not able to solve combinatorial problems within the limit of the wireless channel coherence time. Thus, Online Offloading with Deep Reinforcement learning (OODRL) is proposed. The proposed algorithm jointly optimizes the offloading decisions, the time slots devoted to energy harvesting (EH), and local computation/offloading to maximize the MEC computation rate. Deep Q network (DQN) is used to learn the binary offloading decisions from the learning experience. This method no longer needs to solve combinatorial problems. Simulation results are presented to demonstrate that the proposed algorithm is able to approach near-optimal performance and superior in decreasing tasks computation time compared with existing optimization methods, enabling real time optimal resource allocation and offloading achievable in a fast-fading wireless environment.