EE / CPRE / SE 492 - sdmay23-47
CyDAQ DSP Platform Firmware and Software Redesign

Bi-Weekly Report 2

February 19, 2023 - March 5, 2023
Client: Matthew Post
Faculty Advisor: Philip Jones

Team Members

Yohan Bopearatchy - Firmware Engineer
Wyatt Duberstein - CLI Engineer
Blake Fisher - GUI Lead
Corbin Kems - CLI Engineer Lead
Cole Langner - Testing Lead
Jens Rasmussen - Project Lead
Long Zeng - Firmware Engineer Lead

Past Period Summary

Since last period, a significant number of changes have been made to the GUI such as adding scientific notation to the configuration inputs, creating clear indications of when configurations are made and sent to the CyDAQ, and improving the live plotting. Along with this, a lot of time was spent cleaning up the code and creating documentation in comments and on the wiki page. In preparation for user testing in the upcoming weeks as we put our GUI in front of EE 224 students to complete labs, a simple-to-use .exe file was created for the GUI and ways to get feedback from the students were brainstormed and created. Work was done on the dual-core functionality bugs that have been occurring throughout the project as well as finishing the CPU0 implementation. Research was started on getting USB serial to work with petalinux and meaningful progress has been made.

Past Period Accomplishments

Yohan Bopearatchy

Yohan worked on finishing the problem with the registers on the dual core not sharing the data and started researching petalinux.

EE / CPRE / SE 492 - sdmay23-47
CyDAQ DSP Platform Firmware and Software Redesign

Wyatt Duberstein

Wyatt worked on cleaning up the gui, fixing small bugs and adding a few features from our code review (scientific notation, plotter mode on the basic operation page, send config only button) and general code cleanup for the deadline. Also added lots of comments and documentation

Blake Fisher

Blake worked on cleaning up the gui to improve the user experience. Also worked on questions to ask the students when we test the new interface in actual labs.

Corbin Kems

Corbin worked on the communication portion of firmware. He spent about a week trying to fix the first bare-metal implementation of the USB CDC protocol, which allows for serial emulation over a USB connection. He was able to get it to much higher transfer rates, but some existing bugs in the bare metal implementation led us to decide to scrap the whole idea and switch to petalinux for the firmware altogether. The second week was spent learning about petalinux and configuring its kernel modules to suit our needs. Corbin got a working install of petalinux with the kernel module that allows for USB CDC communication to enable, which took a lot of trial and error.

Cole Langner

Cole worked on getting started on testing the GUI. Started writing unit tests for the main page of the GUI and worked on testing all inputs possible on that page.

Jens Rasmussen

Jens worked on creating questions for the students that will be testing the GUI during 224 lab.

Long Zeng

Long Worked on finishing the implementation on CPU0. Fixed the problem of command taking, adding back the mix select for filters. Researched petalinux.

Pending Issues

Yohan Bopearatchy

Yohan had issues with the shared registers inconsistently sharing data or even not working when testing.

Wyatt Duberstein

Wyatt had issues with code cleanup and trying to implement scientific notation while minimizing the amount of obfuscated code.

EE / CPRE / SE 492 - sdmay23-47
CyDAQ DSP Platform Firmware and Software Redesign

Blake Fisher

Blake had issues with adding certain new features to the interface.

Corbin Kems

Corbin had issues with the bare metal implementation of the USB CDC communication protocol. There are a lot of bugs with it, and fixing them is extremely difficult to do considering most of the code for that aspect of the project is written by Xilinx themselves. Corbin also had some issues with the petalinux install, mainly due to incompatible versions of software, but it all got smoothed out eventually after much trial and error.

Cole Langner

Cole had issues with learning how to test pyQt with unit test.

Jens Rasmussen

Jens had issues with learning about the firmware and understanding how to improve it.

Long Zeng

Long had issues with command taking in CPU0, and adding back the mix select for filters

Individual Contributions

Name	**Hours Worked This Period**	**Cumulative Hours**
Yohan Bopearatchy	5	11
Wyatt Duberstein	8	24
Blake Fisher	6	14
Corbin Kems	20	36
Cole Langner	3	7
Jens Rasmussen	4	12
Long Zeng	8	16

EE / CPRE / SE 492 - sdmay23-47
CyDAQ DSP Platform Firmware and Software Redesign

Plans For Upcoming Period

Yohan Bopearatchy

Yohan will work on how to implement petalinux in the dual cores and continue working on the shared registers problem.

Wyatt Duberstein

Wyatt will work on whatever needs to be done after the application is sent for lab testing and we receive feedback. Wyatt will also work on other modes such as the balance beam mode.

Blake Fisher

Blake will work on adding new features to the interface while keeping the aesthetic and keeping the application easy to use and not confusing.

Corbin Kems

Corbin will work on rounding out the petalinux install so it will be able to be very configurable in the future if need-be. He will also document the whole process, so future teams don't have to go through the same trial and error process that was very frustrating. The main goal for the next period is to have a working petalinux development environment that other team members can use to further develop the firmware applications on this new platform.

Cole Langner

Cole will work on writing tests for the GUI and add them to the pipeline. Cole will also update the wiki to include how we test and how to add more tests.

Jens Rasmussen

Jens will work on taking feedback from our user tests to improve the GUI and help make progress on the firmware.

Long Zeng

Long will work on the hardware design of the current platform. Add back the missing filter GPIOs and all other missing parts of the hardware rather than just the sampling sub system.

Summary of Advisor Meetings

Since last period, a former member of a senior design group that worked on the CyDAQ sat down with the team for a code review meeting to provide feedback on the progress made so far and help us create a roadmap for the rest of the project. There was a lot of discussion about creating clear, available documentation inside the code to remove ambiguity for future

development. There were a few quality-of-life changes made based on this meeting such as adding scientific notation in configuration inputs. The faculty advisor (Dr. Philip Jones) also created a Google account for the team to allow for the creation and posting of tutorial YouTube videos on the code and use of the project. A .exe file was given to the client for testing before putting the software on the Coover lab computers. Further time was spent ensuring that the product will be prepared for user testing in the coming weeks and that the firmware is still progressing.