

sdmay19-20: MicroCart (Microprocessor Controlled Aerial Robotics Team)

Week 5 Report

September 17 - September 23

Client/Advisor: Dr. Phillip Jones

Team Members

James Talbert — *Hardware*

Sarah Koch — *Controls*

Anthony Bertucci — *Ground Station*

Nina Moriguchi — *Quad Simulation*

Tina Li — *Quad Software*

Summary of Progress this Report

James verified the existing IP core for PWM Capture, and is nearly complete with project-generation scripts. Sarah met with the Controls Lead from last year's team to discuss and work on unresolved issues regarding the controls model. Additionally, she reviewed and evaluated the LQR controller and the computational graph for the PID controller. Tony began working on expanding the UI for the groundstation to support real-time flight data. Nina met with the Controls Lead from last year's team to build an understanding of the current Simulink model and identified areas of improvement in CI documentation.

Pending Issues

The Vivado toolchain has some oddities in how it handles certain auto-generated files that need to be dealt with for the project-generation scripts to work. The computational graph currently used to implement the PID controller on the quad is complicated and not capable of matrix multiplication, so its continued use as we prepare to implement the LQR controller is being reevaluated. We are still waiting to receive feedback from our client on the desired specifications for the custom quad PCB. Currently, the software (QTCreator) used to program the ground station UI only exists on the ground station computer in the lab. This makes working on this project outside of Coover somewhat difficult. The CI test files for the project are spread out without a main landing page that links to them. The current Simulink model does not implement the Lidar and Optical Flow systems for a full sensor output simulation.

Plans for Upcoming Reporting Period

James will develop the test applications for verifying PWM generate and capture modules. Sarah will begin creating explanatory documentation for MicroCART's Controls Model and Systems, as it is currently scarce. She will also be researching another method for implementing the LQR controller on the quad instead of using the computational graph. Tony will continue creating backend code to support graphing of flight-log data, as well as begin exploring how to expand communication protocol to support real-time data transfer. Nina will continue creating a C program to link the virtual quad and Simulink hardware model, and add links to the markdown page for the CI Framework.

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
James Talbert	Created tcl/bash scripts for Vivado	7	17

Sarah Koch	Identified potential for the streamlining of controls implementation and the need for improved controls documentation. Began process of implementing the LQR controller.	6	18
Anthony Bertucci	Expanded mainwindow.ui to include a new tab for real-time flight data. In addition, began writing backend functionality to support receiving flight data	6	17
Nina Moriguchi	Read up on using matlab engine in C programs and using C inside Simulink using mex to start connecting the existing Simulink hardware simulation with the existing unix virtual quad. Started simple practice in Simulink. Went over the existing CI testing framework.	7	17
Tina Li	Tried to determine test coverage and tasks that still needed to be done for testing; reviewing code in repository and reading documentation (Was gone for 3 days for interviews, will be doing extra work the following weeks to make up for lost time)	2	14

Gitlab Activity Summary

 Action: commented on, Sun Sep 23 2018

Author: Austin Rohlfing

Title: Improve documentation for parameter identification, Type: Note

Comment: Note to the future: This is largely completed. The markdown document `controls/model/modelParameters.m` is acting as the table of contents for all these documents (though they can also be found independently in git). All processes that aren't yet git-documented are listed in italics with a reference to where the procedure can be found.

 Action: closed, Sun Sep 23 2018

Author: Austin Rohlfing

Title: Add LQR Control to Simulink, Type: Issue

 Action: closed, Sun Sep 23 2018

Author: Austin Rohlfing

Title: Updated control model files from Andy, Type: Issue

 Action: pushed to, Thu Sep 20 2018

Author: James Talbert

Title: Changed the project tcl to allow for making new projects for the zy...

 Action: pushed to, Thu Sep 20 2018

Author: James Talbert

Title: Add the software project to the repo

Action: pushed to, Thu Sep 20 2018

Author: James Talbert

Title: Clean up old auto-generated files

Action: pushed to, Thu Sep 20 2018

Author: James Talbert

Title: Added project tcl for a simple zybo project

Action: commented on, Thu Sep 20 2018

Author: James Talbert

Title: Transition current hardware platform to Vivado, Type: Note

Comment: I got a project working (hello world code runs) with a recorder block included in the design. I'll start building the unit test branches (one per sensor/output) today.
