

Senior Design Team may23-45: MicroCART Team

Spring Semester Bi-Weekly 1 report (2/18 to 3/4)

Members:

- Austin Beinder - Simulations Lead
- Cole Hunt - Git Master/Device OS
- Connor Ryan - Physical Systems Lead
- Emily Anderson - Telemetry/Backend Lead
- Gautham Ajith - YouTube/GUI Lead
- Grant Giansanti - Client interaction/Testing
- Tyler Johnson - Project Manager

Advisor:

- Dr. Jones - Advisor

Weekly Progress Summary

We have completed our first two sprints being Sprint 2.5 to Sprint 4. To view our progress further in depth: <https://git.ece.iastate.edu/danc/MicroCART/-/boards/970>

Past Weeks Accomplishments:

A lot of time was spent preparing the lighthouse demo for the scholars fair and presenting our work at the scholars fair. We used the lighthouses to showcase the lab room we are using and our senior design project to prospective Iowa State students. We had a couple of issues with the lighthouse calibration and connection with the Crazyflie drones. To address these issues, we have been investigating whether the addition of another lighthouse would improve the connection and calibration.

Over these two sprints, we have been working on creating a test stand for the future MP-4 labs for CPRE488. The goal of the new design is to add another dimension when students test and figure out PID parameters for the drone. We have made improvements with each iteration of the new test stand such as making it less flimsy, adding ball bearings, etc.

We also are working on revising the MP-4 document to add clarity and discuss the new features with the groundstation GUI. We are ready for our advisor to revise and provide further feedback. He has already taken a look at what we have done and will provide more feedback. On top of

that, we are going through the lab document and attempting the lab based off the revised lab document.

We have wrapped up the GUI changes we have made for the lab. The addition of a JSON file to easily set the PID parameters will be very helpful for students. It has the ease of editing the values and storing them as well as helps when it comes to the GUI crashing. Some beautification and an easy way of accessing the JSON file through the GUI has been added. Besides this, we have pushed the changes to the main development branch.

We also have been working on the new drone with creating a new schematic for new hardware revisions. We also have been looking into a new protocol of the PWM of the motors to avoid the issue of extra noise with the PWM and a more stable method. Dshot protocol was something that caught our attention.

Individual Contributions:

Team Member	Contributions	Hours	Total Hours Spring
Austin Beinder	<ul style="list-style-type: none"> ● Lighthouses buggy but at least now we can use them ● Simulation vs reality demo hopefully fooled the children since they're using different control algorithms lol ● Soldered the broken connector lighthouse board back together (thank you prisum hotplate) ● One lighthouse deck seems to have gotten progressively worse and worse, and now it barely will ever turn on. We may have tuned the base station height to a failing part. ● Test stand somewhat works <ul style="list-style-type: none"> ○ Still iterating it so it doesn't sometimes come off the track and is less wobbly ○ Need to sand down the wheels ○ 11-13 grams ● Wrote documentation on wiki to alleviate future teams of the knowledge we had to gain last week for the lighthouses ● Played with the lighthouse deck and the flow deck <ul style="list-style-type: none"> ○ All demos work more reliably with the flow deck, though the logged data for the simulation is noisier ○ Tried rasing the lighthouses up more and the drone just flew all over the place, they really like being chest 	27+15	96

	<ul style="list-style-type: none"> height. Worked w/ Tyler to install lighthouse above field area, haven't gotten very far but has some issues. <ul style="list-style-type: none"> Requires newer firmware than the 2021.06 Beams seem to interfere with each other at origin 		
Cole Hunt	<ul style="list-style-type: none"> Attended Scholars Day Worked on setting up crazyswarm demo <ul style="list-style-type: none"> crazyswarm is a ROS based system to control multiple drones and integrate them with a ROS simulation Helped Tyler with cflib based swarm demo Investigated communicating with a RaspPi over bluetooth. Created test script using python module python-bluez 	8+4	44
Connor Ryan	<ul style="list-style-type: none"> Attended Scholars Day Reflowed two IMU breakouts and one of the boards has been successful tested with arduino. Other board had been tested for an extended period with shorted power pins which may have damaged IC. I will write up a testing procedure for future IMU board assemblies Schematic for next hardware revision is finished. Needs reviewed for anymore possible additions Wrapping up the PCB revision. Struggling to find a 20 pin connector small enough for the expansion board. UVLO has been simulated add works properly, resistor added for bypass option Looking into possibility of making board cross-compatible with both styles of ESC 	8+6	63
Emily Anderson	<ul style="list-style-type: none"> Worked with Grant on testing removing sleep in setting params from json file function Ran into some issues with firmware Working on packets dropping while setting parameters ticket 	4 + 4	41
Gautham Ajith	<ul style="list-style-type: none"> Scholars day demo with Tyler, Cole and Austin Helped with debugging issues with lighthouses and setting up demo Worked on Bi-Weekly Status report Revised wiki document 	10+5	40

	<ul style="list-style-type: none"> • Worked on transmission queue ticket <ul style="list-style-type: none"> ◦ Qt crashes usually crashes when there are issues with the threads ◦ Test out polling each parameter (Doesn't take advantage of threads) • Helped Austin and Tyler Test out flashing multiple drones at once 		
Grant Giansanti	<ul style="list-style-type: none"> • Created more user friendly interface of editing the json file • Reduced the amount of time to sleep when updating the parameters • Working on the PWM control for the motors • Merged stable version of gui updates with json param update changes • Researching Dshot protocol to figure out if we can implement it with our current set up. <ul style="list-style-type: none"> ◦ Do we want to stick with PWM output or try to configure the pi to implement the dshot protocol 	5+8	48
Tyler Johnson	<ul style="list-style-type: none"> • Scholars day demo with Gautham, Cole and Austin • Created a couple of python scripts to easily connect with multiple crazyflies <ul style="list-style-type: none"> ◦ There was alot of debugging • Edited MP4 doc • Finished revising the MP4 document <ul style="list-style-type: none"> ◦ Tested multiple drones at the same time and could not find a issue ◦ Through all the documentation I couldn't find how to space out the radio frequencies though. • Did a dry run of MP4 to amke sure everything looks correct and makes sense • Worked on the new revision of the test stand. 	15 + 6	59

Next Week's Plans:

- Make youtube videos for this year's demos - Austin
- Finish XY test stand and attempt tuning XYZ PID - Austin
- Add in Jone's Nested PID to simulation - Austin
- Begin looking at adding Kalman filter to simulation - Austin
- Lighthouse configuration - Austin and Tyler
- Communication with ESC's working well - Grant/Connor
- Implementing Dshot Protocol - Grant
- Bluetooth working well - Cole

- MP4 completely done - Tyler
- Transmission Queue - Gautham
- Bi-Weekly Report :(- Gautham
- Upload more YT vids if ready: Gautham
- Printing PCB boards: Connor Ryan
- Sourcing parts: Connor Ryan
- Testing MP4: Connor Ryan and Cole Hunt
- Tracing through code to figure out packets dropping: Emily

Advisor meeting:

- Stability was improved by integrating flow deck with lighthouses
- XY test stand is working with some room for improvement
- ESC Protocol
- UVLO Protocol Working turns off at 11.10V, turns on at 11.28V (~30%)
- Learned how to interface with the lighthouses while prepping for Scholar's Day
 - Decks exhibit buggy performance
 - Will be requesting two additional lighthouses and two more decks from ETG
- Any changes to hardware need to be decided by end of the week
- Setting standard parameters has been reduced to a wait time of 3 seconds (previously 12)
- Possibly look into receiving parameters to enable quick saving of values. Could be used to check parameters were set properly