EE/CprE/SE 491 WEEKLY REPORT 9
11/8/2024 – 11/14/2024

Group number: ***sdmay25-17***

Project title: ***Microbial Pill Sensor***

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

Team Members/Role:

- ***Wes Ryley:*** Data Transmission Design Lead
- ***Rakesh Penmetsa:*** Bacteria Housing Design Lead
- ***Alex Upah:*** Optical Sensors Design Lead
- ***Cade Kuennen:*** PCB Design Lead

Weekly Summary

Throughout the week, the team continued to work on component selection, the ESP 32 dev kit breakdown, the 3D CAD design of the housing, and the GUI application. Following a discussion with our faculty advisor and client, Dr. Lu, we have established that testing options for LED and PD components may exist in the lab. Further work on the dev kit breakdown for the MCU revealed that the breakdown of the XIAO ESP32C dev kit was due to poor existing documentation that lacks component names. A different ESPRESSIF ESP32C dev kit was identified as an option for breakdown due to available documentation, but its MCU component exceeds our size constraints. Further component selection activities will continue to be a point of emphasis.

Past week accomplishments

Team:

- Reviewed various pressing questions and concerns with Dr. Lu in the weekly meeting. Dr. Lu provided clarification regarding optical filtering and lensing useful for component selection.

Cade Kuennen:

- Continued working on part decomposition of MCU
    - Realized that the XIAO ESP32-C3 dev kit will not work due to missing information in product datasheets.
    - Started looking into other dev kits that could potentially be decomposed instead, the best possible candidate so far is the ESP32-C3-MINI-1 dev kit.
    - Looked into tutorials for creating custom PCBs utilizing the ESP32-C3 as a back up for if part decomposition continues to not go well.

Alex Upah:

- Continued to review PD, lensing and LED components.

Wes Ryley:

- Started construction of the GUI interface. Switched to Tkinter software as PySimpleGUI required extra licensing to use.

Rakesh Penmetsa:

- Worked on making 3D housing and completed the design of housing

Pending issues

Cade Kuennen:

- XIAO ESP32-C3 dev kit will not work for part decomposition into the teams custom PCB implementation due to missing component information in datasheet.

Alex Upah:

- Still working on component selection. Facing various sizing and lead time issues when reviewing applicable components.

Wes Ryley:

- Bluetooth connectivity with GUI and MCU.

Individual contributions

NAME	**Individual Contributions** *(Quick list of contributions. This should be short.)*	**Hours this week**	**HOURS cumulative**
Cade Kuennen	Worked on various class related documents such as this report and the lightning talk, restarted searching for a dev kit we can use for part decomposition, started watching tutorials on building custom PCBs utilizing the ESP32-C3.	7	57
Alex Upah	Continued examination of available PD, lensing and LED components. Compiled list of current questions and was able to get relevant answers from Dr. Lu. Worked on various class assignments.	6	53.5
Wes Ryley	Started construction of GUI interface via Tkinter software. Researched into functionality of Tkinter as a processing software and as a GUI interface. Documented possible improvements and resources to improve and operate GUI.	8	56
Rakesh Penmetsa	Completed designing Housing of the microbial pill sensor. And the design is ready to 3D Print	8	51

Plans for the upcoming week

Team:

- Continue to review various components for the project.

Cade Kuennen:

- Plan to continue searching for a better dev kit we could do another round of prototyping with that would be a better representation of our custom system
    - This dev kit must be decomposable, meaning datasheet must have sufficient component information
- Plan to continue looking into creating a custom PCB implementation utilizing ESP32-C3 without needing to decompose from an existing dev kit

Alex Upah:

- Finalize component selection in lensing optics, PD and LED and order selected components.
- Identify testing capabilities with currently on hand components within Dr. Lu's lab.
- Review optical table used to place and test components available in Dr. Lu's lab.

Wes Ryley:

- Plan to finish the processing and GUI functionality by November 20th
- Attempt to connect software to hardware via established BLE connection.

Rakesh Penmetsa:

- To get design tested by 3d printing and modifying the dimensions if required.

Summary of weekly advisor meeting

During our meeting we covered the topics below and Dr. Lu answered questions involving optical components and lenses.

- Op-Amp Transimpedance Amplifier: Convert photocurrent into a voltage through amplifier system.
- Test with fluorescent beads during prototype testing to recreate simulation and evaluate performance.
- Use Ball lenses as optical enhancement for both LED dispersion and PD collection.
- The filter will be on half of the clear housing chamber as the LED shouldn't be affected by the filter.
- XIAO ESP32-C3 dev kit will not work for part decomposition due to lack of information in datasheets