FlySense

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Team C: FlySense

Teammates: Nihar Tadichetty, Joao Fonseca, Harikrishnan Suresh, Nicholas Crispie

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Individual Progress

One of the major goals for this progress review was to complete flight hardware integration and test our onboard software stack in air. I was working with Nick to accomplish these goals. Following sections describe my work in detail:

Jetson TX-2 compatibility issue with Unify AC-M wifi router:
Jetson TX-2 supports only the lower bands in 5Ghz frequency range and was therefore not able to see the hotspot setup by the Unify unit. To fix this issue, I had to reset and specify the wifi channel permanently instead of automatic which is the default setting. This fixed the issue and Jetson automatically connects every time it powers up which reduces our flight setup time.

Flight Dynamics Data Collection:
We flew the aircraft multiple times to collect flight data. These tests were done at different weight configurations to understand the effect of weight on flight dynamics. Specifically, We wanted to understand how the quad responds to pilot inputs and how weight affects stability. Following two configurations were flown:
1. Weight 2.9 kg
2. Weight 3.65 kg

The flight plan for these tests was as follows:
1. Takeoff and Climb to 15m altitude.
2. Check vertical up and down acceleration with max pilot input up and down respectively.
3. Check max yaw rotation.
4. Check full forward Pitch and Full Backward pitch input.

Joao was able to use this data and tune the flight dynamics model with it.

Communication Test:
The goal was to test the range of the wifi hotspot and if there are any latency issues in receiving the image stream. The quadcopter was setup to publish an image stream which was received at a laptop. The quadcopter was flown around and image stream was observed for any perceivable lag. Figure 1 shows the path of aircraft in Schenley Park.

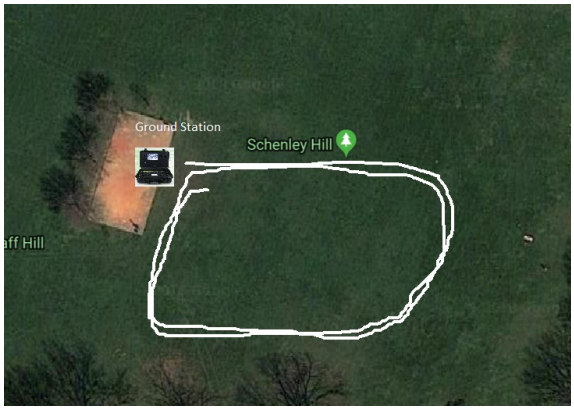

Figure 1: Flight Path at Schenley

Observations from the test:
1. No latency seen when flying at altitude less than 30m

2. No latency seen when flying upto a distance of 60m, haven't tested beyond that.

Flight with Velodyne and Fall Validation Experiment(FVE) code running on Jetson TX2

All the flight tests that we had performed gave us the confidence to put Velodyne onboard. I assisted Nick in getting the hardware integrated properly and then later tested the systems in lab before going out to fly.

During the flight test, the Raw point cloud and Bird's eye view was seen live on a laptop and was later tested offline with the Epson BT300 AR headset as well. The aircraft was stable during the flight and I was able to fly it closer to the trees to get some data with obstacles. Figure 2 shows the quadcopter in air with Velodyne onboard.


Figure 2: DJI M100 with Velodyne VLP16

Challenges faced

- Pittsburgh weather is turning out to be the biggest challenge for us. To beat the weather we try to be prepared to fly and try to plan for tests a few days in advance.

Teamwork

Name	Contribution
Nihar Tadichetty	• FPV video on Epson, research on improving voice recognition
Joao Fonseca Reis	• Tune the flight dynamics model based on collected flight data • Sound warning and coloring code in matlab, unit tested
Harikrishnan Suresh	• Offline implementation of Sound warning and Bird's eye view coloring code
Nicholas Crispie	• Flight Hardware setup and testing which involved wiring all the flight hardware • Testing the Power module • Flight Testing • Procurement

Plans

Goals for Next Progress review:

- Collect more flight data so that code development can continue offline
- Flight Dynamics, Sound warning and Coloring code integration
- Get FPV video working with Epson
- Obstacle avoidance in Simulation
- Make flight and ground hardware robust

My tasks:

- Update flight dynamics code based on flight data and improved model
- Obstacle avoidance in Simulation
- Collect more flight data so that code development can continue offline