Age Optimal Scheduling in Energy Constrained Wireless Networks

Dony J. Muttath (EDM16D001)

Dept of Electronics and Communication Engineering
Indian Institute of Information Technology,
Design and Manufacturing, Kancheepuram

Abstract

We consider a cross-layer packet scheduling problem in fading channels in which the channel state information at the transmitter (CSIT) is known at the transmitter. We study a problem of scheduling transmissions of status messages over a fading link. The fading process is i.i.d., and is known at the sender after one-slot delay. Messages arrive according to an i.i.d. Bernoulli process at the sender, and each message has a delay deadline of d time-slots. *The problem is to decide whether or not to transmit, and to choose an optimum transmit-energy, such that the average Age of Information is minimum satisfying a constraint on transmit-energy and throughput.* We pose this problem as a Markov decision process, and provide an Age OPTimum policy (AOPT) based on value iteration. We obtain the structure of the optimum policy, based on which we propose a simple heuristic, Greedy Randomization of Energy Policy (GREP), and compare the performance of AOPT and GREP with the other policies. We also consider a scheduling problem for transmission of delay sensitive messages of N IoT nodes to a base station (BS), where the communication between the nodes and the BS is provided by a fading channel. Each node has an energy constraint. We obtain a scheduler that minimizes the expected weighted sum AoI (EWSAoI) of the system.