Senior Design May22, 43

MicroCART Senior Design Team

Week 3 Report

October 06 - 12

Faculty Advisor : Philip Jones

Members:

Brandon Cortez - Team Lead

Reid Schneyer - Test Station Lead

Colton Glick - Git Wrangler

Ellissa Peterson - Tech Lead

Ryan Hunt - Firmware

Carter Irlmeier - Web Master

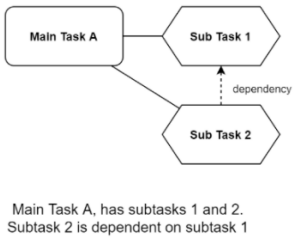
Zachary Eisele - TBD

Summary of Progress this Week

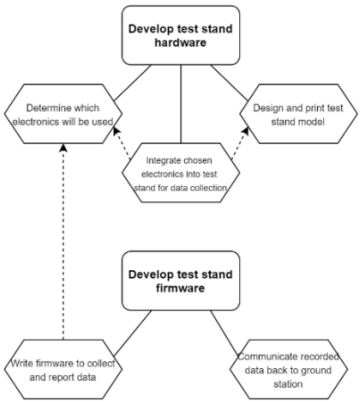
The team has gotten access to the git repository and has been getting that setup. The design process for the test stand continues to move forward and should be ready for printing within the week.

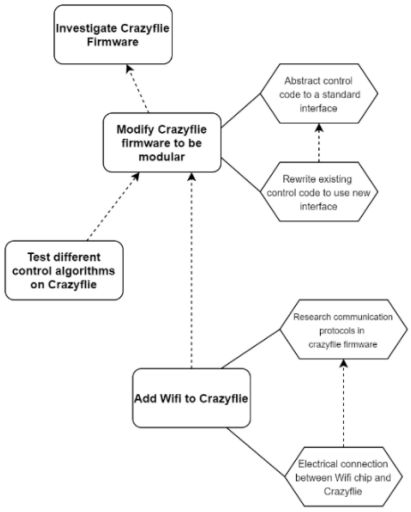
Additionally, this week the team worked together to complete the project plan assignment, which included details on scheduling and goals for the project.

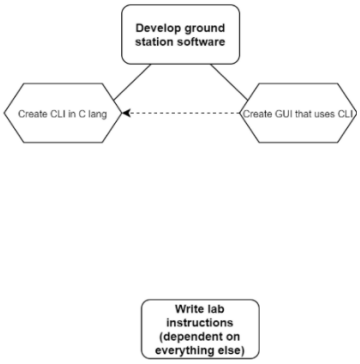
Task	10/10	10/17	10/24	10/31	11/7	11/14	11/21	11/28	12/5	12/12
Investigate existing firmware	D									
Make modular firmware				D						
Add wifi to Crazyflie							D			
Test different control algorithms							D			
Develop test stand hardware			D							
Develop test stand firmware				D						
Develop ground station software						D				
Write lab instructions & documentation									D	



Main Task A, has subtasks 1 and 2.
Subtask 2 is dependent on subtask 1







1. Investigate CrazyFlie firmware architecture
    a. Learn how to modify and flash new firmware to the CrazyFlie
    b. What is the current architecture structure?
    c. Can the control code be easily modified?
    d. How easy is the control code to understand for new users?

2. Modify CrazyFlie firmware to be as modular as possible
    a. Abstract the control code to a standardized interface to allow other control algorithms to be easily implemented through an adapter architecture
    b. Rewrite the existing control code to utilize the new interface
3. Add wifi capabilities to the CrazyFlie
    a. Research current communication protocols in the CrazyFlie firmware
    b. Electrical connection between wifi chip and CrazyFlie
    c. Test communication over wifi
    d. Control drone over wifi with less than 20 ms of latency
4. Test different control algorithms on the CrazyFlie
    a. Write a basic PID control loop to maintain a stable hover, using the new interface
5. Develop ground station software to communicate with and control CrazyFlie
    a. Start with command line interface on linux
    b. Build a GUI/frontend once the backend is mostly working
6. Develop test stand hardware
    a. Determine what electronics will be used to record & communicate data
    b. Integrate chosen electronics into test stand for data collection
    c. Design and print test stand model to mount CrazyFlie
7. Develop test stand software to measure and log rotation of the CrazyFlie while held in test stand
    a. Should collect and record all desired data from the CrazyFlie in real time
    b. Should communicate with the ground station to allow for easy saving of log data
8. Write lab instructions and documentation for interfacing and using the modified CrazyFlie
    a. Basic quick start guide
    b. Detailed proposed lab activities
9. Stretch goal: Convert control algorithm from MatLab code to C code that works with our interface

Past Week Accomplishments

- Spoke with Fan to get more details about working with the 476 lab - Colton
- Fixed tags link on Gitlab - Colton, Brandon
- Completed project plan assignment - Colton, Brandon, Reid
- Create Gantt chart of project timeline - Reid

Pending Issues

- Create folder for crazyFlie in git repo - Colton
- Create and setup new board in Git to manage new issues - Brandon, Ellissa
- No current YouTube channel - Carter

Individual Contributions

Team Member	Contributions	Weekly Hours	Total Hours
Brandon Cortez	Worked on project plan & lightning talk	4	16
Reid Schneyer	Worked on project plan & lightning talk	4	16
Colton Glick	- Met with Fan to talk about integration with the 476 students - Wrote the tracking procedure, task decomposition, and risk mitigation section of the project plan doc. - fixed link on repo readme, first experience with pull request for the team	5	18
Ellissa Peterson	Continued looking through crazy flie source code and contributing to slideshow	3	13
Ryan Hunt	Continued looking through crazy flie source code and making slideshow on how it works	2	14
Carter Irlmeier	Researched OptiTrack for future use, looked into feasibility of department youtube channel and practices	2	13

Zachary Eisele	Recorded lightning talk, researched using python motion library	3	15

Comments and Extended Discussion

Colton Glick, Met with Fan,

Fan and I talked for a while (I invited him to the discord in case he wants to quickly contact any of us btw) he said our goals for the lab line up pretty well, being able to remove control algorithms in the crazy file and replace it with what the students write is perfect. One thing is the class is focused around Matlab so that would probably be the preferred language for the students. Fan did mention that it's possible to convert Matlab code into C, but we're not sure what the quality will look like. We could make a Matlab template that we know will work with conversion for the students. Or we can make a C template for them to modify directly, this should be pretty straight forward because they will only be modifying the control equations.

We also talked about what date they want to implement it into the course, they said late February to early March. I say we have a working prototype by the end of this semester, then polish it for the lab environment to have it ready by February.

Finally we mentioned the crazyflie swarm software that has already been started, Jones showed this page to Fan detailing it https://wikis.ece.iastate.edu/distributed-autonomous-and-networked-control-lab/index.php/Crazyflie_Swarm

This utilizes the camera system in the lab and would require us to get a tracking deck or design one. It would also be advantageous to look into sensing position data without the aid of an external system like the cameras. This would allow the quad to be more versatile in different locations.

Plans for coming Week

- Setup folder in Git repo to place all CrazyFlie files for now - Colton
- Continue experimenting with crazyflie and looking into how to rip control logic out
- Begin work to set CI up for website uploading once GIT is ready - Carter
- Continue to work on getting YouTube set up - Carter

- Create and setup new board in Git to manage new issues - Brandon, Ellissa
- Finalize first iteration of test stand design - Brandon, Reid

Summary of Weekly Advisor Meeting

10/06/21 Jones Meeting Notes

-- Meeting Notes

- Roles have been assigned
- Jones likes the new weekly report formatting
  - Include links to GDrive and git repo on weekly report?
- Jones added comments to the test stand req doc
- Jones looked at the git changes document
  - Old (good) team (17-16) linked pre-compiled bins to a particular tag, but git repo didn't likes
  - Find out why current tags may or may not work

  https://git.ece.iastate.edu/danc/MicroCART/-/tags
- Review old microCART protocol for data communication
  - Potential changes
- Funneling model for ground station
  - Keep GUI and CLI separate
  - CLI in C lang, GUI in whatever lang