

**EE/CprE/SE 491 WEEKLY REPORT 5**  
**10/17/2024 – 10/17/2024**

**number: sday25-17**

**Project title: Microbial Pill Sensor**

**Client &/Advisor: Dr. Meng Lu**

**Team Members/Role:**

**Roles still subject to change as we transition from research to design phase.**

- **Wes Ryley:** Data Transmission Design Lead
- **Rakesh Penmetsa:** Bacteria Housing Design Lead
- **Alex Upham:** Biosensor Design Lead
- **Cade Kuennen:** PCB Design Lead

**Weekly Summary**

The group finalized the functioning code for the excitation and emission collection test circuit. This circuit utilizes the Lilygo T-Display test board to control the circuit. This ESP32 Processor was coded to power the excitation LED for five seconds and then collect a single reading from the Photodetector. The group also started looking into the use of filters and lenses to concentrate and create a controlled testing environment.

In addition to this the group also began working on the BLE system that is on the ESP32. There was time spent on research and developing code that would initialize the functionality of the BLE system and could connect to a searching device. Unfortunately, this goal is still out of reach for the time being as the group attempts to understand how BLE technology works in relation to starting your own system. With the help of Zhang, the graduate student advisor, the group plans to accomplish this goal by next week.

**Past week accomplishments**

Team:

- During this previous week, the team finalized creating the excitation and emission sensing circuit. Also, they created the code to control the processor which would power and control the circuit components. The team demonstrated the functioning excitation and emission sensing circuits that were created on the test board.
- The team started creating the BLE code for the ESP32 processor. Unfortunately, after running into multiple undetermined errors and control faults this section has taken a halt as research into BLE technology has begun to discover the issue and a possible resolution.

- In preparation for the completed test circuit, the group looked into PCB design on the KiCad software as well as the 3D CAD design for the housing container in Fusion 360. By beginning to familiarize ourselves with these software now, when the time comes to create and implement the different sections of our project together, we will have the familiarity to overcome issues that may arise in that part of the process.

Cade Kuennen:

- Worked on developing Arduino code for transmitting the PD data to paired device utilizing low power Bluetooth
- Read into UUID and figure out if a standard UUID will be applicable to our project or if we are going to need to build our own

Alex Upah:

- Helped troubleshoot issues with Arduino BLE code.
- Set up Arduino IDE to work on the second device so that Wes is not the only one with a properly configured Arduino environment.
- Tested that the second Arduino configuration worked properly.

Wes Ryley:

- Worked on developing the Arduino BLE code.
- Looked into UUID usage for BLE data transfer.

Rakesh Penmetsa:

- Worked on understanding how to add the libraries to the Fusion 360.
- Worked on understanding and writing Arduino code and soldering the second Arduino Board.

### **Pending issues**

Team:

- Create a functioning BLE code that can connect to a paired device to send data from the test circuit.

Cade Kuennen:

- Understanding UUID for BLE data transmission.

Alex Upah:

- Understanding BLE data transmission.
- Understanding filtering relationship to photodetection and physical photodetector included on PCB design.

Wes Ryley:

- Understand how UUIDs affect the functionality of a BLE connection.

Rakesh Penmetsa:

- To learn how to transfer the layout of ki-cad to fusion 360.

### Individual contributions

<u>NAME</u>	<u>Individual Contributions</u> <i>(Quick list of contributions. This should be short.)</i>	<u>Hours this week</u>	<u>HOURS cumulative</u>
Cade Kuennen	Working on developing BLE Arduino Code. Researched UUIDs for BLE data transmission. Worked on design document and other weekly class related documents.	6	30.5
Alex Upah	Completed design document and other weekly assignments. Helped troubleshoot issue with BLE Arduino code.	6	27.5
Wes Ryley	Worked to develop the BLE Arduino Code. Looked into the usage of UUIDs to	6	28
Rakesh Penmetsa	Worked on Fusion 360 and on Arduino code	6	25

### Plans for the upcoming week

Team:

- To finish designing and testing the transmission between Arduino and mobile devices. And start designing the circuit for the pill.

Cade Kuennen:

- Assist in getting BLE data transmission to work for our breadboard prototype.
- Contingently if BLE gets working:
  - Start thinking about PCB layout for our design.
  - Create a schematic in KiCad for our system.

Alex Upah:

- Further review BLE data transmission and help get it working on breadboard prototype
- Review photodetection on PCB and needed filtering

Wes Ryley:

- Make the BLE system work to transfer data from our excitation and emission circuits.

Rakesh Penmetsa:

- Start working on the Bacteria housing layout.

### Summary of weekly advisor meeting

This week during the meeting with Dr. Lu, the group showed him the functional test circuit that used the Lilygo T-Display with the ESP32 processor. This test circuit had commands to power a LED for a duration and then collect a Photo Detector reading.

The group also expressed the confusion and difficulty that came about from trying to utilize the BLE data transmission. Dr. Lu walked through some of the knowledge that he had and expressed his interest in learning more about how BLE would work in our project.