Senior Design
ENG EC 463

Memo

To: Professor Pisano

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Team: 4

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Subject: Second Prototype Test Report

1.0 Prototype Test Results

Due to the incident with our battery last semester requiring a change in the parameters of our project deliverables, much of our work this semester has been about acquiring and constructing a new drone for testing with a safer power profile. However, we also made advancements in our software, which we demonstrated.

2.0 Hardware

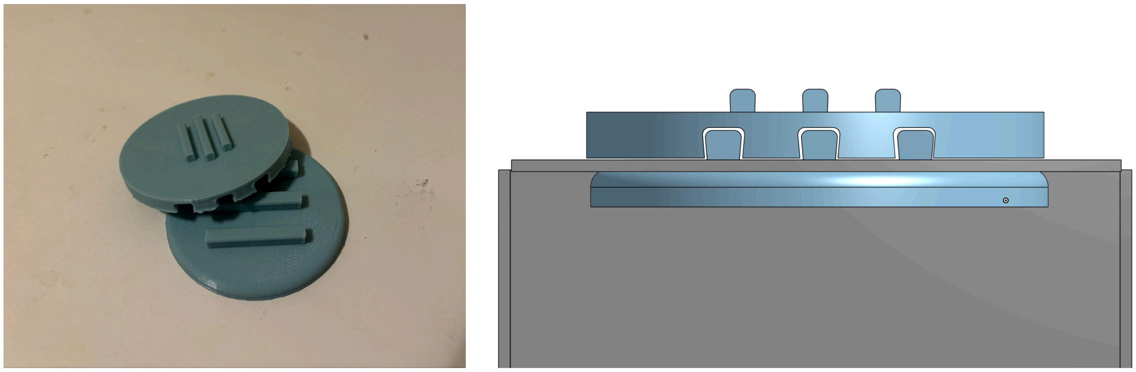
We are in the process of assembling our new drone. We have constructed the drone sans attaching propellers, and displayed the drone during the prototype test.

We used QGroundControl to calibrate and set up other configurations of the drone prior to its use. If it was working properly, it could act as a virtual cockpit and display real-time data of the drone performance. It could also be used to send mission commands and set parameters. The software was successfully connected to the drone and were able to finish a few calibrations including GPS and accel. However, it was not able to control the motors successfully, so we were shifting to a new Ground Control Station called Mission Control after checking the wiring was correct.

Our group member developing the new delivery system was not present, however he had designed and printed a prototype of the delivery system for our smaller prototype drone.

Lastly, we set up our new NVIDIA Jetson Nano, as the previous Jetson and its SD card were destroyed in the fire.

Above: our new drone. The Pixhawk flight controller, motors, and legs are attached. To do: create a harness for our other components (camera, Jetson, cellular data module) and attach our battery.



Above, Left: A 3D print of our harness for the prototype drone. The bottom disk slips into the top disk, which snaps into the drone, so that payloads can be attached to the drone with ease. Above, Right: A CAD section view of our harness. During flight, the interlocking teeth are pushed together by the weight of the payload, allowing for secure travel.

Above: the Jetson set up with its development configuration, including wall-mounted power supply, KBM, monitor, and camera. When in development, it will be powered by our drones' battery, the KBM/monitor will be disconnected, and the Camera will be pointed towards the front of the drone.

3.0 Software

We have made advancements in our software stack since our last prototype test, specifically relating to

1] Improvements in our computer vision/drone control policy, including more rigorous tests than November.

2] A first prototype for our cloud application, which interacts with the computer on our drone and our client web application.

We successfully demonstrated the first leg of our cloud application by demonstrating that the client user could upload coordinates to our cloud service hosted on AWS. Then we showed that our Jetson (which will eventually be on our drone) can receive the coordinates from our AWS client. This fetching process can be run in a separate process or as part of our main control loop.

We also demonstrated that our control loop can run on the (new) Jetson, taking in camera footage and returning navigation instructions for our low-level drone controller.

We also made progress on the communications between the Pixhawk and the Jetson Nano, dronekit Python API that handles drone control, and a simulation to test that Python code. Unfortunately, although we got really close, due to the outdated and mismatching versions of dependencies we were not able to present anything working on this part. We decided we are going to look into another API called MAVSDK.