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

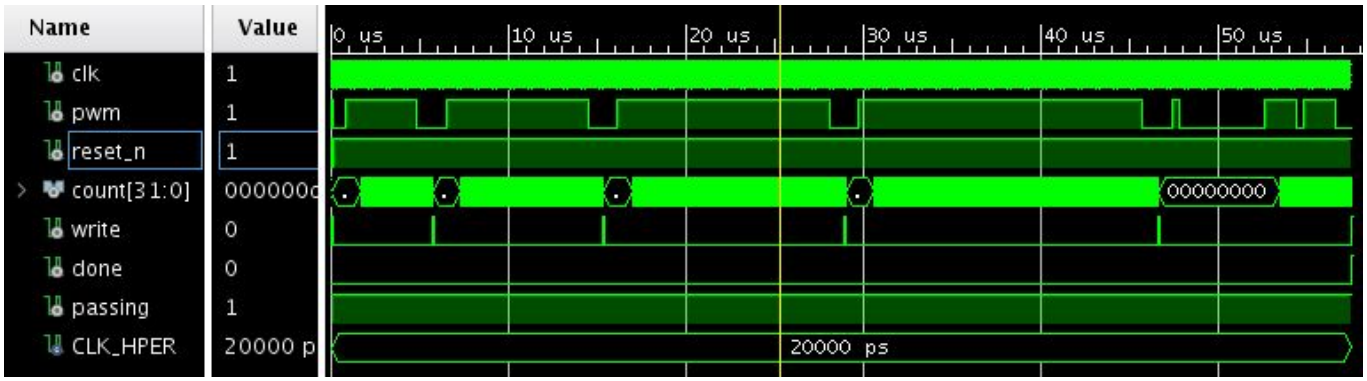
Week 6 Report
September 24 - September 30
Client/Advisor: Dr. Phillip Jones

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

- Quad Hardware - James
  - Added more software testing using the PWM recorder and generator in a loop to test each other. This verifies that they are behaving consistently, but not that they are working correctly.
  - Built a testbench in the Vivado IP packager for the recorder module, which will allow for future automated testing of the hardware design modules.
    - This exposed a minor bug in the IP core that has since been resolved.



- Controls Documentation/Implementation - Sarah
  - Created an outline of the information that should be contained in the documentation for the MicroCART Controls.
  - Performed parameter identification for the controls model and continued analysis of the LQR model by checking the calculations used to design it.
  - Read the code currently used to implement the PID controller on the quad and, based on this, began writing code to implement the LQR controller.
- Ground Station - Tony
  - Added UI frontend feature for Flight Data to be displayed
  - Determined the different levels of flight data that can be selected from to display intended flight information
- Nina:
- Tina:
  - Created some documentation about what tests were currently in place
  - Read through test code to determine test coverage
  - Spoke to previous team members to understand what areas need work
  - Developed test plan

Pending Issues

- James
  - Simulating the hardware test module requires the Vivado toolchain, which is not currently available on the continuous integration server that MicroCART uses.
- Tina
  - Need to talk to previous members about what tests need to be added
- Sarah
  - While the controls portion of the project has documentation for calculating parameters used in the controls model and explains the theory behind the creation of the model, the documentation for how to alter and implement the controls model on the quad is scarce.
- Tony:
  - The physical amount of data we can currently send per cycle without sacrificing performance is currently unknown. This information will be useful for determining how much flight data can be sent during flight times.
- Nina:

Plans for Upcoming Reporting Period

- James
  - Integrate the simulation tests into the GitLab Continuous Integration environment, allowing for any changes to be tested, even if the developers forget to do so. This will require configuration changes to the MicroCART test run server.
- Sarah
  - Continue her work on the implementation of the LQR controller for the quad.
    - In order to do this, she will first need to finish her verification of the LQR controller design to make sure that it is theoretically sound and will operate correctly.
    - Write LQR controller code for use on the quad. Throughout this process she will be updating the Controls documentation.
- Tony
  - Continue and possibly finish linking the backend functionality of the new UI flight data feature in mainwindow.cpp to the frontend in mainwindow.ui
- Tina
  - Implement the test plan, sending sensor data in real time
  - Find a script to graph the data in real time
  - Write a debug level feature where users can set which data to send
- Nina

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
James Talbert	Added simulation tests for the PWM recorder IP block Added more software tests for the PWM recorder and generator	8	25
Sarah Koch	Continued analysis of LQR controller Created outline of an explanatory Controls	5	23

	document Worked on creating LQR code for the quad		
Anthony Bertucci	Determined different levels of flight data Created UI component for each level of flight data Began to create backend portion of UI	5	22
Nina Moriguchi			17
Tina Li	Worked on developing a test plan Worked on debug level implementation Working on real time sending of sensor data Read through current test code and wrote documentation	5	19

Gitlab Activity Summary

Action: pushed to, Fri Sep 28 2018
Author: James Talbert
Title: Update how_to_use_XSDK.md

Action: pushed to, Fri Sep 28 2018
Author: James Talbert
Title: Remove unused Project Generation script

Action: pushed to, Fri Sep 28 2018
Author: James Talbert
Title: Remove unused Project Generation script

Action: pushed to, Thu Sep 27 2018
Author: James Talbert
Title: Update using-vivado.md

Action: pushed to, Thu Sep 27 2018
Author: James Talbert
Title: fixed board_repo_path

Action: pushed to, Thu Sep 27 2018
Author: James Talbert
Title: Corrected project-creation script

Action: pushed to, Thu Sep 27 2018
Author: James Talbert
Title: Update SDK project to new IP core version

Action: pushed to, Thu Sep 27 2018
Author: James Talbert
Title: Add PWM Recorder kernel module test

Action: opened, Thu Sep 27 2018
Author: James Talbert
Title: PWM Recorder IP block has an 18-cycle measurement error, Type: Issue
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Action: pushed to, Wed Sep 26 2018
Author: James Talbert
Title: Add a duty cycle sweep test

Action: pushed to, Wed Sep 26 2018
Author: James Talbert
Title: Added Combined PWM SDK Test projects

Action: pushed to, Wed Sep 26 2018
Author: James Talbert
Title: Add some more sdk files for all the projects

Action: pushed to, Wed Sep 26 2018
Author: James Talbert
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Action: pushed to, Wed Sep 26 2018
Author: James Talbert
Title: Created combined project for both PWM capture units

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Action: pushed to, Wed Sep 26 2018
Author: James Talbert
Title: Add a constraints file to source control

Action: pushed new, Wed Sep 26 2018
Author: James Talbert

Action: commented on, Mon Sep 24 2018
Author: James Talbert

Title: Transition current hardware platform to Vivado, Type: Note
Comment: I have scripts for building the projects and software test applications for the PWM units. The tests are currently extremely thin, but are able to read and generate PWM signals successfully.
