

CPRE 491
Oct 10, 2024

Weekly Report 4

Advisor: Professor Meng Lu

Group: 22

Members:

- Sajjan Patel (Fullstack Software)
- Daniel Karpov (Data Processing)
- Jay Patel (Data Processing)
- Ty Beresford (Fullstack Software)
- Chuck Mallek (Physical & Electrical Design)

Project: CyVital

Project Purpose: CyVital project is dedicated to providing modular hardware in the form of sensors and its corresponding software counterpart to read, analyze and display data seen within the sensors. The hardware-software will be used for the Biomedical Engineering Lab, so it must be created so that students, professor(s) and TA(s) can use it with ease.



Languages:

- Graphical User Interface: Python
- Backend Data Analysis: Python

System:

- Configuration: Universally modular
- Open Sourced: Data acquisition

License:

- For educational purposes through Iowa State

Weekly Summary

Group Success:

As a group, we have finalized our prototype physical hardware. The conversion for a modular system has begun: adjusting physical components to accept USB-C by rewiring existing hardware, final permissions and roles within the GitHub repository and a rough idea on how to train a data model to predict incoming sensor data.

Individual Roles:

Sajan Patel Hours: 6 Cum. Hours: 17 Issues: N/A	I conducted research on how our kit interfaces with the computer and explored potential APIs and libraries for data analysis. I also tested the sensors provided in the kit to identify possible implementation methods for our own system.
Daniel Karpov Hours: 6 Cum. Hours: 21 Issues: N/A	I started learning more about signal processing and data acquisition. I found it. I also read and took notes on a chapter of a textbook called "Introduction to Biomedical Signals and Their Applications." This article helps us understand more where the physiological signals come from and how they are captured and used for medical purposes.
Jay Patel Hours: 6 Cum. Hours: Issues: N/A	I started research on the heart rate sensor acquired from spark fun and the potential implementation of the sensor unit using our existing DAQ software. I also have started on a skeleton for a python program to allow us to utilize the DAQ without the need for pre-built software.
Ty Beresford Hours: 7 Cum Hours: 22.5 Issues: N/A	I made final adjustments and permission requirements for the GitHub repository. I have elected myself to be the final step before PR requests are accepted and merged into the main branch. I as well have begun writing simple graphical user interfaces to be narrowed down and selected; this allows for further development on advanced graphical user interfaces.
Chuck Mallek Hours: 6 Cum Hours: 17 Issues: N/A	I gave our client the list of sensors needed for our project's next iteration, and he delivered them to us at our meeting. I also started researching what input and outputs are required for the heart rate and got lots of input from our professor and the next steps for the physical iteration of the project.

Advisor Meeting

Got the sensor from spark fun and showed us how it can be used. We then went over how we would go about connecting the sensor to the DAQ that we have. We also went over the next steps and he gave us some more things to research before we can get fully started with the assignment. Next meeting he will give us a mini-lecture on signal processing and data acquisition and how our machines read the data.

Room to improve:

- We should try to ask more clarifying questions during the meeting so we don't get stuck later in the week when working on the project.

The Good:

- Strong communication
- Have a good idea of what is expected from our group from the advisor
- Got all the parts needed in order to get started with the project

Upcoming Week

Upcoming Group Success:

As a group, we aim to have an application that runs properly. Ideally, backend and frontend will have strong communication as each section will be written separately. In terms of physical components, our group plans on mastering data I/O actions between backend and physical sensors. Due to the numerous structures of data transfer, the two will pair to find the most efficient and fastest method of transferring data to-and-from before being displayed by frontend.

Upcoming Individual Roles:

Sajan Patel	Gathered additional data from the provided kit to determine how it can be integrated into our system. Explored the use of simple sensors and considered the potential of using a USB-C cable for our project.
Daniel Karpov	Start to implement a program that is able to read a signal and output info about that data. We will also start finalizing the way we are going to be transferring data.
Jay Patel	Begin to implement data analysis program using python by controlling sampling rates along with Daniel for a reliable signal from the sensor
Ty Beresford	I will begin to investigate further into the GUI libraries to ensure frontend rendering does not affect backend=>frontend data transfer. If the GUI can not handle the speeds, then I will begin investigating strong data protections (mutexes, multithreading ect).
Chuck Mallek	Next week, I will start working on connecting the heart rate sensors and the DAQ ADC device to display on the pre-made software provided by the DAQ company. This will include brushing up on my EE 201 and 230 classes, as I will have to figure out how to feed 3.3V DC power into the heart rate sensor.