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Programming for IOT

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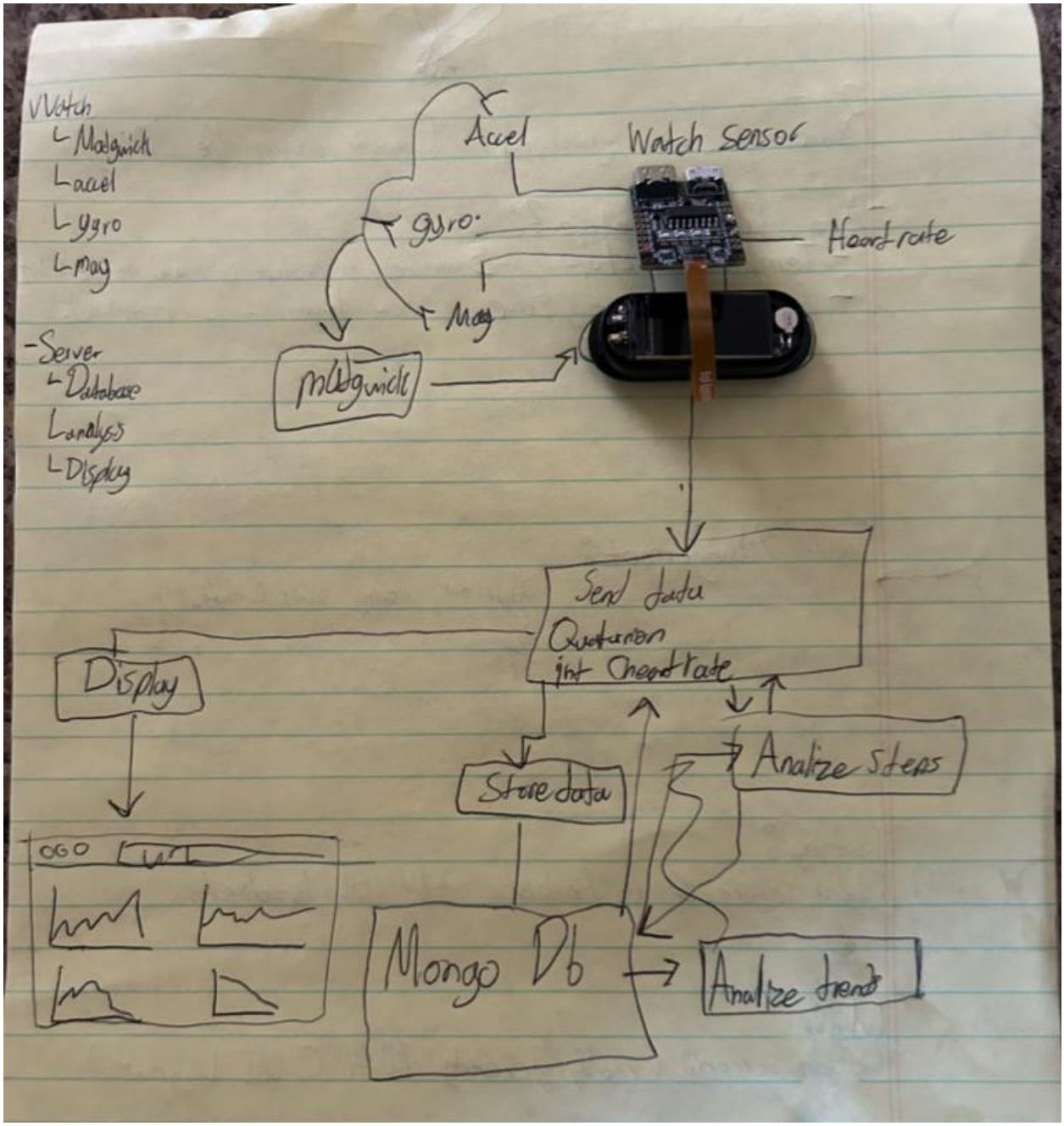
Customizable Health Analytics

A common issue with modern health tracking technologies like the Apple Watch and the Fitbit is a need for more open-source and customizable options. This project aims to create a health analytics wearable that could be openly modified and modularly added to fit an individual's needs. For example: if an individual is particularly concerned about the quality of their sleep a watch that prioritizes passive analytics and longer battery life would be more useful than one that focuses on intermittent monitoring and athletic diagnostics. Because of this, the most useful watch would be one that can evolve with the user's needs.

Initial Ambitions.

The initial goals of this project were to combine sensors reading accelerometer, gyroscopic, magnetometric, and Holter monitor data to get comprehensive diagnostics about a user's health and health-related behaviors. The root of the project lay in monitoring the steps and physical activity of the user and providing them with useful statistics that could tell them about their habits and encourage them to continue their exercise. The goal was to send the data as a computed orientation and a live heart rate over http to a server which would run analytics and display the data to the user.

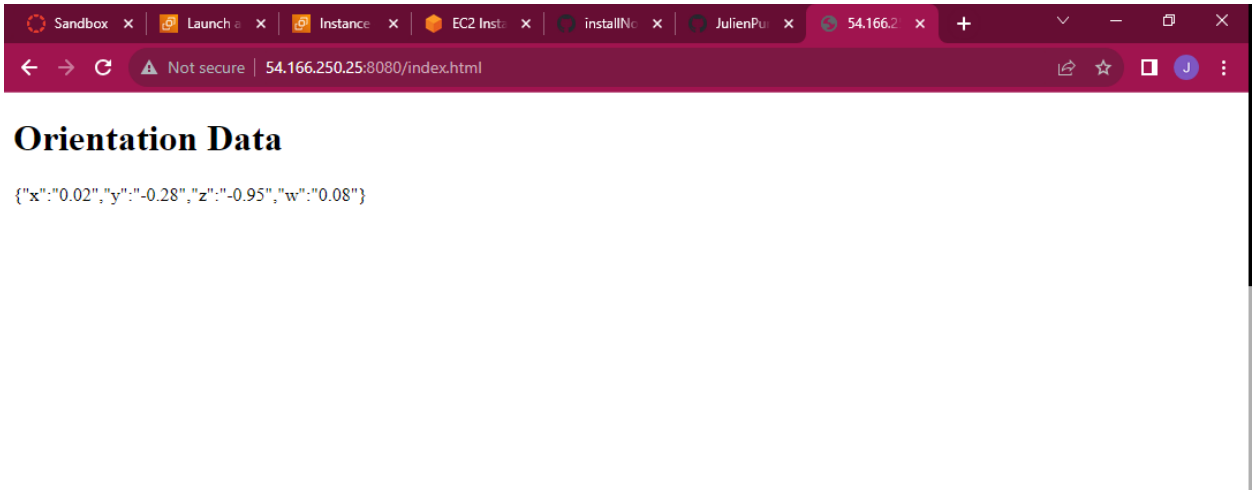
Initial design diagram of the pedometer system.



What we achieved.

We used a Lilygo MPU9250 for our orientation data and core computations. It successfully computes orientation using a Madgwick filter and sends it to a server. The device is able to connect to wifi and communicate reliably. On the server side the server is able to reliably receive and display the orientation data. An implementation of the data analysis for step recognition and graphing of the steps has been added however it is non-functional at this time.

Transport and display of orientation data on the server.



The design gap.

While some of the bones of the project are missing it was somewhat overscoped and the learning curve was too steep for some of the functionality stated in the initial goals. There is no heart rate monitor and no hardware was identified for it, and the data analysis portion has been rather unsuccessful. For this to be a usable product we believe that there would be significant research and time needed to develop and train accurate data analysis functions, and a more comprehensive system of interfaces for the user to interact with.

Reflection - Julien Purvis :

This class has in many ways changed the way I think about building applications and turning ideas for projects into a reality. The main way this has happened is by shifting my preferred development methods from desktop focused to web focused. I appreciate the versatility and ease of developing for the web. This class has also opened my eyes to the plethora of resources and libraries available for creating things quickly and efficiently especially when it comes to device integrations such as web bluetooth and WLED. I think the main thing this class provided was lowering the barrier to entry for web development and daunting things like server hosting.