

Smart Water Bottle

Final Report

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Project Description:

The Internet of Thing (IoT) product that I decided to build for my final project was a smart water bottle. I had the vision to build a water bottle that would have some unique features to it from which the user can benefit. In general, the water bottle would allow the user to track their daily water intake, remind users to drink water every hour, track the user's last water intake time, and lastly track how much water is the bottle at any given time. Although I had such a vision for the product, at the time of writing this document, only few of the above-mentioned features are present.

Currently, my minimum viable product (MVP) allows the user to set their bottle on a Force Sensitive Resistor (FSR) which takes the pressure and sends it to an LCD display screen for the user to see. Additionally, the current MVP also allows user to store their measured water weight into a sqlite3 database by the press of a button.

Project sketch has been uploaded to GitHub and can be accessed [here](#).

Learning Outcomes:

Coming from almost having zero background experience in computer hardware and electrical engineering, I am proud to say that I have picked up a lot of new tools and hardware practices which I can utilize in the future.

One of the biggest lessons I will take away from this project is the knowledge of working with the ESP32 and the Arduino IDE. Although I had the opportunity to work with Arduino Freshmen year, I did not learn as much as I would've liked to. I am grateful that I got another opportunity to work with ESP32 (an Arduino device) and code in Arduino IDE. I really enjoyed the simplicity of the Arduino code as it only had two primary functions, `setup()` and `loop()`, and the rest of the work had to be built around that.

Although I still do not feel completely comfortable with using a breadboard and wiring, I am glad I got to work on this project and pick up some of that experience. There were many different components (Buttons, LCS Screen, FSR, LED) I had to put together for my smart water bottle, so working on a single breadboard having to combine all the different components also provided for a great learning opportunity. I also found the different Arduino libraries very useful and helpful to work with. Many of the libraries had built in functions which made my project flow a lot smoother.

Lastly, I was able to learn a bit about working in the backend for an IoT device by working on the sqlite3 database. To build by database I had to use a Serial Peripheral Interface Flash File System (SPIFFS) which store by sqlite3 database. Using SPIFFS in my project was great and is a valuable tool to have in toolbox.

Challenges:

The biggest challenge by far throughout the project was setting up the backend. I found it a lot more challenging that I had intended to work with a database in Arduino. There was a lot of time spent searching through the internet looking for compatible databases with Arduino, but I had little luck. In the end, I found a GitHub repository for a sqlite3 library which someone had written to be compatible with Arduino which involved the SPIFFS. The library was great, but had poor documentation, so I had to spend even more time understanding what the function calls were. However, this library served to be great addition for my project and allowed me to store the data into a sqlite3 database.

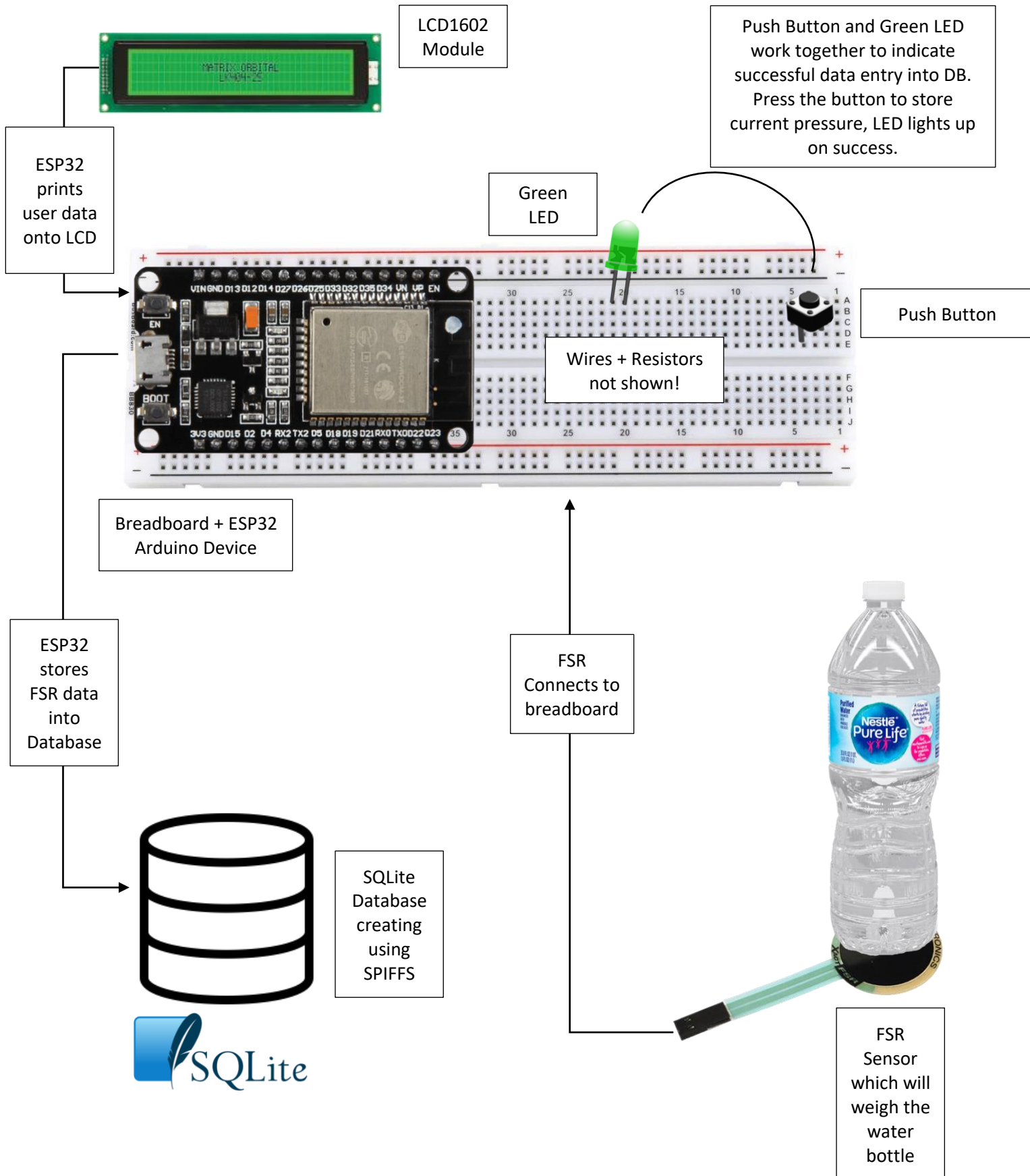
A minor challenge was understanding the wiring, including how the different components in my project interacted with one another. However, this challenge was easy to overcome with help from fellow peers as well as the starter documentation provided by the ESP32 starter kit.

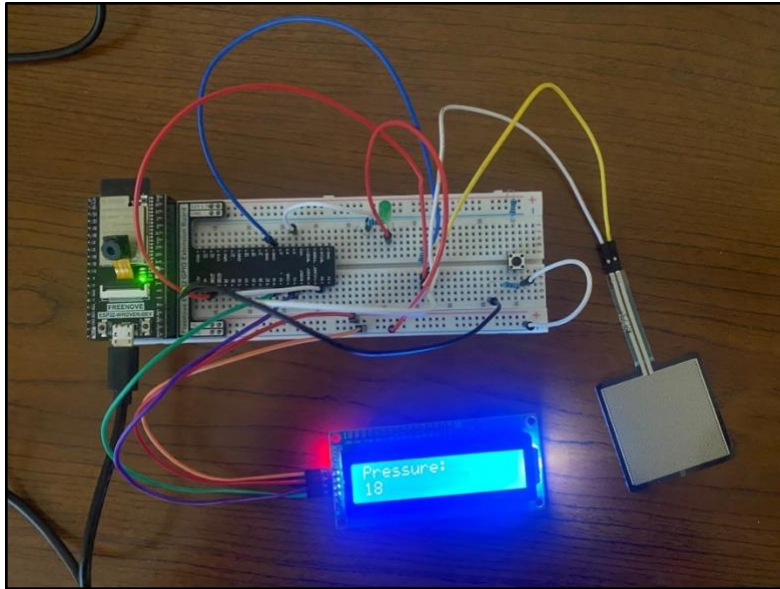
Project Reflection:

Reflecting on my project, I am very pleased with the product that I have been able to develop so far, however, if I had more time, I would like to continue adding more features onto it. Before taking this class, I don't think I would've ever imagined building such a IoT device with a functioning front-end and back-end. I am proud of how much effort I've put into the product and how it has turned out so far. However, if I were to continue to work on the project, I would like to fully finish the product by adding the final promised features such as adding custom goals and allowing user to set custom reminders for drinking water.

Few of the things that I enjoyed working on this project was learning about the back end and learning to combine a bunch of different IoT components. I really enjoyed building the sqlite3 database in Arduino and linking it with the Arduino code to properly store the user's data. Since my project used different components such as Buttons, LEDs, and FSR, it was also fun to learn about each component and how I could make them interact with one another. There wasn't much that bored me, but the wiring and reading some of the documentation could be a bit boring sometimes.

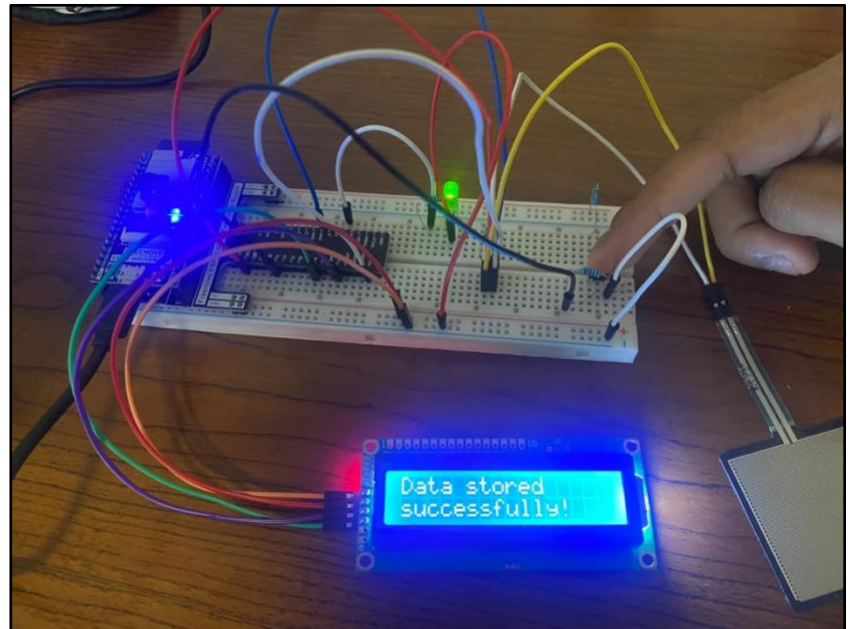
System Diagram:





Real world example of the project running

Pressing the button stores data into the database. Green LED turns on upon success.



```
14:10:07.783 ->
14:10:07.783 -> ===== ROW =====
14:10:07.783 -> LogID = 1
14:10:07.783 -> Pressure = 19
14:10:07.783 -> User = Devam
14:10:07.783 ->
14:10:07.783 -> Operation done successfully
14:10:07.783 -> Time taken:8396
```

User can print out stored data from the database.