EE/CprE/SE 491 WEEKLY REPORT 6

11/4/2025

Group number: 6

Project title: CyVital

Client &/Advisor: Dr. Meng Lu

Team Members/Role:

Kate Endersby - Plans for Upcoming Week

Claire Haas - Weekly Summary, Pending Issues, Advisor meeting

Reza Choudhury - Individual contributions

Max Tanruther*

- **Weekly Summary**

The team worked on integrating the revamped GUI and adding finishing touches onto the PCB. The hardware team worked on developing the EMG sensor which included gathering patents and learning how to do envelope detection. Some additional features in the GUI include new classes and the EMG sensor, with revised design implemented for the reaction rate sensor. The team went over ways to test and write code for the respiratory sensor and blood pressure cuff.

- **Past week accomplishments**
  - ★ Kate Endersby
    - Completed EMG plotting
      - Adjusted it to operate with PlotManager and Scope classes
      - Added a top graph that is raw voltage
    - Shifted more functions to PlotManager class
    - Worked on the design section of the design document
  - ★ Reza Choudhury
    - Completed working GUI integration
      - Modular system allows easy sensor integration
      - Works with Sensors (reaction time so far)
    - Export function working -> sends to downloads for a selected dataset
  - ★ Claire Haas
    - Designed an EMG sensor using instrumentation op-amps and rectifiers
      - Gathered literature from other designs in order to understand necessary components for proper data collection
      - This article breaks down the high-pass, low-pass, and signal to noise ratios of a proposed EMG sensor. While the board is more complicated than the CyVital's desired output, the article illustrates good motivations for design choice. https://journals.sagepub.com/doi/epub/10.1177/16878132251338446
      - This is the original patent that was suggested as a high-level overview by Myoware staff. The patent breaks down the different components of the EMG sensor and different specifications the EMG sensor meets. https://patents.google.com/patent/US10010259B2/en
    - Confirmed the corresponding footprint and pre-existing component dimensions have been added to the schematic
      - The image on the next page shows the identified analog inputs for the BIOPAC sensors connected to an analog multiplexer, which is used to access different channels that correspond to different sensors. The necessary

changes due to the button short to ground as identified in Design Document 4 was updated onto the main schematic. The below image is before the EMG sensor was added.

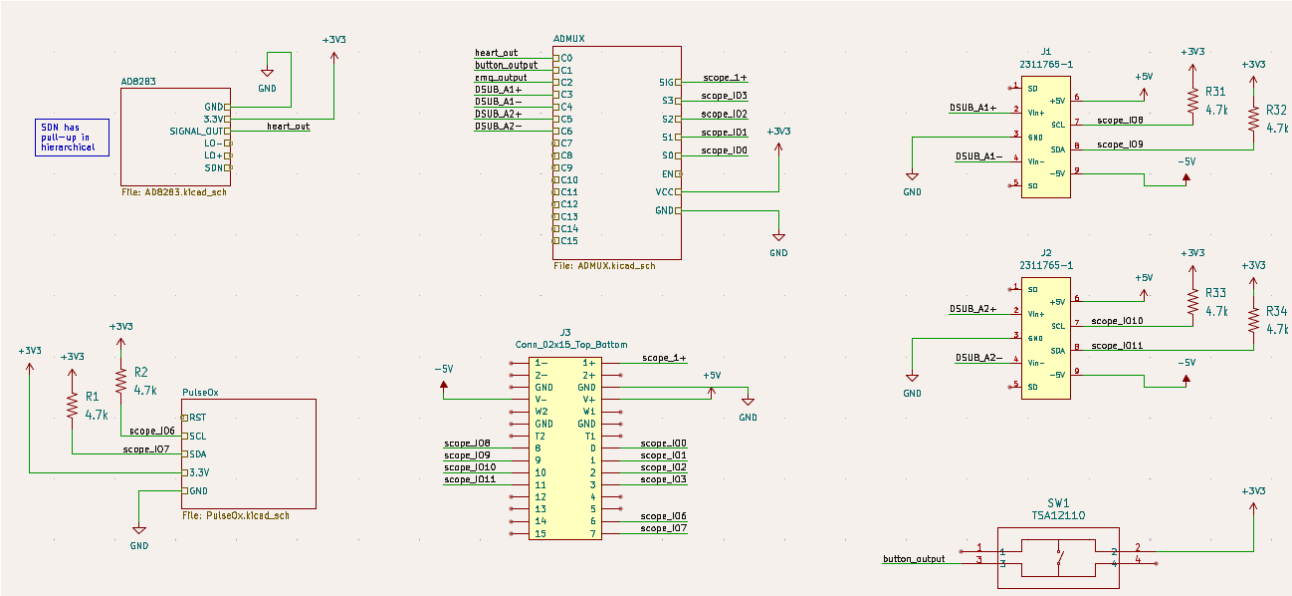

Figure 1. BIOPAC sensors added with proper analog channels

- Created a list of possible materials with pros and cons for PCB casing
  - The list can also be seen in Design Document 4. The materials are plexiglass, PETG, ABS, wood, and aluminum
  - Chose ABS and will use PETG for casing if ABS is not available or causes issues

- **Pending issues**
  - The team should formulate a plan to test envelope detection. While there are lots of recorded ways to detect an envelope, the team needs to figure out how to test envelope detection both on the hardware side (via filters) and software side. Adding a feature that supports envelope features during physical down-time would boost productivity.
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Individual contributions

NAME	Individual Contributions	Hours this week	HOURS cumulative
Kate Endersby	- Finished EMG plotting - Improved PlotManager class - Worked on design document	8	46
Reza Choudhury	- GUI integration - Modular system ready for EMG integration - Export feature working (excel)	7	37

NAME	Individual Contributions	Hours this week	HOURS cumulative
Claire Haas	- Designed EMG sensor - Casing material list and criteria - Cross-checked lab equipment with design	8	46

- **Comments and extended discussion**
  - Analyze transducers that are included in BIOPAC based on more recent knowledge, specifically transducers for the blood respiratory. Find and verify that the transducer is built into the D-SUB 9 connector.

- **Plans for the upcoming week**
  - Kate Endersby
    - Work on ECG plotting
    - Work on creating the plot for the pulse ox sensor, including a graph display for the raw digital signal
  - Software team
    - Merge sensor plotting code with base GUI code
  - Reza Choudhury
    - Integrate EMG & ECG into GUI
    - Make export function produce more readable outputs
  - All members
    - Hook up the blood pressure cuff to the BIOPAC to try to get readings out of it / calibrate it
      - Possibly do the same for the respiratory sensor, if we have it
    - Hook it up to the oscilloscope using WaveForms and figure out what pins do what
  - Claire Haas
    - Identify which CAD software is the best for 3D printing in the Biosensor labs
    - Ensure smooth ordering from ETG

- **Summary of weekly advisor meeting**

The weekly advisor meeting was postponed this week due to scheduling conflicts. However, the team plans to present a brief overview of what happened this past week based on new GUI implementations and PCB. The team will also discuss with Dr. Lu how the respiratory and blood pressure sensors work based on the four types of connectors that work with the BIOPAC. The next status report will be about the planned Week 12 meeting.