EE/CprE/SE 492 Status Report 3

Start Date – End Date: 02/14/2025 - 2/27/2025

Group number: 13

Project title: PTSD Detection Device

Client &/Advisor:

Advisor: Mohammed Selim

Mentors: Bae Systems - Alice Crutcher, Michael Goderre, Jennifer Plakyda, Ryan Littler

Client: America's VetDogs - Cheyenne Whitetree

Team Members/Role:

Justin Scherrman - Design Engineer - Communications and Sensors

Neil Prange - Software Engineer

Aidan Klimczak - Design Engineer - Microcontroller

Justin Jaeckel - Software Engineer - Embedded systems

Ty Decker - Security - Stenographer

Katerina Zubic - Team organizer and PCB engineer

- **Bi-Weekly Summary**

From the last report, we met with our advisor and discussed further plans for implementing our PCB design, and discussed how we can improve our software implementation for detecting PTSD episodes. We have begun creating schematics in KiCad for the veteran wearable device and dog-worn device. We have also started implementation of a software-based method for estimating blood pressure, and ordered a blood pressure monitor to help calibrate and test the PPG sensor.

- **Past week's accomplishments**
  - Battery testing, improving some energy overheads
  - PCB research and schematic design
  - Blood pressure research/implementation

Neil Prange - Research/Testing

- Research industry used devices that utilize a PPG sensor to detect blood pressure.
- Starting design of an algorithm that can build on our PPG analysis to read blood pressure.
- Research implementation PPG calibration using a more reliable cuff-based device.

Aidan Klimczak - Research/Design

- Began schematic design of veteran PCB
- Research and development on USB-C connection
- Research on a battery charger circuit
- Research on the PPG sensor connections

Justin Scherrman - Research/Design

- Research into iteration 2.0 of the current design.
- PCB implementation research and beginning footprint work.
- Current battery life tests resulted in longer life.

Justin Jaeckel - Research / Development

- Continued research into blood pressure detection using PPG sensor.
- Contacted doctors to inquire about heart rate data.
- Researched acquiring a baseline heart rate for each different user.

Ty Decker - Research / Security

- Started sorting NIST checklist for pertinent items.
- Attempting to fully understand the entire NIST SP.
- Started preparation for examination of our default bluetooth settings.

Katerina Zubic - Research & Testing

- Began implementing the schematic design of service dog pcb
- Researching implementing battery charging circuit
- Working on the implementation of USB-C charging and serial communication to the microcontroller
  - Half of the schematic is complete
- Met with America's Vet Dogs to clarify constraint questions

- **Pending issues**

  - Detecting blood pressure using our PPG sensor
  - Thinking about what materials to use for the housing
    - Including other design inquiries such as if we will have it interface with already existing bands

- Deciding what tools to use for PCB design(kicad)
    - Breaking down our boards into solderable components
    - Removing unnecessary peripherals (camera, etc…)
- Battery usage for System
    - Testing experimentally
    - Find ways to optimize power consumption
- Receiving blood pressure monitoring for calibration and testing.

- **Individual contributions**

NAME	**Individual Contributions**	**Hours**	**HOURS cumulative**
Neil Prange	Beginning research on modern blood pressure detection schemes using a PPG sensor. Use this to improve our PTSD detection software, which currently only bases off the users heart rate.	5	16
Justin Scherrman	Conducted battery life testing on previous. Worked with a member of Iowa State 3D printing laboratory to discuss possible materials and layout of housing materials. Discussed timeline for having prototypes printed.	7	16
Justin Jaeckel	Continued research into heart rate triggers and contacted a doctor to inquire about retrieving data.	6	16
Aidan Klimczak	Began development of PCB design. Research and development on USB-C, Battery Charger, and PPG sensor circuit	10	20
Katerina Zubic	Development of service dog PCB design. Implementing voltage regulator, battery charger, USB-C communication/charging.	10	21

Ty Decker	Started sorting through a security checklist for items pertinent to our specific project. Started preparation for reviewing default bluetooth settings.	4	8

- **Plans for the upcoming weeks**

  - Complete PCB design research, development, and design regarding battery charger, PPG, and USB-C.
  - Finish schematics and begin footprint design in Kicad.
  - Material research for housing the device for both dog and veteran.
  - Refine our PTSD detection algorithm using additional blood pressure data
  - Integrate blood pressure monitor
  - Start initial examination of Bluetooth settings

- **Summary of biweekly advisor meeting**

  - Discussed team's progress with PCB schematic design.
  - Recommended a PCB advisor we could use to ensure the success of our product.
  - Updated on individual accomplishments and some plans for the future.