

Aquaponics Monitoring



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Problem and Purpose:

- **Problem:** Currently, there exists no efficient, all-in-one aquaponics monitoring system that provides convenient, accurate information on the go.
- **Purpose:** Create a solution to this problem by developing a **mobile iOS application** that monitors:

- **water levels** → *a water level sensor will monitor the amount of water available in the aquaponic tank*

- **plant moisture** → *a hygrometer will monitor if the plants are receiving water*

- **pH levels** → *a pH sensor monitors if the pH levels are healthy enough for the fish*

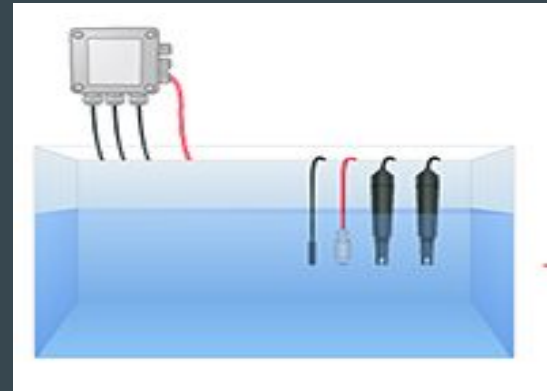
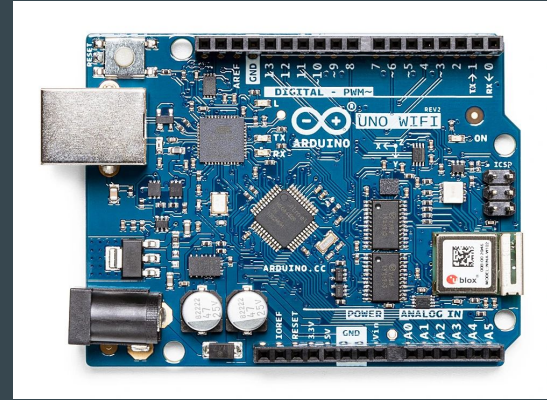
- **water temperature** → *a thermometer monitors if the temperature is safe for the fish*

- **light** → *a light sensor monitors if the plant is receiving enough light*

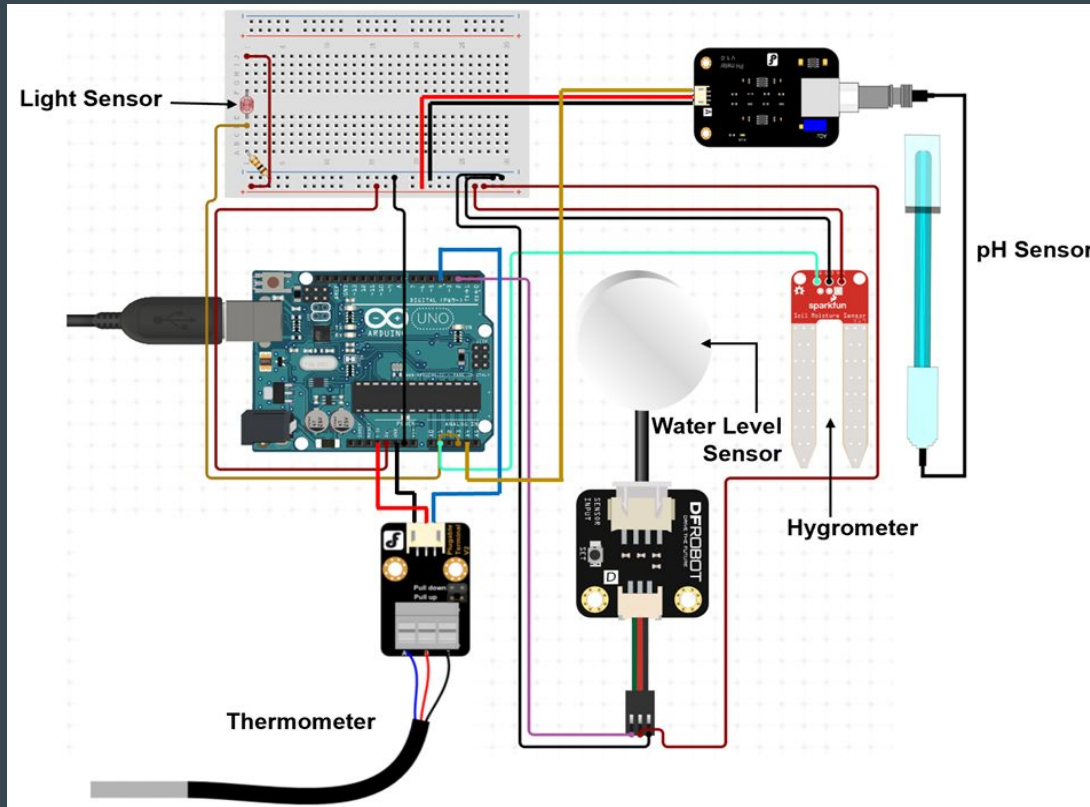
The mobile application will clearly indicate to the user when any of these measurements are **outside of their user specified range**.

Equipment and Software

- Arduino Uno Wifi Rev2
- Aquaponics Tank
- Arduino supported sensors that measure important factors such as water levels, temperature, plant moisture, pH levels, and light.
- An Arduino IDE, Xcode, and a server hosted through Google Firebase that receives information from the Arduino board.



Hardware Schematic

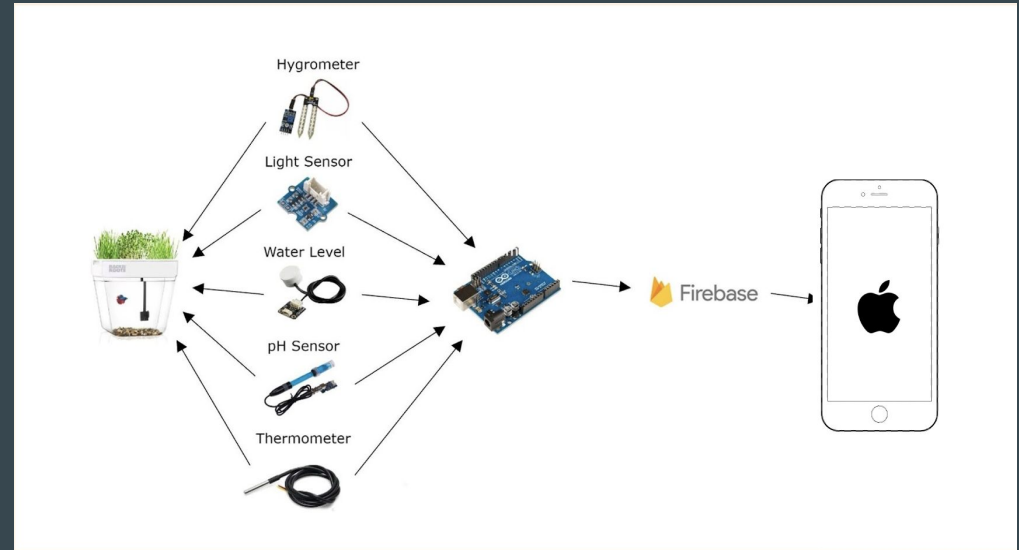


Key Concepts

- The Arduino board acts as a monitor for the plants by tracking important factors sent from insertable probes.
- Insertable probes track factors like water levels, plant moisture, pH levels, water temperature, and light.
- These factors are sent to a database hosted on Google Firebase.
- A mobile application receives the data pulled from the Arduino software and stored in Google Firebase as JSON objects. Specified boundaries allow the user to control the maximum or minimum values they deem safe for the plants and fish. If a specified boundary is out of range the user interface will illuminate the factor as red.

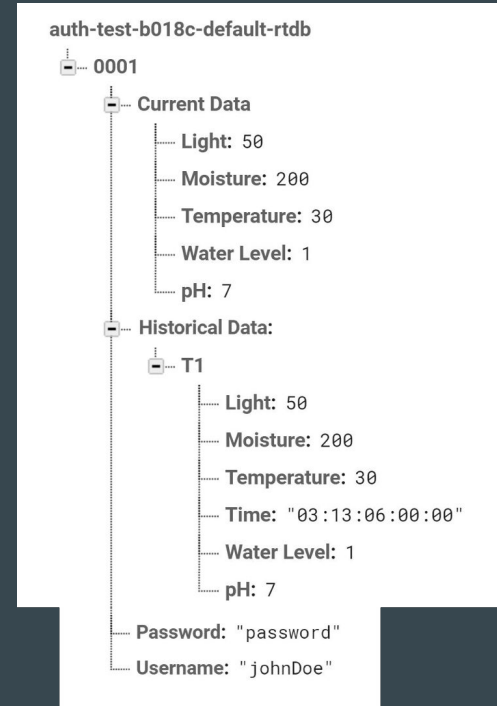
Design

- Each sensor is placed in the aquaponic system and then connected to an **Arduino WiFi Rev2**.
- Over WiFi, the Arduino sends all of the data collected to our database, **Google Firebase**, stored as JSON objects
- Google Firebase transfers this information to the application, where the user is able to view **current data** and **past data received from the sensors**.



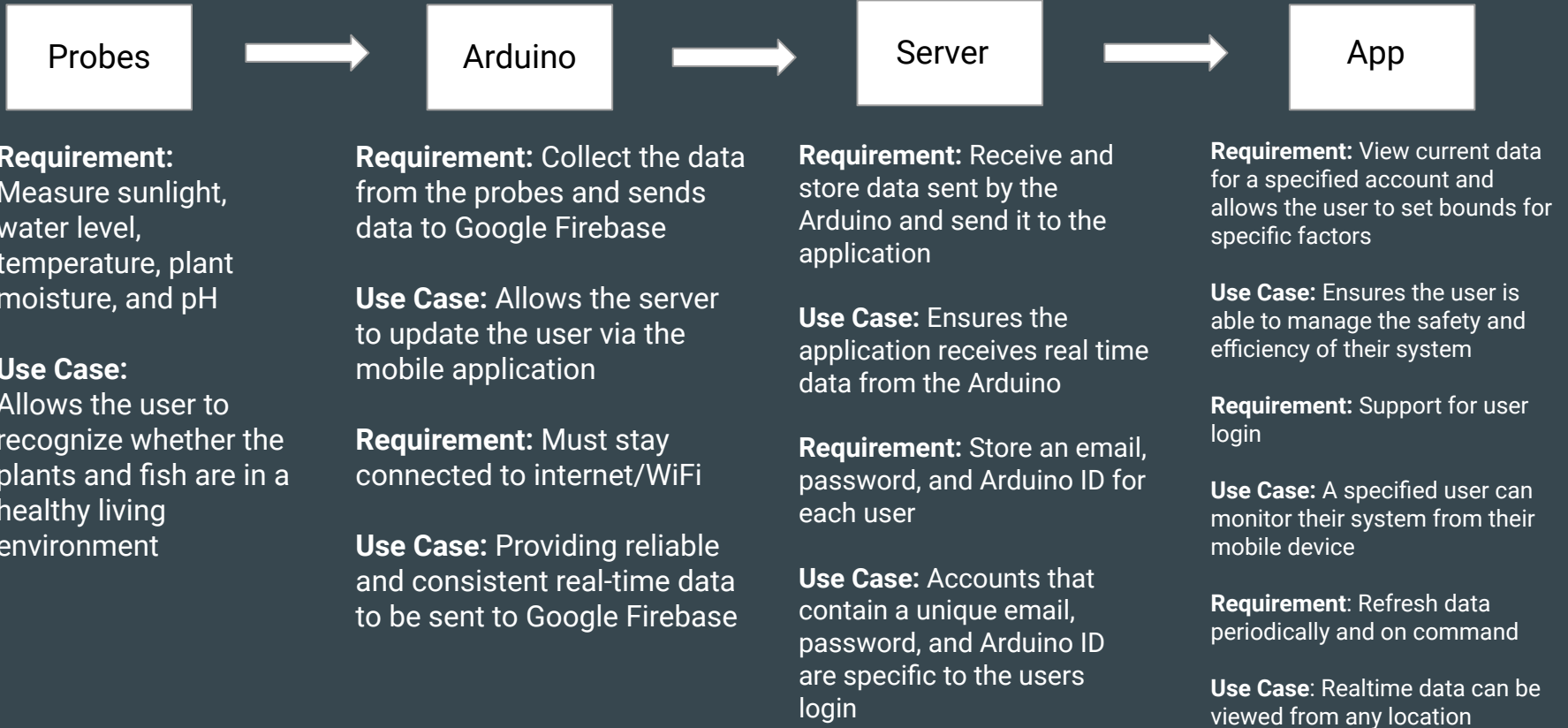
Software:

- Utilizes a Google Firebase realtime database to store data
- Arduino pushes data to the database
- Database stores data as JSON objects
- iOS application listens and pulls data from the database when the database is updated



Database structure

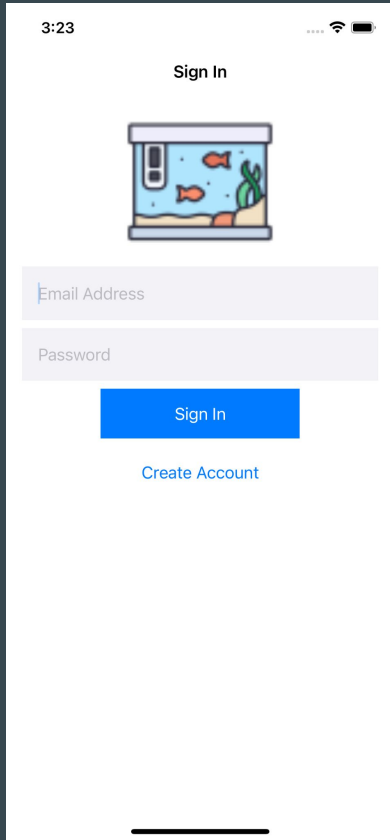
Requirements and Use Cases



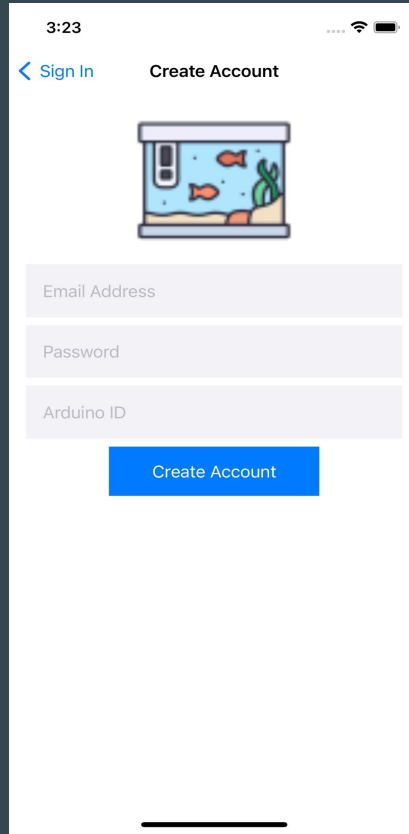
Mobile Application

- Receives data or information from the Arduino software that's sent to Google Firebase.
- Hosts factors such as water levels, temperature, plant moisture, pH levels, and light.
- Allows a specified user to sign in or create an account with a unique Arduino ID
- If a specified boundary is out of range the user interface will illuminate the factor as red. This could happen if the plant moisture is not wet enough, the water levels are low, the pH levels are too basic or too acidic, the plant is not getting enough light, or the water temperature is unsafe for the fish.

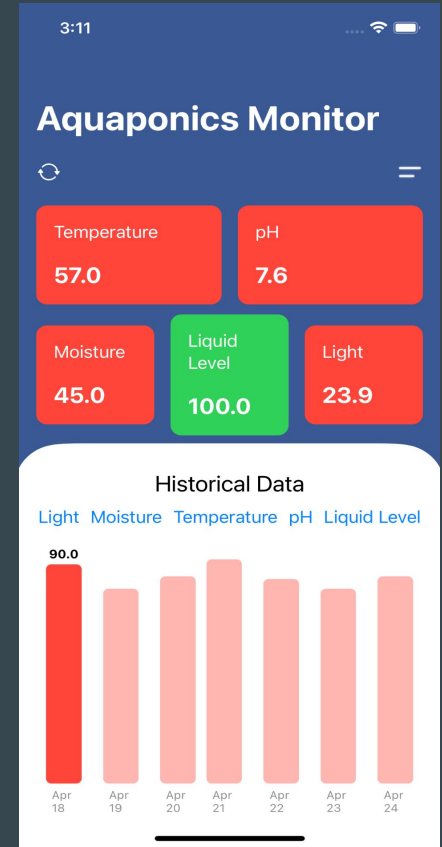
User Interface Design:



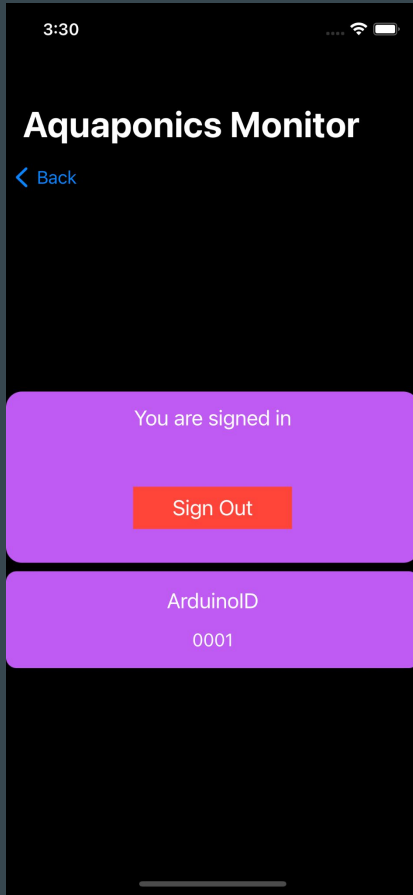
Sign in Page



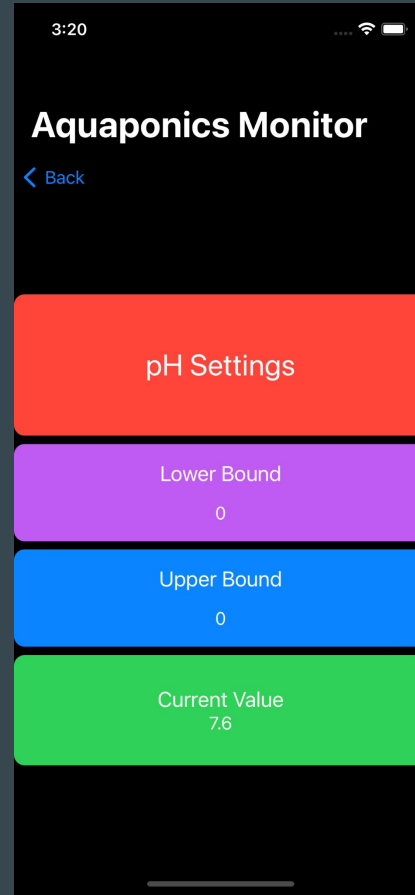
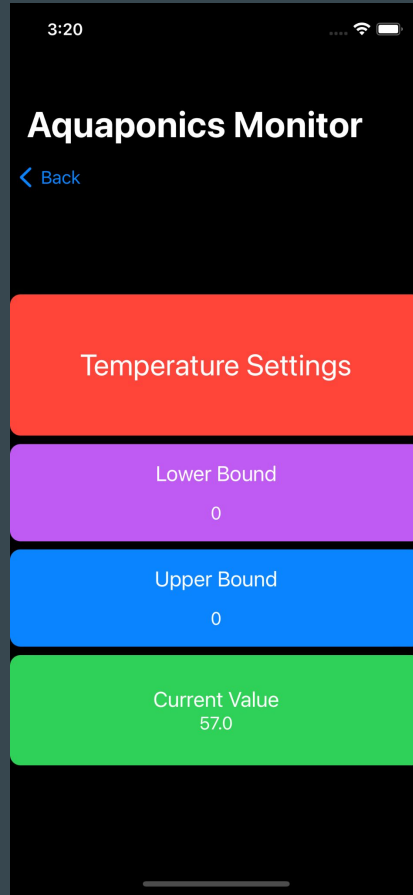
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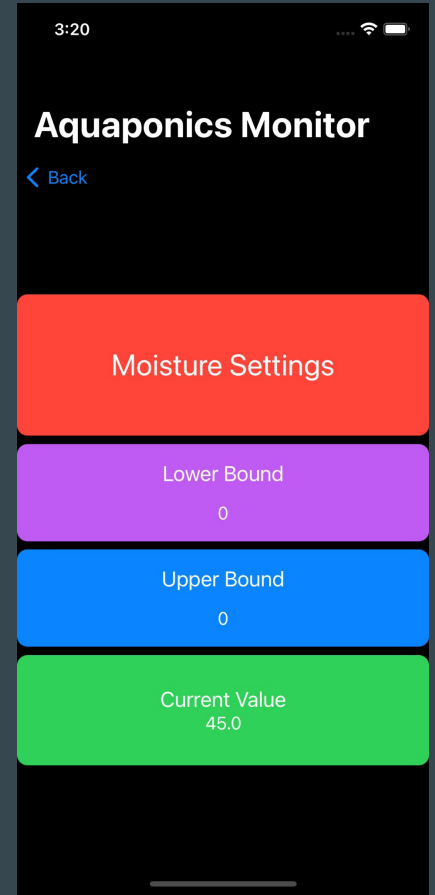
User Dashboard



System Settings



Boundary Settings



Aquaponics System



Application Functionality Demo:

