Water Meter Project

SENIOR DESIGN, MAY 2016

University of Rochester

ELECTRICAL & COMPUTER ENGINEERING

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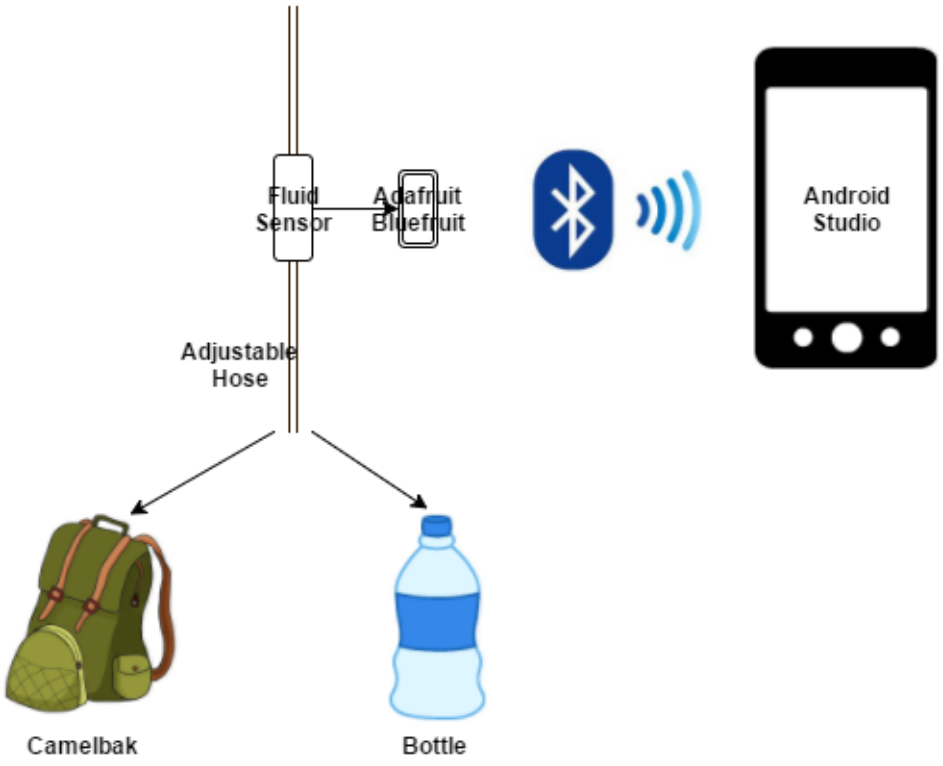
1 EXECUTIVE SUMMARY

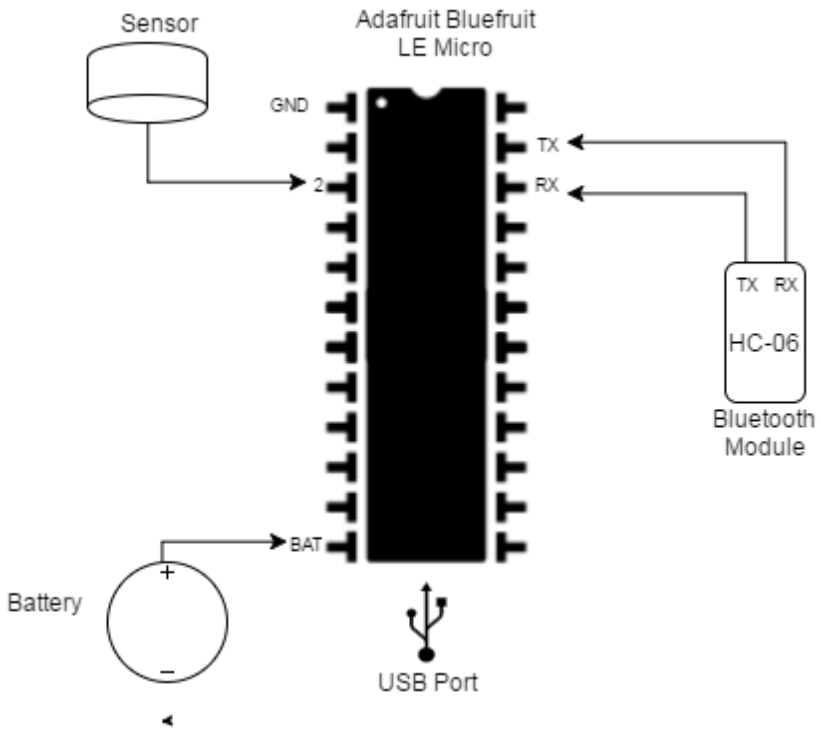
1.1 OBJECTIVE

The objective of this project was to design a device that can measure the amount of water consumed and to report that information wirelessly to a smartphone application using Android Studio. In addition to the device being fitted for a water bottle or camelbak, the smartphone application provides the following functionalities: it keeps a record of how much water was consumed in numerical and a graphical form (daily), and it allow users to input relevant information such as weight, and exercise time to calculate the water consumption goal.

1.2 DESIGN DESCRIPTION OVERVIEW

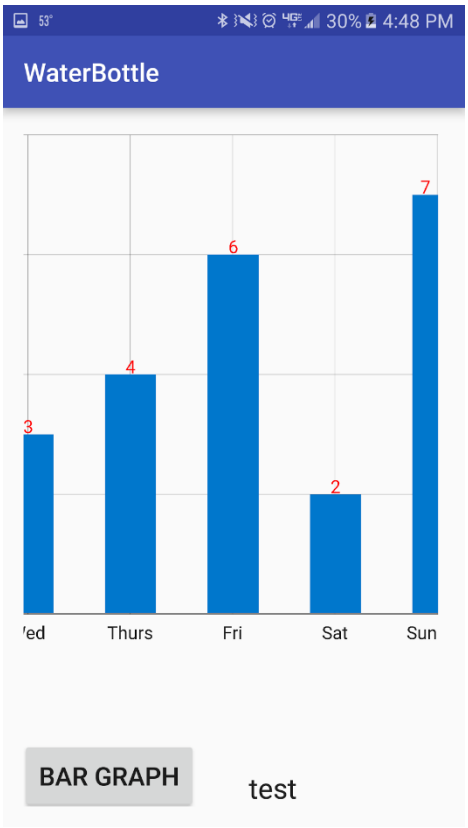
This project was brought to us by the customer, Harris Corporations and is divided into three major sections that include: the water meter system, the smartphone application, and the Bluetooth connection between the two devices. This is all done via the Adafruit Bluefruit LE Micro microcontroller board. Shown below is the block diagram for the design.





1.3 EVALUATION OVERVIEW

The device was tested in two ways. Firstly, we used the Serial Monitor that the Arduino IDE provides to verify the amount of water consumed was correctly measured. By doing this, we verified that the Arduino code for the sensor was working to our expectations. We then moved on to using the phone application. In particular, we made sure that if I drank X mL of water, that the bar graph would display X mL of water give or take 3mL. Below is a depiction that documents our results. Component cost used in this project adds up to $59. We have analyzed that using cheaper sensor parts can further reduce the cost and using a customized integrated board would help to reduce the size of the device.



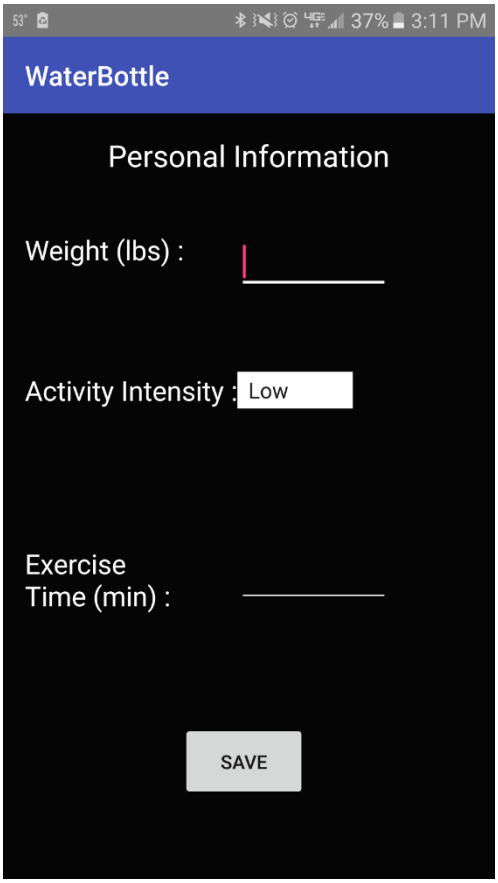


Figure 2 *the X-axis lists the days of the week and the Y-axis is the amount of water consumed in milliliters (mL)*

2 PROBLEM DEFINITION

2.1 INTRODUCTION

People often do no drink enough water to be fully hydrated every day. Nowadays there is a rapid increase in demand for smart accessories to help us keep track of certain daily needs such as fitness trackers, smartwatch, key finders, and wireless speakers and so on. Our proposed project helps people track their water fluid intake and relays that information to their smartphone. This especially helps fitness fanatics, hikers, athletics, bodybuilders and anyone who would like to optimize their

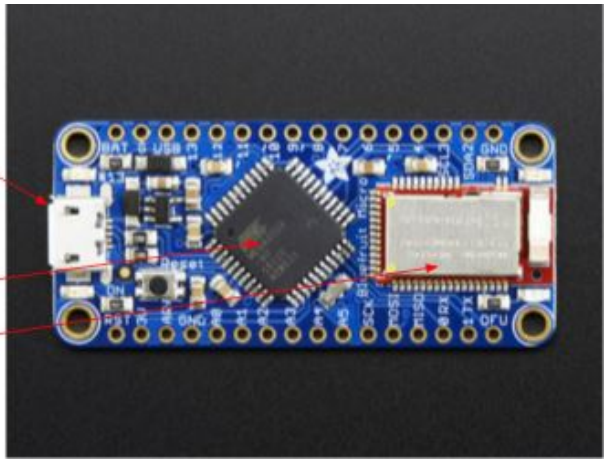
daily hydration needs. The average person's recommended amount of water intake per day is 64 FL Oz equivalent to 8 glasses of water. Although 8 glasses of water might seem adequate enough to stay hydrated, there are some factors that change this figure. Our app will take personal information of the user such as weight and daily exercise time to calculate the amount of water recommended for the user.

2.2 Proposed Solution

Our proposed project is to design a water meter device that can serve as an attachment for existing water bottles or for a camelbak.

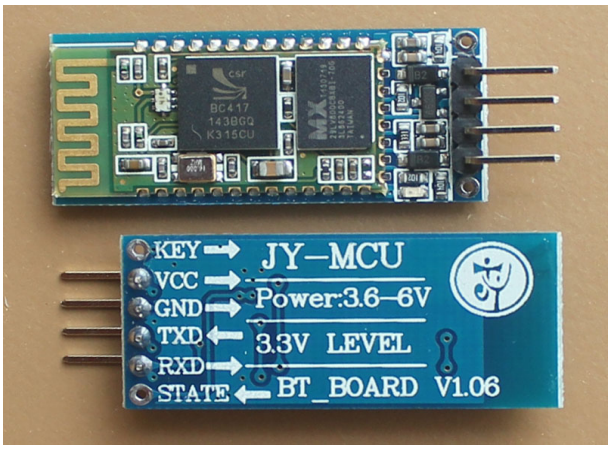
2.3 Adafruit Bluefruit LE Micro

- Built-in USB bootloader
- Programmable using the Arduino IDE
- ATmega32U4 Microcontroller
- Bluefruit LE Module
  - Nordic nRF51822



2.4 Bluetooth Module

- Used for establishing connection with the phone application



3 EVALUATION

3.1 TESTING (CODE)

Both the Arduino and Android Studio code for the Harris Water Meter Project can be viewed and downloaded from our github repository:

https://github.com/josera2594/H.W.-B.P

3.2 RESULTS

Our final system is an attachment for existing water bottles that measures the amount of water consumed and reports the information wirelessly to a smartphone application. We have an Arduino code that calculates the amount of water that has flowed through the sensor, and we have a case to enclose the water flow sensor, Adafruit Bluefruit LE Micro microcontroller board shown below.

Figure 3 *an enclosed case that protects the water flow sensor and Bluetooth*

Figure 4 *Two-way communication between the Bluetooth and smartphone application*

4 CONCLUSION AND ACKNOWLEDGEMENTS

For future groups, we advise that the best way to approach this type of project is to continuously use trial and error as a basis to gather data and most importantly to maintain a solid form of communication amongst your teammates. Furthermore, the Water Meter Project Team would like to thank our advisors, Tri Nguyen of Harris Corporations, Professor Derefinko, and Professor Motley for their guidance throughout the year.