Machine Learning aided UAV Assisted Wireless Communication for Disaster Resilient System

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Abstract

Unmanned aerial vehicles (UAVs) commonly referred to as drones are becoming the attractive solution that provides wireless connectivity in a situation wherever the standard terrestrial base station is burden with high data traffic or unreachable in a disaster scenario. Our work examines the problem of best deployment of the UAVs as an aerial base station to empower wireless coverage to the users in the coverage less area. The foremost contributions of this study incorporate couple of strategies to deploy the ABSs and associate the UEs to the best ABS, where the total spectral efficiency of the network is maximized. Approaches will be chosen considering the prevailing environmental condition and system constraints. The first strategy uses an unsupervised clustering algorithm to determine the 2D positioning of the UAV ((x,y) coordinates) and a stable marriage approach is used for UE assignment by contemplating the qualities of the air-to-ground channel condition and the influence of co-channel interference from other UAV ABSs. After that, it applies brute exhaustive search on different altitudes to find the optimal altitude (z-coordinate). In the other strategy, 2D placement and UE association follows a similar strategy as the previous. Though, the best altitude combination is exploited by applying particle swarm optimization (PSO). Depending on the deployment scenario and the environment, the advantages and disadvantages of the two approaches have been identified.

Keywords: Aerial base station; machine learning; particle swarm optimization; unmanned aerial vehicle; matching algorithm