

Strategies for Cooperative Aerial Robots Inspection Challenge

Bharat Manvi and Sumedh Gupte

I. ABSTRACT

In this work, we present solutions for the cooperative aerial robot inspection benchmark challenge at CDC 2023. The objective is to come up with strategies for a team of heterogeneous robots to collectively perform inspection task across three scenarios. The quality of the inspection task is measured by a scoring function, where unmanned aerial vehicles (UAVs) of different types and capabilities need to cooperate to maximize this score. We pose this as a two-stage multi-agent problem, where the first stage is modelled as a Partially observable Markov game (POMG) with cooperation, and the second stage is modelled as a Markov game (MG). In the POMG, the explorer drones form one group and photographic drones form another group and each group have their separate goals. The explorer group's objective is to map the environment as early as possible and for this we come up with a heuristic function that achieves the desired exploratory behaviour. On the other hand, the photographer group's objective is to increase the score of the interesting points by getting higher resolution images. Both groups use heuristics based methods to generate their strategies. Once the explorer group covers whole map the state becomes (almost) fully observable. Now the game becomes a Markov game (MG) with complete information and all drones (both explorer and photographic) must cooperate to get better score of the interesting points. We propose a reinforcement learning scheme to maximize the score where all drones cooperate to cover the interesting points in an intelligent manner.