FlySense

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Team C: FlySense

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

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Individual Progress

The goal for this progress review was to test all the sub-systems on bench and then integrate them with our flight system. We have been able to get most of the systems ready for final integration except the power module test due to procurement delays. Specifically I was responsible for the following tasks:

Flight with overall weight 3.65Kg:
We estimated our final weight of the flight systems with all the onboard components to be 3.65Kg. To ensure that the flight system can take that much weight and is stable at that weight we had planned a few flight tests.

We first flew with Gross take-off weight (GTOW) 2.5Kg. The aircraft was fairly stable with some drift seen due to wind. Then we added ballast (cylindrical aluminum tubes) in steps of 500g. Every time we changed configuration we first conducted short duration flight and landed the system to inspect if there was any physical issue due to loading the system. Then if everything was fine, we conducted a long duration flight where we moved the quad a little for first few minutes to check response. The quad was left in hover mode for rest of the time and altitude and position accuracy was observed. Figure 1 shows aircraft with ballast mounted.
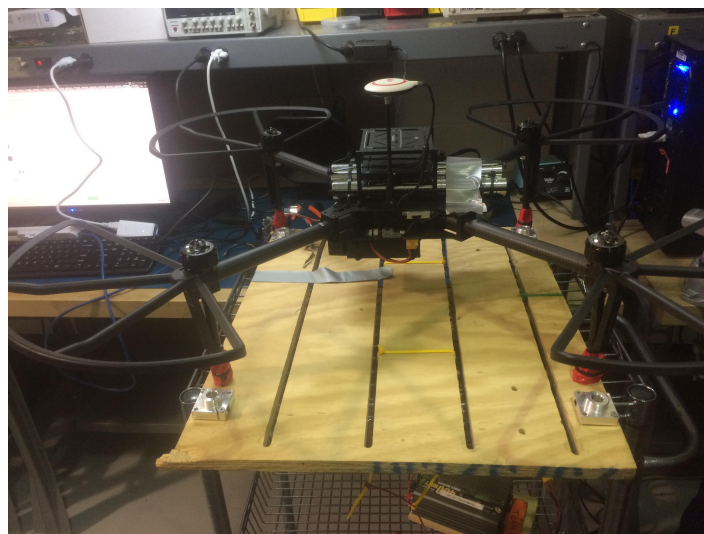

Figure 1: DJI M100 quadcopter mounted with Ballast

Following tests were performed:
i. Flight 1(with dummy weight): 3050g: Total flight time: 8min

ii. Flight 2(with dummy weights): 3450g: Total flight time: 13:45. The aircraft was kept in hover state until battery failsafe was engaged. The battery level at the end of this flight was 30%.

iii. Flight 3(with dummy weights): 3650g: Total flight time 11:30. The aircraft was again flown until battery dropped to 30%. This test confirmed that our flight time will be around 11 mins with our final weight configuration with Velodyne and Jetson.

Communication system:
We are using Unifi AC-M access point to set-up a hotspot on ground to which the flight system(Jetson TX-2 onboard DJI M100) and ground system (Laptop, Epson AR headset) will be connecting. Only 5Ghz band will be used for connection to prevent interference with DJI flight controller.

After configuring the system, I tested it with Epson headset, my laptop and Jetson TX2. Both the laptop and Epson were connecting to the hotspot without any issue. Unfortunately, wifi hotspot was not visible in Jetson as it does not support higher frequency bands. I tried configuring the wifi on lower channel but for some reason that wasn't working. For our initial tests we can work with 2.4Ghz bands as we'll be operating nearby but later we'll have to resolve this issue. I have asked this problem on their discussion forum and hope to hear back soon.

Jetson TX2 with Velodyne:
Since Fall validation experiment we have replaced our onboard computer with Jetson TX2. I assisted Hari in getting Lidar working on Jetson TX2. It was a network configuration issue at the end which was resolved, tested and documented.

Jetson TX2 with DJI M100:
I assisted Harikrishnan in getting DJI flight system working on Jetson TX2. Since Jetson TX2 has ROS Kinetic instead of Indigo there were few compatibility issues, which were resolved.
Also, we are now using UART on Jetson to connect to DJI instead of usb to serial converter, which is less reliable.

Challenges faced

- Flight testing:
  The biggest challenge we are facing with flight testing is lack of empty location where we can conduct flights in a safe manner. We have tried flying near Robo-lounge but there's a high foot traffic and we have to park the quad again and again to ensure safety. Flying in Schenley park is an option but it takes a lot of time.
- Jetson TX2 compatibility with our unifi ac-m access point. We'll have to investigate further to ensure this connection works.

Teamwork

Name	Contribution
Nihar Tadichetty	• FPV Camera integration, research on image segmentation, research on speech recognition
Joao Fonseca Reis	• Bird's eye view coloring algorithm • Sound warnings code
Harikrishnan Suresh	• Jetson TX2 setup, installed all the libraries and got our onboard code working.
Nicholas Crispie	• Flight system integration, testing and procurement. Overall project management.

Plans

Goals for Next Progress review:
- Complete Flight hardware integration
- Our complete onboard software stack tested in flight
- Implement new coloring algorithm in code
- Test FPV camera video on Epson AR headset

My tasks:
- Get all the systems flight ready: Ensure code starts automatically and starts logging data.
- assist Nick with flight system hardware integration
- Conduct flight tests: Fligth data logging, Point cloud data logging and full system test except camera.