

Project Title: A Demonstration Platform for Dynamic Mission Planning with Multi-Domain Autonomous Systems

Advisers: Prof. Huy T. Tran (AE)

Project Description:

This project will create a demonstration platform to test algorithms to control teams of quad-rotors and ground-based robots competing in games of capture-the-flag (CtF). These games are designed to represent a team of autonomous systems performing a constantly evolving reconnaissance or interdiction mission within a contested, urban landscape. As such, they require teams to create and execute innovative strategies to achieve their mission objective, in the presence of an adversary that may be equally or even more capably equipped. Blue and red teams will be identically equipped, with a neutral team (grey) that injects uncertainty but does not actively participate in thwarting or aiding the mission of other teams. We will use this platform to demonstrate novel techniques for dynamic mission planning with multi-domain autonomous systems.



Figure 1: Demonstration platform consisting of a Python simulation (left), Gazebo-ROS hardware-in-the-loop simulation (middle), and physical aerial and ground robots (right).

Our approach to mission planning will focus on a hierarchical decomposition of team decision-making. Algorithms for higher-level decision-making ensure that individual agent actions comply with stated mission specifications, while algorithms for lower-level decision-making determine how agents move and operate in a game.

Student background and expected research activities:

We are looking for an enthusiastic and ambitious individual who has an interest in helping to implement the physical demonstration consisting of custom-built quad-rotors and commercially produced ground robots. Experience with one (ideally multiple) of the following is required: Gazebo, ROS, Arduino, Pixhawk, quad-rotors, other robotic platforms, C++, or Python. We also ask that the student reach out to us during the Spring semester to get started with the existing setup before the summer starts (potentially for hourly pay).

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Funding: DARPA/AFRL