Bi-weekly Status Report 5
Senior Design, December 2020, Team 14

Introduction of Real-World Signals and Systems into ECpE DSP Laboratory Curriculum

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Progress Summary:
Over the last two weeks, we validated the external DAC and ADC additions to the hardware and implemented them into the final hardware revision. We implemented DAC drivers in firmware, and also added new DAC commands and command parsing, making the firmware ready for testing with the front end. We planned out changes to the front end architecture to enable DAC configuration and control. We finished the plans for the mechanical system for EE 324 lab 1 and ordered all necessary parts to prototype. Finally, we finished our PIRM presentation and began preparations for our faculty panel presentation.

Individual Contributions by Team Member:
- **Brady Anderson (Biweekly: 14; Cumulative: 144)**
  - Implemented SPI controller
  - Implemented DAC driver in main firmware
    - Added command strings and new command logic
  - Created SPI ADC test program
    - Successfully received samples from external ADC
  - Completed second PIRM presentation
- **Sam Burnett (Bi-weekly: 32, Cumulative: 178)**
  - Finalized hardware revision 2
  - Annotated full schematic with new designators
  - Updated bill of materials for revision 2 additions
  - Generated fabrication files for assembly quote
  - Ordered PCB, solder stencil, and parts
  - Started PMOD to retrofit revision 1 with revision 2 capabilities
- **Mitchell Hoppe (Weekly: 12; Cumulative: 122.0)**
  - Building out the ability for the user to take a backward step and start from the beginning when picking parameters in the GUI
  - Worked on the PIRM Presentation II
- **Max Kiley (Biweekly: 115; Cumulative: 126)**
  - Finished drafting lab 1 for EE 324
  - Researched and completed math models for mechanical spring-mass-damper system.
  - Continued simulating LC circuit for lab 1
  - Began prototyping spring-mass-damper system
- **Emily LaGrant (Biweekly: 12; Cumulative: 127)**

- ○ Research final power project lab
- ○ Work on documentation, cont.
- ○ Revise heart rate lab
- ○ PIRM presentation
- **Isaac Rex (Bi-Weekly: 12; Cumulative: 192)**
  - ○ Completed 3D model of mechanical system for Controls lab II
  - ○ Began building initial prototype
  - ○ Tested distance sensor module
  - ○ Began Simulink modeling of ball/beam system

Pending Issues:
- ● Live streaming of data to lab PCs may require some firmware design changes. UART RX process is polled but may also need to transmit periodically, necessitating a timeout or hybrid FreeRTOS approach
- ● UART cannot keep up with 1 MHz+ ADC sample rates, so some buffering will be necessary. Sliding R/W heads would maximize buffer utilization
- ● Labview and DAD don't play well together–needs further investigation

Plans:
- ● Isaac:
  - ○ Test mechanical design prototype for controls lab II
  - ○ Create Simulink model for distance sensor
  - ○ Validate Simulink model
- ● Emily:
  - ○ Check on faculty presentation details
  - ○ Begin work on poster
  - ○ Continue work on power lab
  - ○ Continue documentation
  - ○ Continue revising heart rate lab
- ● Brady:
  - ○ Create SPI ADC driver in main firmware
  - ○ Review PWM block
  - ○ Test DAC command parsing with Python scripts
  - ○ Investigate possible solutions for UART streaming mode
    - ■ Probably using UART interrupts on command receive
- ● Sam:
  - ○ Build revision 2 validation PCBs for final demo
  - ○ Finish PMOD design to retrofit revision 1 units
  - ○ Finalize enclosure modifications (3D Models, mill files)
  - ○ Order retrofit PMOD validation PCBs and parts
  - ○ Test and characterize hardware revision 2 performance
  - ○ Finalize presentation documentation (Schematic, layout, etc)

- Max
  - Polish up lab 1 document for EE 324
  - Finish creating prototype for mechanical spring-mass-damper system
  - Create a second revision of the mechanical spring-mass-damper system.
- Mitch
  - Add DAC configuration to the backend, as well as the frontend of the MATLAB gui
  - Polish the quality of life improvements to the front end.