POWER CONTROL IN SPONTANEOUSLY DEPLOYED WIRELESS LANs

Yalemzewd Negash, Hailu Ayele
Department of Electrical and Computer Engineering, Addis Ababa Institute of Technology,
Ethiopia
ynegash@ece.aau.edu.et, hayele@ece.aau.edu.et

Abstract – Wireless LANs operate in the unlicensed frequency bands. Their deployment has seen a tremendous growth since their introduction. It is very common to see a wireless LAN in most homes around the world. These networks are deployed spontaneously leading to the possible coexistence of several networks in the shared frequency band. Their spontaneous deployment has made the networks to be collectively unmanaged and this has led to the existence of larger interference areas. Too much power is lost due to two reasons: interference and due to the reason that the default power settings of the access points lead them to operate beyond their required radio ranges. In this paper, we study this situation, assuming that access points want to cooperate in order to decrease their power usage while requiring that all network nodes are covered. We model the behavior of access points as an optimization problem in which each access point decides about its transmit power, or coverage area. We first identify a target function with possible constraints for two access points a certain distance apart. We then prove that an optimal point exists for the coverage area of each access point that minimizes the overall power transmission and also minimizes the interference area between the two access points. We finally show that, for an open area propagation, the total transmit power of all access points can be proportionally decreased by half.

Keywords – Wireless LAN, Power Control, Spontaneous Deployment, Voronoi diagram, Access Point