Microbial Pill Sensor Prototyping

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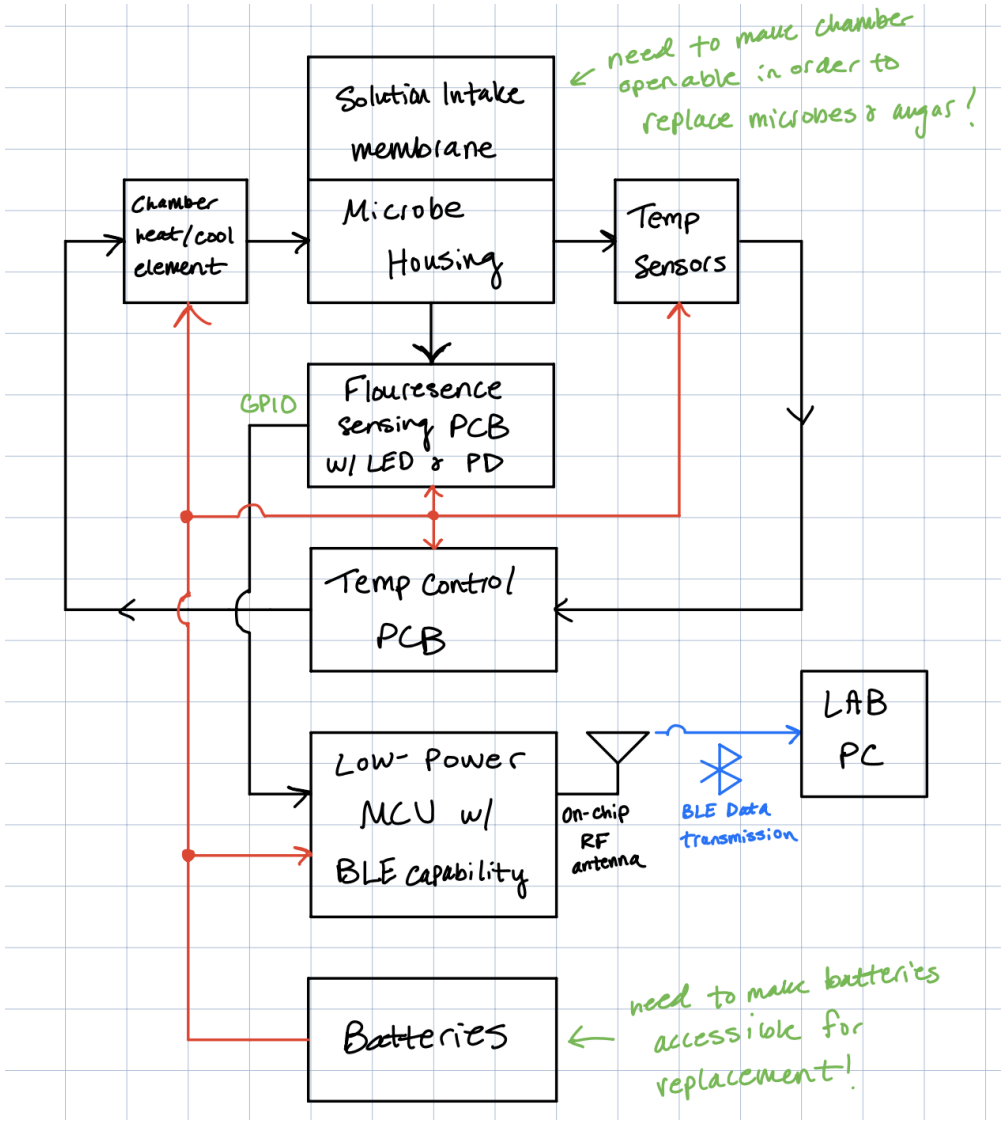
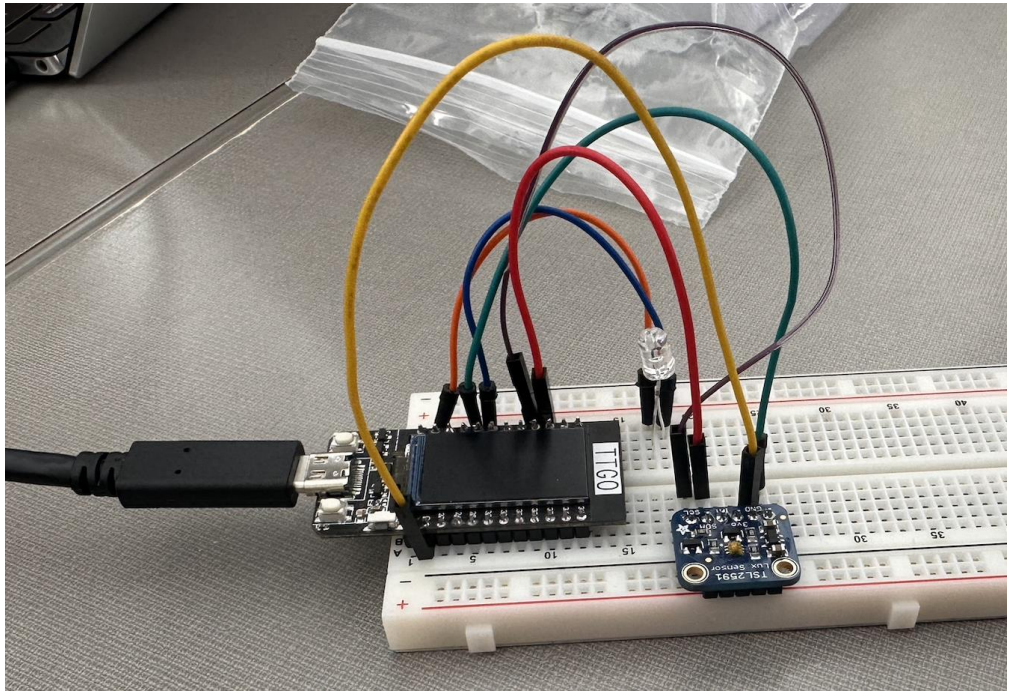
Project Overview

- Develop biosensing system that will house, monitor, and transmit data using bioengineered detection mechanism.
- Monitor and control the temperature of the housing unit to maintain cell growth.
- Optical circuit to emit light and measure fluorescent output
- Transmit the collected data through a Low-Energy Bluetooth connection.



Breadboard Prototype

- Prototype of electronic components to be used in our pill sensor:
  - ESP32 LilyGo MCU Dev Kit
  - TSL2591 Photodetector
  - Excitation LED
- Allowed us to see how these components will interact.
- Also allowed us to test data transmission via Low-Energy Bluetooth (BLE).



Lessons Learned:

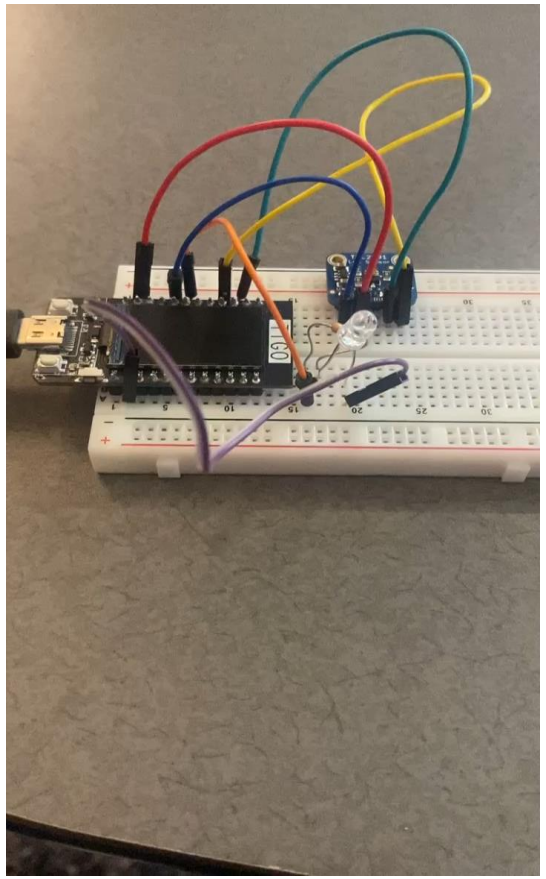
- Learned that we can make a working system utilizing components found on the ESP32 LilyGo MCU Dev Kit and TSL2591.
- Learned that we will be able to transmit the data via BLE utilizing similar components

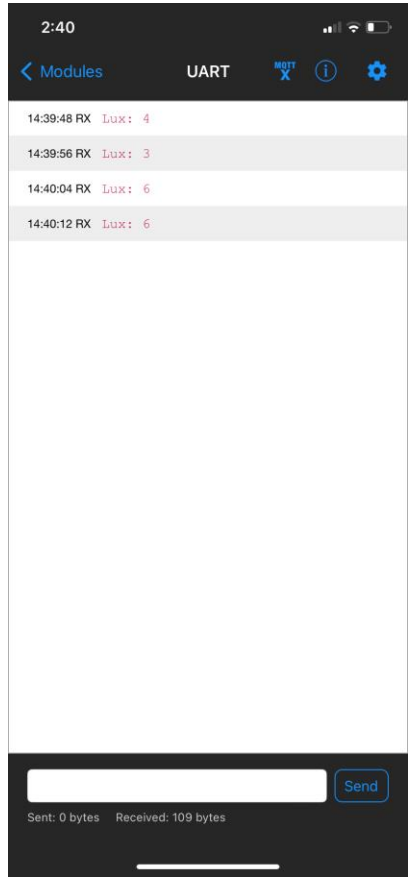
Breadboard Prototype In Action

During this demonstration multiple things can be observed:

- The excitation LED stays on for a duration.
- The photodetector board collects a response and sends it back to the MCU.
- The MCU sends the data via BLE to a connected device on a loop.

This simulates a faster looped response of the excitation and emission collection systems in action.





Implications & Next Steps

- Redesigning the Bread Board Prototype into a miniature version by eliminating the additional components that are not used.
- Design a PCB to accurately collect the data through TSL2591 and transmit the data to MCU.
- Make a secure transfer of data from MCU to the device.
- From the prototype we realized the need to create a GUI to display the data as the needs of the user.
- Need to make a 3D housing to hold the microbes above it the TSL2591 Photodetector for further breadboard testing of biosensor system.

Conclusion

- By prototyping our electronic system, we can see if the components utilized in the prototype design will be applicable to our custom implementation
- We learned that the chosen components will work for our implementation
- We can now start thinking about part decomposition of each individual component of the breadboard prototype to meet the sizing constraint of the final implementation

Thank you!
Any Questions?