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Team C: Fly Sense
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Individual Progress

My major focus in the initial half of the semester will be implementing the software stack developed during the fall semester for a flying vehicle. The major challenges to be addressed will be incorporating more preprocessing steps like point cloud registration to improve the accuracy of the obstacle map, implementing sound warnings accounting the obstacles in 3D and fine tuning the user interface based on feedback received from the pilots.

Based on some trade studies and discussions with the AIR lab, we decided to migrate to the Jetson TX-2 with the Orbitty carrier as our onboard computer. I have been working on setting up the development environment on the TX-2.

The first flight tests without any payload were conducted at CMU, to ensure the perfect working condition of our aerial system. It was noted that the vehicle shows slight drift in position even during hovering state, and some correction terms must be applied to the dynamic model used for our algorithms. Figure 1 shows the aerial system before takeoff.

Figure 1: Aerial system during initial flight tests

The team also had an observation day at our test location, Near Earth Autonomy's testing area at Nardo airstrip. A particular area with lot of containers was identified as a possible testing zone for the SVE main test, with options to make the pilot perform a few difficult maneuvers with the quadcopter so as to evaluate our assistive tech.

In addition, I have been doing some literature review on motion planning for UAVs. This was a requirement added to the project based on my interest to work on motion planning. Since this is an add-on feature to the assistive tech we aim to provide to the pilots, it has been made as a desirable requirement. The aim is to provide the pilot with a feasible trajectory to the end goal, where the path will be shown in the Bird's Eye View. The trajectory planning implementation relies heavily on the obstacle map generated and will only be done after conducting the flights tests and analyzing the data.

Challenges faced

- Due to unfavorable weather conditions, flight tests with dummy weights on the aerial system have been delayed.
- The payload we plan to put on the aerial system is above the recommended maximum take-off weight, and calls for some major adjustments to the hardware design

Team work

Team Member	Contribution
Shivang Baveja	• Flight system component selection • Preflight checks and testing • Understanding the DJI controller interface to implement the obstacle avoidance algorithm
Nick Crispie	• Flight System setup, preflight checks, flight testing • Flight system component selection • Flight system layout design in CAD
Joao Fonseca	• Obstacle avoidance algorithm development
Nihar Tadichetty	• Research on voice command recognition using deep learning. • Research on Image segmentation and classification to generate label for the obstacles

Tasks

Team goals

- Complete the onboard hardware package setup – cable replacement and power module for Velodyne PUCK, mounts for the PUCK, TX-2 and FPV camera
- Complete all flight tests with dummy weight, and initial tests with onboard hardware package
- Implement the obstacle avoidance algorithm with interface to the DJI controller and test it in simulation
- Test FPV video reception on the Epson standalone

My goals

- Complete setup of fall semester software stack on the TX-2
- Assist in conducting flight tests and collecting data
- Implement code to get the locations of all the obstacles in 3D using height map or octomap