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Collaborative Center of Control Science (CCCS)

Decentralized Adaptive Coordination and Control of Uninhabited Autonomous Vehicles via Surrogate Optimization

Prof. Raúl Ordóñez
University of Dayton

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Rm. 267 Dreese Laboratories
Dept. Electrical Engineering
The Ohio State University

Abstract: The idea of a group of coordinated UAVs able to adaptively react to their environment and learn about their surroundings while following either an individual or a communal agenda is an intriguing corollary to familiar images from the animal kingdom: packs of wolves or lions hunting for prey, buffaloes running in tight formations to escape predators and protect each other, bees surveying a field in search for food and building complex structures out of a myriad of simple but cooperative behaviors. Achieving such a degree of control and producing such sophisticated behavior remains an elusive goal that presents considerable challenges due to the inherent complexity of the task, and also because it may be approached from a variety of different angles. In this talk we present a possible solution to this problem that is based on the idea of surrogate optimization to adaptively identify a terrain map on-line and use it to produce decentralized controllers yielding UAV trajectories in a coordinated manner. Our results indicate that the approach results in a feasible method yielding significantly better results than exhaustive search and random search, which we use as baselines for comparison.