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COP5570: Concurrent, Parallel, and Distributed Programming

Proposal: Wingman System for Ardupilot

Type of Project

This project is primarily a software development oriented project with relevant research applications related to networked unmanned aerial vehicles (UAV). This project will be an extension to the ArduPilot project and code base.

Topic

Using the ArduPilot system, our objective is to enable a primary drone controlled through a control unit to direct a "wingman" drone through changes in trajectory and flight path. The wingman drone will receive control updates from the primary drone, as directed through the primary drone's control unit, and update its heading, flight speed, and position related to the primary drone according to these directed updates.

Detailed Objectives

Our goal for this project is to design a networking system to allow communication and direction of secondary drones by a primary drone and the updates to the primary drone's flight path and directions. The primary drone will receive its directions based off a ground-based control unit and update its heading and speed accordingly. Our extension should be able to receive communications from a primary drone based off the instructions provided from the control unit, then update internally its heading to compensate for a given squadron formation.

This project will entail an investigation into networking between ArduPilot instances, sending and receiving instructions to instances of ArduPilot, and adapting the flight control processes to change a secondary drone's flight directions according to the instructions and either a hardcoded or a provided formation details, dependent on time.

Plan

- Preproduction
    - Set up coding and testing environment in shared repository
- Development
    - Identify locations of relevant concepts to drone networking and control via control units and drone networking
    - Build extensions and classes to handle networked communications between at least two instances of ArduPilot running simultaneously
    - Develop process to update flight metrics of one drone simulation via updates to a second drone simulation
- Testing
    - Run simulation of multiple UAV with networking process

Current Status

Our team has started examining the ArduPilot code base to identify locations of relevant concepts related to drone control, as well as interfaces for drone networking. We have also set up test environments using a Software in the Loop (SITL) simulator to run experiments related to the project.