



# Medical Kit Dispenser

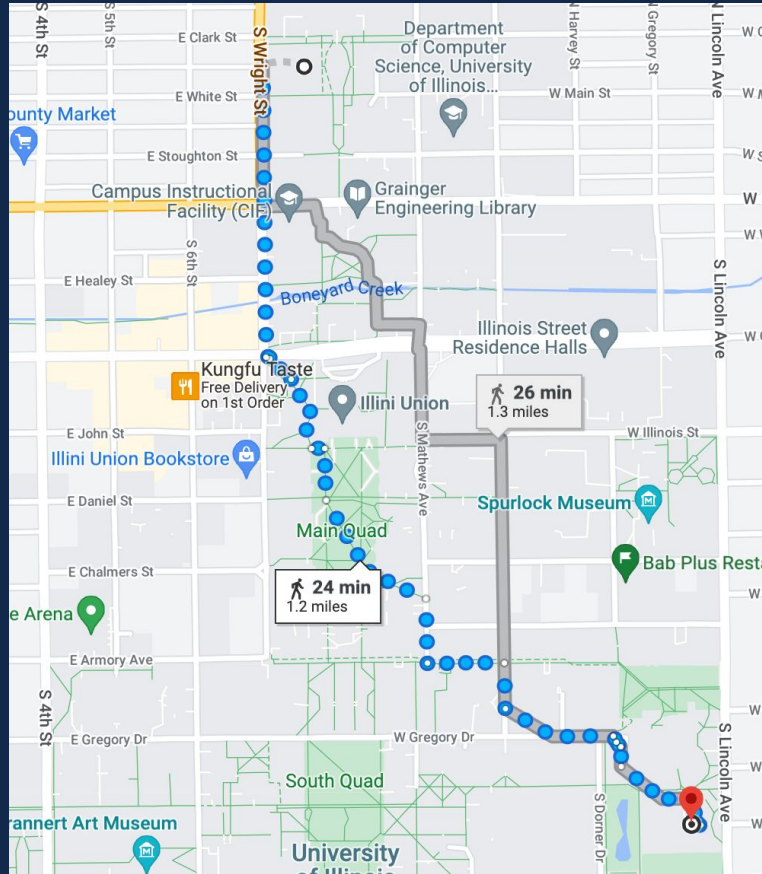
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ECE 445 Group #42

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# Rationale



## RESOURCES FOR BETTER HEALTH

McKinley Health Resource Center gives over-the-counter supplies to students who present their i-card. These resources are intended to benefit the overall health of the student body, as well as provide skills and knowledge to help students better care for themselves.

### AVAILABLE SUPPLIES

#### Twice Per Semester

- » Cold pack
- » Pregnancy test
- » Yeast infection kit
- » Wound pack

#### Every Two Weeks

- » Condom pack
- » Lubricant or spermicidal gel
- » Latex barriers

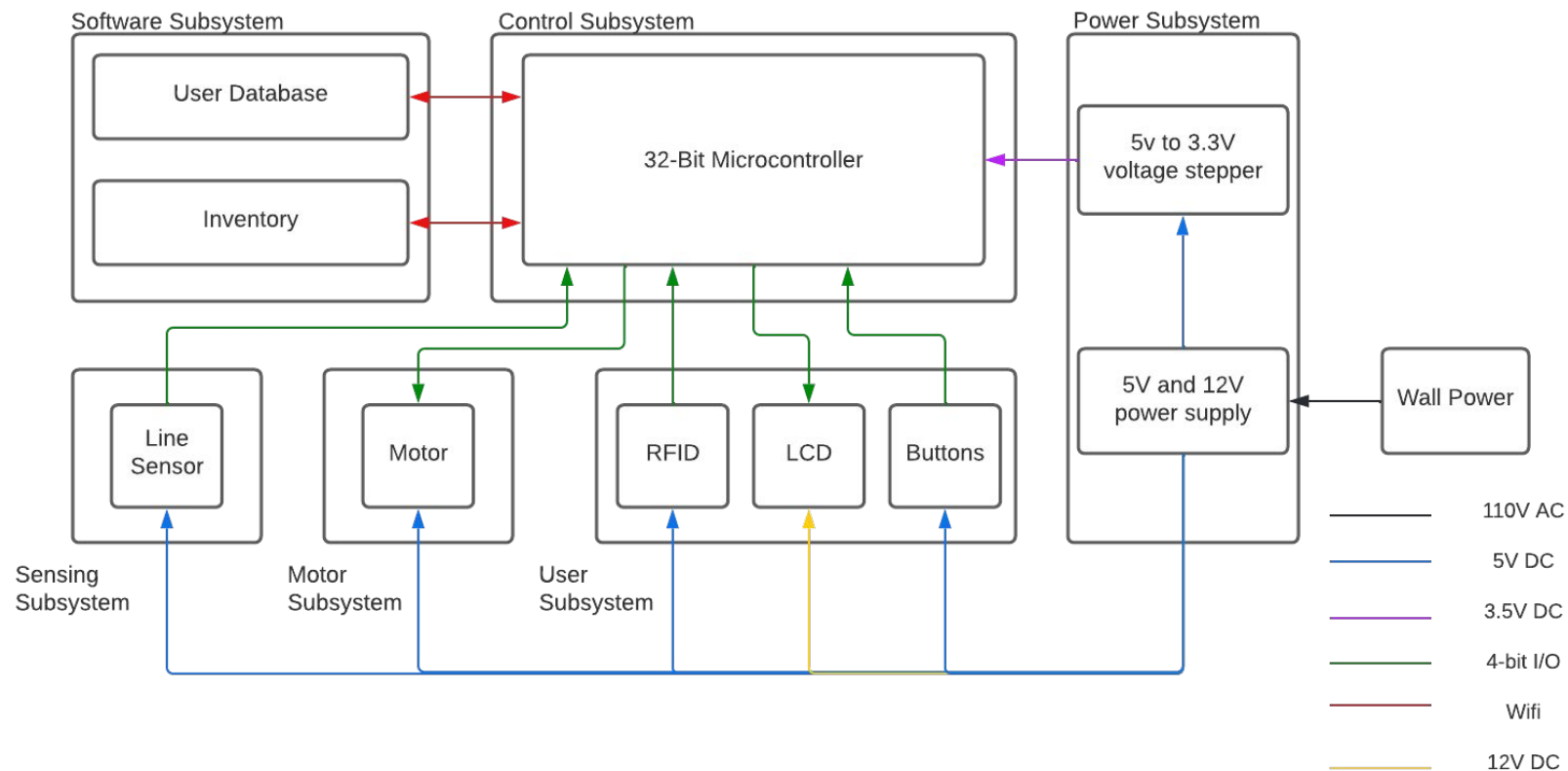
- Increase accessibility of necessities to students while enforcing quotas
- Create a modular design to best utilize available space and demand
- Improve restocking efficiency via. an online inventory database

- 1) The motion sensor should be able to **detect if an item is dispensed** by checking that the signal sent will be high, and should send a signal to the control module PCB. It should then **update the user and inventory databases** after it successfully dispenses a product but before dispensing the next product.
- 2) The microcontroller should be able to **read a user's identification using the RFID** and successfully interpret the user ID, which prompts the LCD screen to show what the user can dispense; the user should be able to **choose the product using the four buttons**.
- 3) When a product is chosen, the correct signal should be sent by the microcontroller to the BUS, and the **corresponding module should activate the motor** to dispense a product for five seconds before repeating up to three times.



# Design Overview

## Original Block Diagram



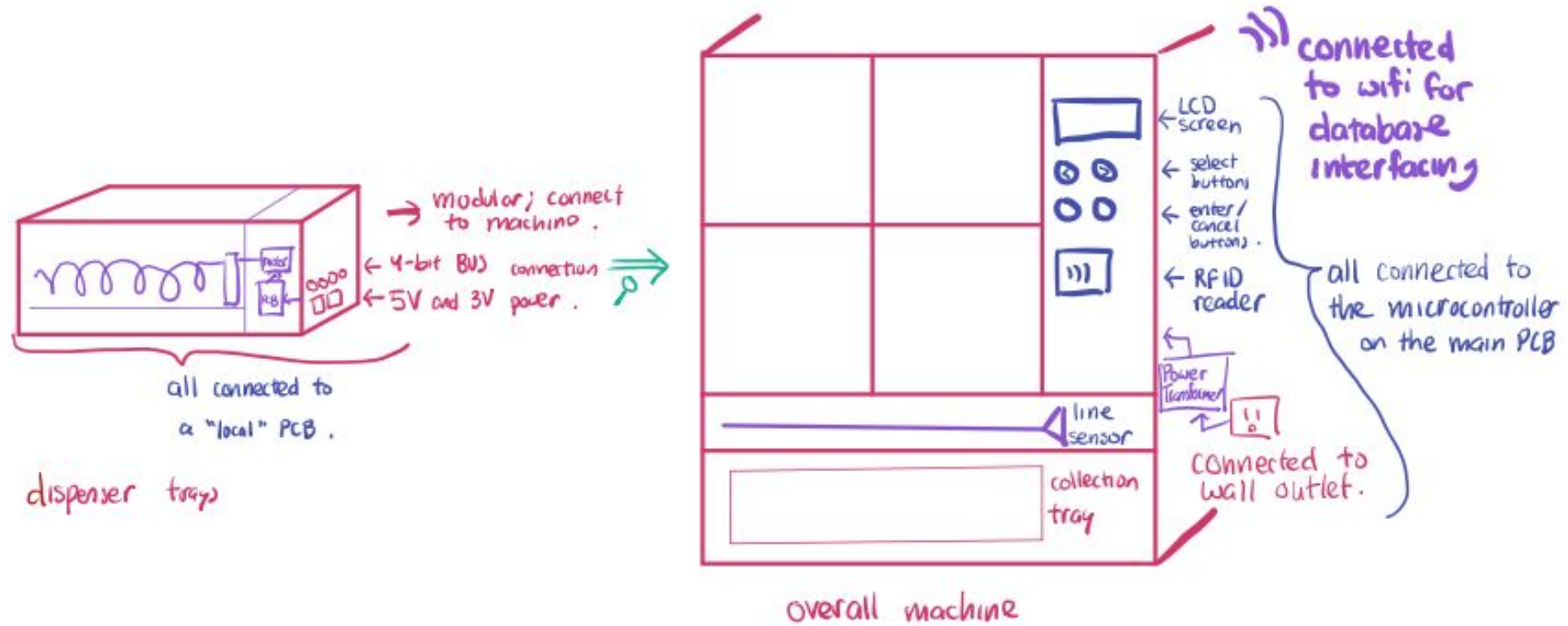
## Revisions

- Powering the motor with 5V instead of 12V
- Introduced additional logic gates to connect the user and sensing subsystem to the microcontroller

## Ethical Remarks

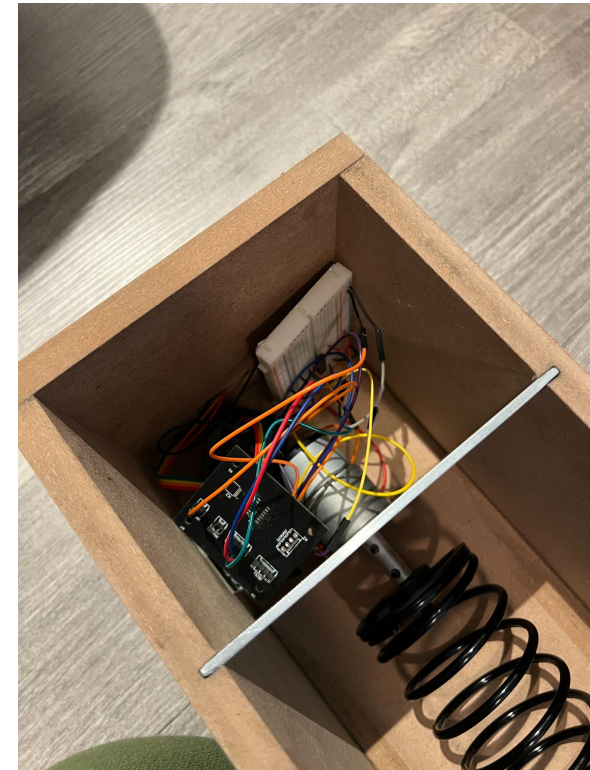
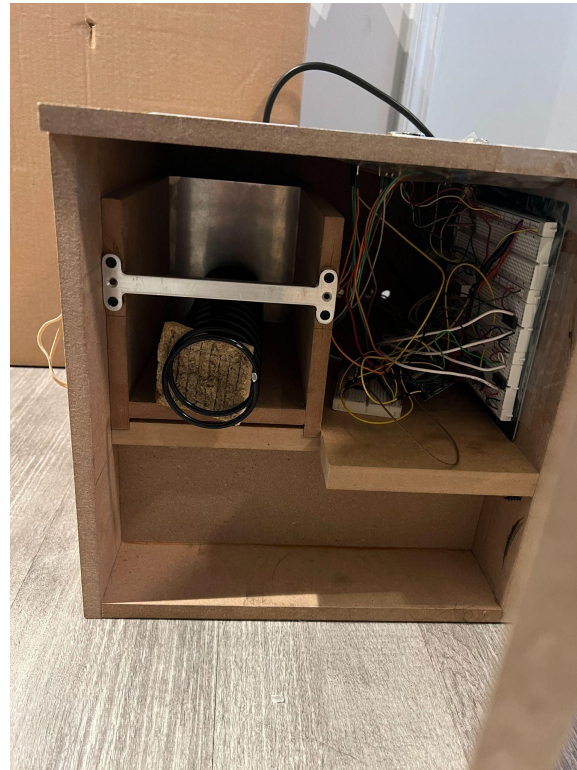
- Only data necessary for functionality is generated and stored;
- No FERPA sensitive data stored, no existing data accessed.

# Design Overview





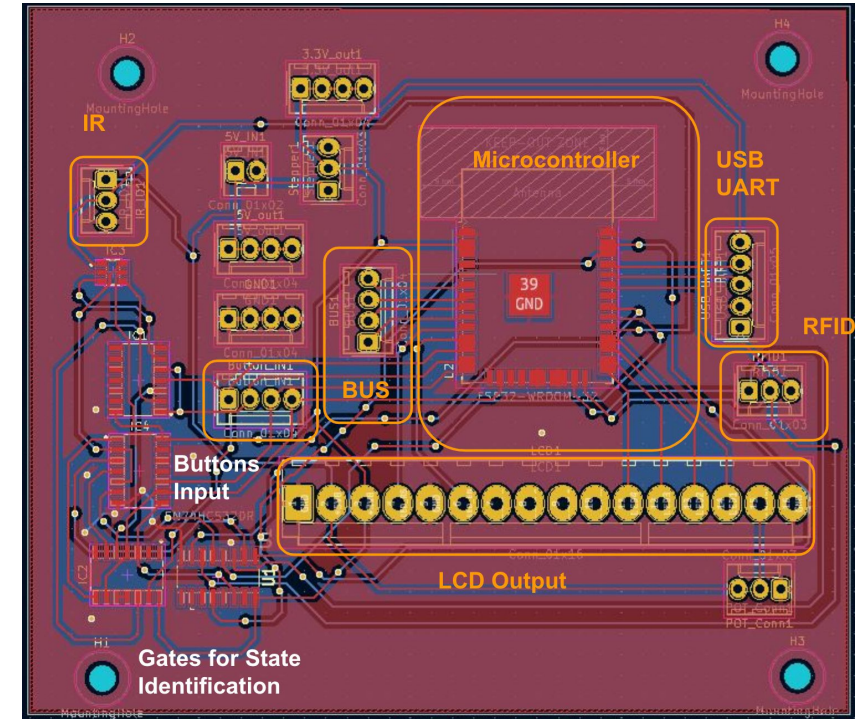
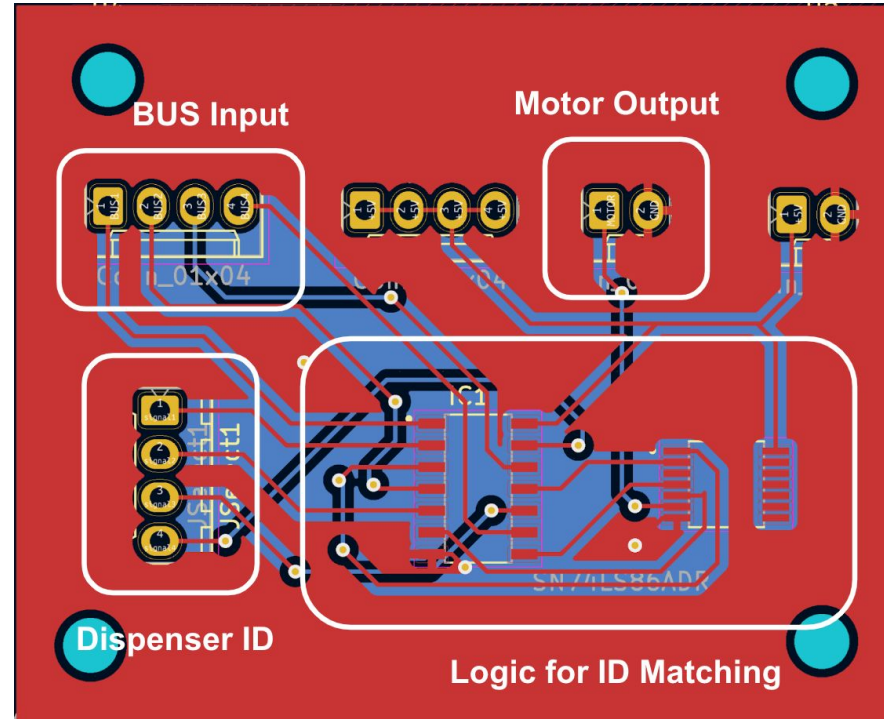
# Design Overview



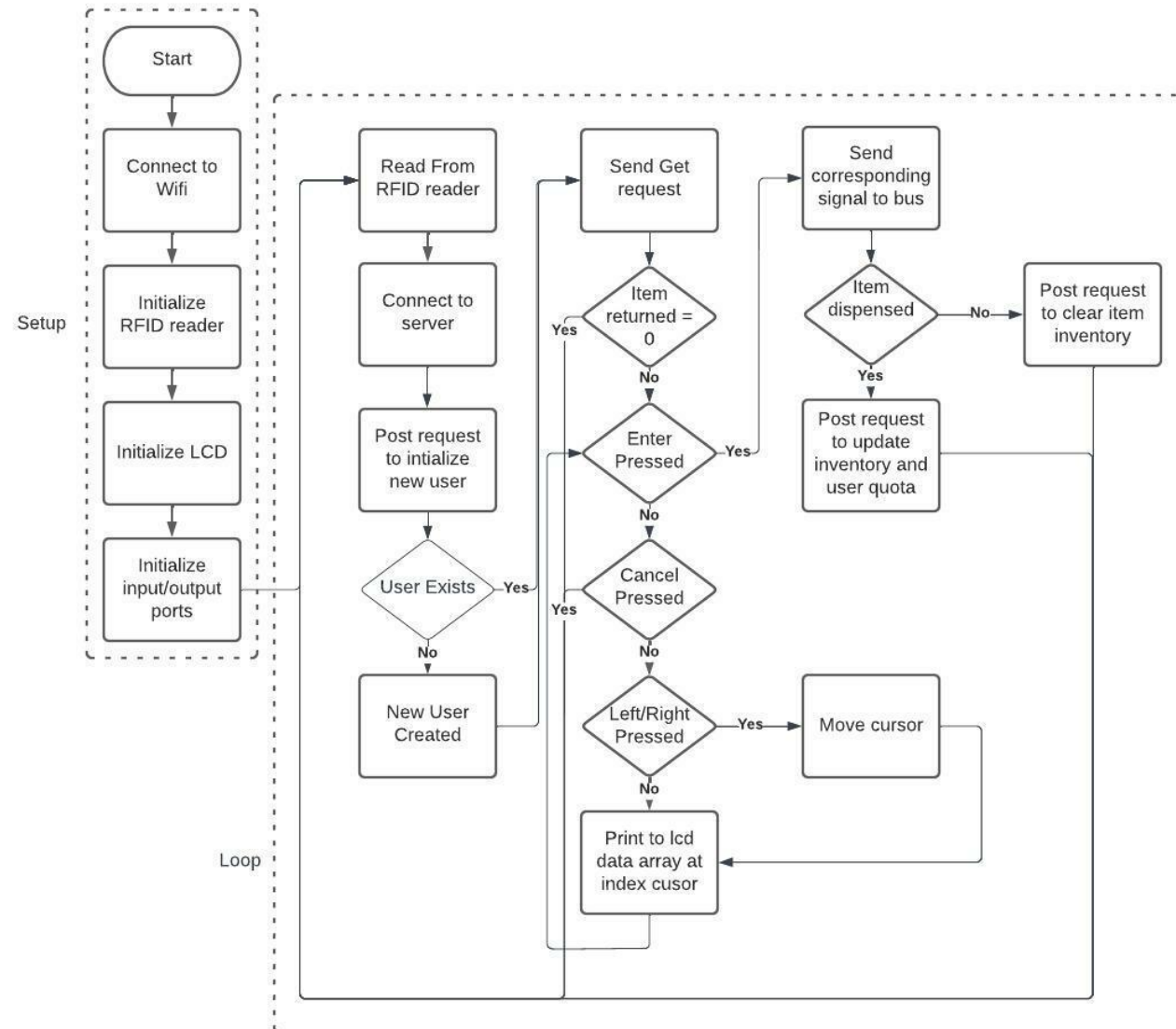


## PCB Design

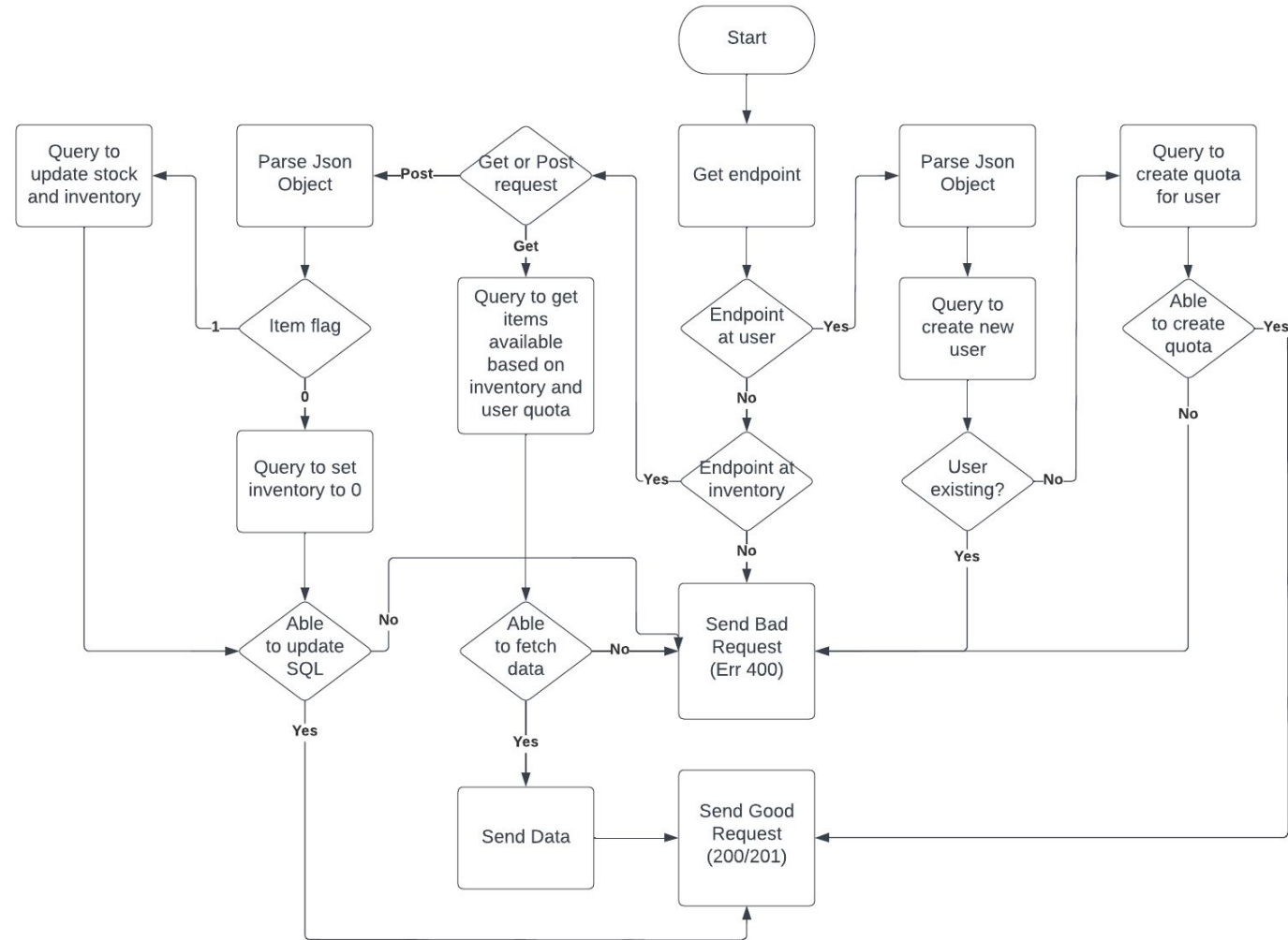
- (Left) Motor Subsystem
- (Right) Microcontroller Subsystem



## Firmware Design



## Software Design (Backend)



## Hardware Revisions

- Used a new LCD which can take 3.3V input from microcontroller;
- Using NOT gates to step-up 3.3V from microcontroller to 5V to BUS;
- Implementing additional logic to make certain states inaccessible from users;

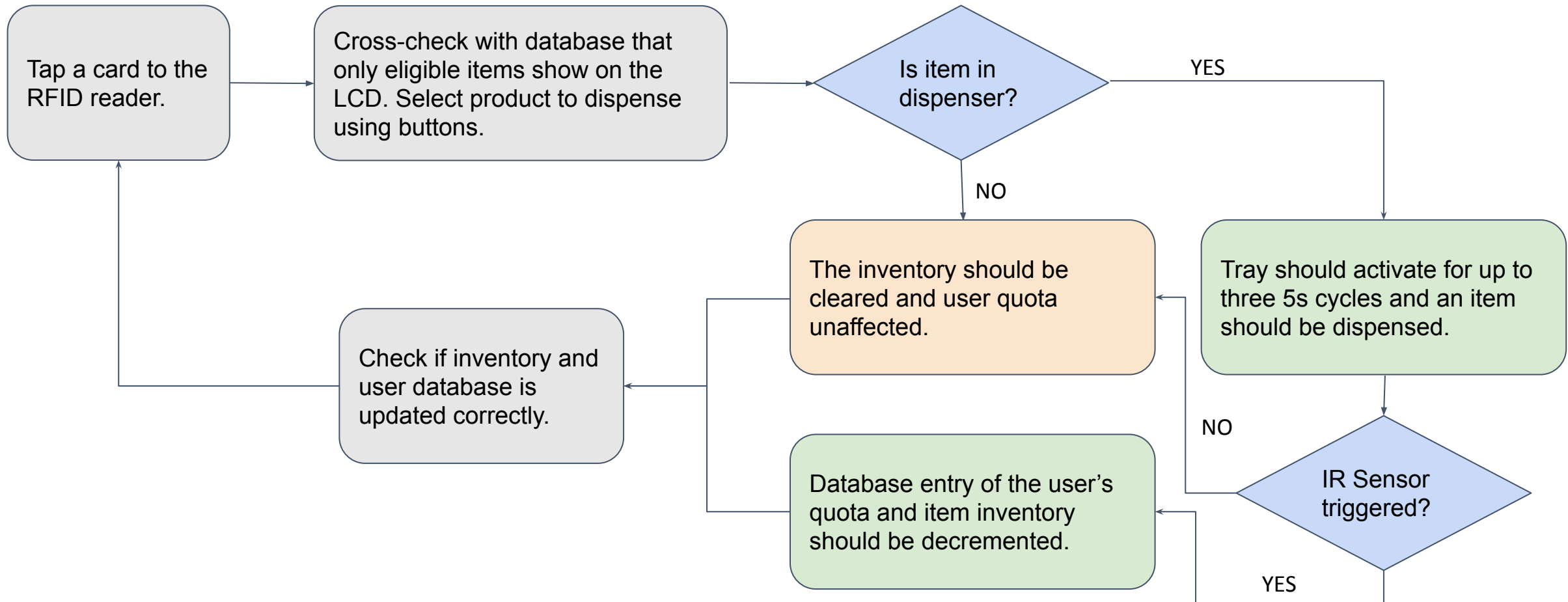
## Software Revisions

- RFID baud rate is changed
- RFID poll rate is decreased



# Project Functionality

## Functionality Test Process



## Functionality Demonstration (Video)





## Functionality Demonstrated

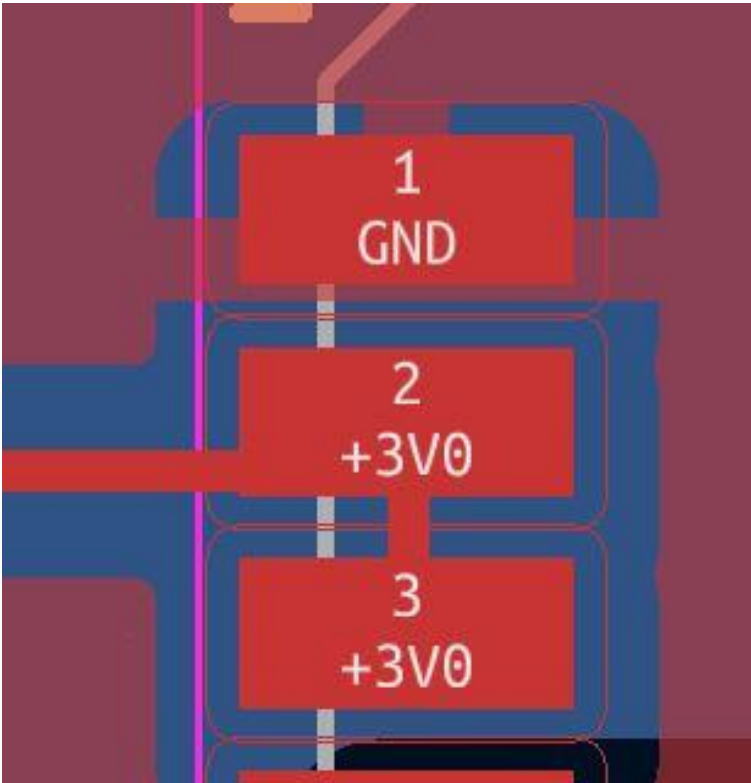
- **A user is identified using the RFID, and items that can be dispensed as per their quota are shown on the LCD (1)**
- **Selecting an in-stock item activates the correct motor to dispense via. the BUS. (2)**
- **Tapping the IR sensor stops the motor from dispensing; user and inventory database are decremented (3)**
- **Letting the motor run for three cycles will clear the inventory but will not decrement the user quota (3)**

## High-Level Requirements (Summarized)

- 1) A RFID card should identify a user and allow them to select items to dispense based on eligibility;
- 2) A BUS signal should activate the corresponding motor to dispense;
- 3) If the IR sensor detects a dispensed item, the databases should be updated correspondingly.

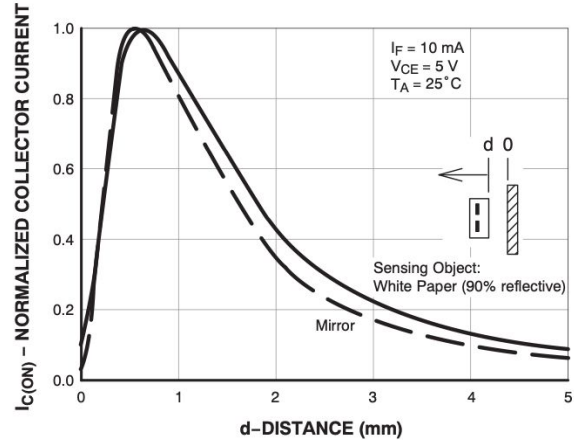


# Complications



## PCB Design and Microcontroller Connections

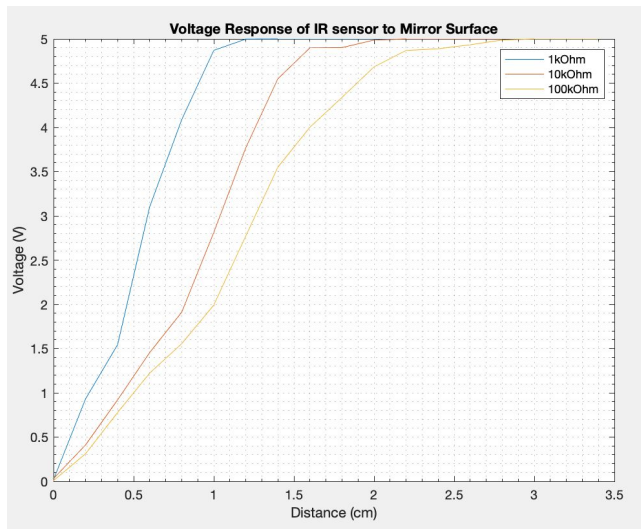
The wire connections between the power and enable pin prevented the microcontroller from being flashed, which forced the PCB to be implemented via. a breadboard and using logic gates.



## Range of IR Sensor

The range of the IR sensor is shorter than expected and it not largely affected by the surface off of which the radiation is reflected.

The reported range is approximately 1 mm, and we were able to extend the range to up to 10 mm using a higher load resistance.



## i-Card Encryption

- I-Card data is encrypted if it is through RFID
- Do not have the key
- Swipe instead of tap



# Closing Remarks

## **Achievements:**

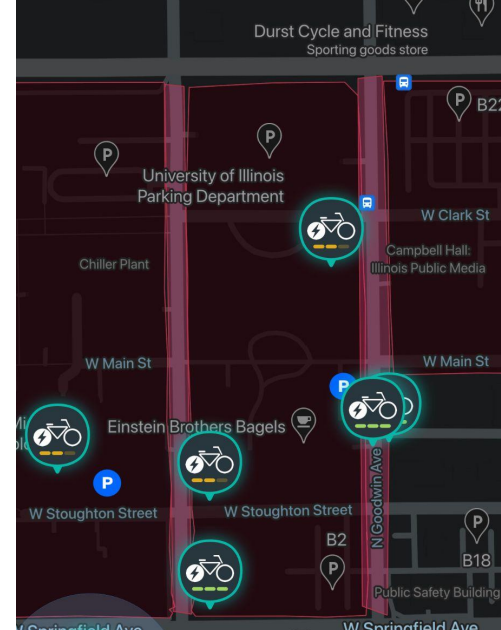
- Software-hardware design and integration;
- PCB design;
- Implementing wireless connection and database interfacing in a microcontroller;
- All high-level requirements were met.

## **Areas of Improvement:**

- Division of subsystems into different PCBs for easier assembly and troubleshooting.



- Using an LED screen;
- Integrating multiple devices into a single database;
- Mobile App for online inventory tracking;
- Use a Card Swipe instead



**Sample of Tracking App,**  
Taken from Veo



**OLED Screen**  
Taken from DigiKey



**Thank You!**