

EE/CprE/SE 491

wDAQ System (sddec24-19)

Weekly Report 9

April 3rd - April 9th, 2024

Client: Manojit Pramanik and Avishek Das

Faculty Advisor: Manojit Pramanik

TEAM MEMBERS

Adam Shoberg [EE] - Circuit Design & Simulation, PCB Design, Team Communications Leader

Henry Chamberlain [EE] - PCB Design & Construction

Lisa Tordai [SE] - Software Development, Wireless Data Sharing

Vaughn Miller [CprE] - Computer Engineering

SUMMARY

This week, we completed quite a bit of work on the computer and software sides and pushed things forward on the electrical side. With our software, we created serial plots of data in LabVIEW and configured the ESP Wi-Fi module to read parallel inputs from GPIO pins on the STM32 microcontroller. On the hardware front, our PCB boards arrived at ETG for the low-noise amplifier (LNA) and ADC circuits, so we requested these boards to be soldered. After the soldering work was completed, we took the boards to the Applied Science Complex (ASC) to perform testing & analysis on the circuits. We also continued our search and selected top options for a Battery Management System (BMS) and DC-DC Buck Converter, which will be used to control the battery and step down the 12 Volt power source from the battery to 5 Volts for the parts of our circuit that require a lower power supply. Finally, we had a team workday with our client on Tuesday (4/09) to continue testing and programming with the microcontroller and Wi-Fi module, and we plan to continue meeting more frequently as a team like this up until the end of the semester to solidify group communication and make progress toward delivering a complete prototype of our device to the faculty panel at the end of the semester.

ACCOMPLISHMENTS

Adam:

- Performed testing on LNA & ADC PCBs at ASC
- Selected Battery Management System & DC-DC Buck Converter for battery module
- Learned more and contributed to microcontroller & Wi-Fi development on team workday

Henry:

- Requested PCB soldering from ETG and acquired soldered boards
- Researched Battery Management Systems & DC-DC Buck Converters
- Learned more about microcontroller & Wi-Fi modules during team workday

Lisa:

- Updated team website with latest reports and documents for client/advisor
- Created template for academic paper (hoping to publish next semester)
- Continued development and optimization of LabVIEW program
- Testing Data logging in LabVIEW with different file format and starting/stopping logging

Vaughn:

- Implemented a structure to manage memory accesses and improve efficiency of input processing
- Configured timing for ADC data transfer
- Tested real ADC data at about ~500KSamples/s and output to serial monitor
- Learned more about battery system at team workday

PENDING ISSUES**Adam:**

- Concerned about having time to compile a prototype before the end of the semester

Henry:

- Struggling to get orders fulfilled and soldering work completed in a timely manner by ETG
- Concerned about having time to compile a prototype before the end of the semester

Lisa:

- When microcontroller is programmed with ESP32 need to test connectivity to LabVIEW
- Team discuss design for 3D Model of prototype case

Vaughn:

- Looking for ways to test bench pseudo ADC input before actual ADC arrives to make more progress

INDIVIDUAL CONTRIBUTIONS

| Member | Contributions | Weekly Hours | Total Hours |
|--------|---|--------------|-------------|
| Adam | LNA & ADC PCB testing, BMS & Buck Converter selection, microcontroller & Wi-Fi workday | 4 | 47 |
| Henry | LNA & ADC PCB soldering, BMS & Buck Converter selection, microcontroller & Wi-Fi workday | 4 | 47 |
| Lisa | Team website updates & formatting, academic paper template, Continued development to LabVIEW program, microcontroller & Wi-Fi workday | 4 | 54 |
| Vaughn | Microcontroller development continuing, | 4 | 50 |

COMMENTS AND EXTENDED DISCUSSION

Adam:

- Try to improve group communication

Henry:

- We should try to meet more frequently as a team and with our client for the rest of the semester to ensure consistent communication & timely completion of tasks

Lisa:

- Creating a plan of work for last few weeks of the semester

Vaughn:

- Need to optimize personal schedule to be able to meet deadlines

ACTION ITEMS FOR UPCOMING WEEK

| Item | Member(s) Assigned | Desired Completion |
|---|---------------------------|--------------------|
| Make changes (as needed) to LNA & ADC circuits to fix issues encountered during testing of prototype PCBs | Adam, Henry | 4/17/2024 |
| Finalized LabVIEW GUI | Lisa | 4/15/2024 |
| Testing LabVIEW/WIFI with microcontroller | Lisa, Vaughn | 4/12/2024 |
| Complete Powerpoint with results for advisor meeting | Lisa, Vaughn, Adam, Henry | 4/12/2024 |
| Completed prototype of device (PCB designed & ordered, soldered) | Lisa, Vaughn, Adam, Henry | 4/28/2024 |
| Add all images, schematics, PCBs, etc. from the design phases into the academic paper and get a draft started | Lisa, Vaughn, Adam, Henry | 5/3/2024 |

SUMMARY OF WEEKLY MEETINGS

Weekly Client Meeting (4/03):

- Discussed research into Battery Management Systems and next steps
 - Need to select a specific device (considering IP2368 Fast Charging Module)
 - Need to find a single input, bipolar output DC-DC Buck Converter to step down battery voltage from 12V to +/- 5V (considering Traco TMV1205D)
- Evaluated progress with STM32 microcontroller and LabVIEW
 - Configured UART bridge to send digital values
 - Partially configured 12-bit Tx message to match ADC resolution
 - Attempted to create serial plot of signals from ADC
 - Simulated LabVIEW code for saving data
- Planned team/client workday for Tuesday (4/09)
 - Want to work on microcontroller, Wi-Fi, GUI, and combining them together
 - Want serial plot of parallel GPIO inputs prior to meeting (Vaughn)
 - Want serial plots of acquired data prior to meeting (Lisa)

-
- Discussed need for increased communication & team meetings until the end of the semester to ensure timely completion of a prototype
 - Discussed deliverables for 4/05/2024 academic advisor meeting
 - Need to complete/update Powerpoint showing achievements from March/April and add photos/plots of data
 - Powerpoint should be relatively vague and results-oriented to avoid confusion