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Team B Arcus
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Individual Progress

I initially started this week working with my advisor and other PhD's trying to integrate a specialized unscented kalman filter that a PhD student is working on in the lab. I had been asked to perform a few different tasks like exposing an interface for point clouds and pose estimates in the state estimation pipeline that is needed to integrate the kalman filter. I also had been asked to work on calculating the covariance of localizing our state estimate to our map. After talking it over and discussing with my advisor, I figured that it wasn't worth spending my time on it due to communication and timing challenges that I will mention later on. I then spent a bit of time trying to get pressure, magnetometer, and temperature measurements out of our IMU. It seems that there are some driver issues that we will need to work out to get these measurements out which can be plugged into the kalman filter to get a better pose estimate. I was able to get this data out of our IMU device but other IMU's of the same model and firmware don't seem to be sending this data out despite using the same code. It seems like our IMU might have some specific configuration that we will need to determine and propagate in the future.

I also spent time working on crafting udev rules for our various sensors to get varying serial usb devices to report themselves as "imu" or "piksi" or "pixracer" instead of being randomly assigned ttyUSBX. This let us hardcode our launch files to streamline the launch process. After the drone crashed I helped the team in piecing our drone back together. It is not complete yet but I helped solder cables for our new ESCs. I took apart the arms of the drones and attached our new ESCs and swapped out broken parts. I have also setup the simulator on my computer and am planning on diving into the trajectory planner.

Challenges

This last PR it was very challenging to communicate with our advisor and other PhD members of the lab. The issue was that they were iterating at a much higher cycle then I could (because of classwork) and I ended up being a bottleneck. I asked if I was needed in this work as it seems the only thing I was contributing was coding up what was asked without knowing why. I decided that it made sense for me to step away from this to let them continue to progress on this work.

Another major challenge we had this PR was our drone crashing. Luckily, our risk mitigation strategy of purchasing spare parts for most of our drone, and trying our best to protect our expensive LiDAR paid off. Most of our equipment survived the crash with the exception of the drone chassis itself and the camera lens. We are working on reassembling the drone as quickly as possible.

Teamwork

All of us were involved in helping to repair the drone with Maitreya leading the effort. He was also instructing us on replacing the ESC's as that was a modification we needed to perform anyway and required just as invasive a procedure as repairing the drone from the crash.

Logan was working on project management tasks and his task of colorizing the point cloud with RGB data. Clare is also investigating the mapping package in order to implement the transformation between LiDAR frame to camera frame. Maitreya in addition to replacing ESC's and leading reconstruction efforts has been investigating Pixracer firmware changes.

Plans

The current plans are to quickly finish rebuilding our drone without mounting any sensors on it. We are then hoping to get it flying with the RASL firmware asap and ensure that it can fly stably outdoors without any issue. Once we are able to prove that we can do that, we can remount our sensors and collect data needed to test and work on integrating the kalman filter. I will personally be working on diving into the trajectory planner and trying to robustify it and get it to produce smoother and more intelligent trajectories. I will also have to do a lot of research on trajectory generation to get this done.