Controlling a Fleet of Unmanned Aerial Vehicles to Collect Uncertain Information in a Threat Environment

Abstract

Unmanned aerial vehicles (UAVs) have been proved to be successful and efficient for information collection in a modern battlefield, especially in areas that are considered to be dangerous for human pilots. We propose a decentralized control strategy while requiring UAVs to maintain radio silence during the entire mission. The strategy is analyzed based on a scenario where a fleet of vehicles is assigned to search and collect uncertain information in a set of regions within a given mission time. We demonstrate that a region-sharing strategy is beneficial even when there is no extra reward gained from additional information collection. A numerical study establishes the computational efficiency of the method; only a few CPU seconds are needed for problems with a planning horizon of 300 time units and 40 regions. We further present a case study to illustrate region-sharing behaviors among UAVs while using practical parameter values.