Aquaponics Monitoring

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Abstract

- **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 android application** that monitors:

  - water levels —> *a water level sensor will monitor if there's enough water available in the aquaponic tank*

  -plant moisture—> *a hygrometer that will monitor if the plants are receiving water*

  -pH levels —> *a pH sensor that monitors if the pH levels are healthy enough for the fish*

  -water temperature —> *a thermometer that monitors if the temperatures are safe for the fish*

  -light —> *a light sensor that monitors if the plant is receiving enough light*

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

Objective

- Develop a system that makes maintaining an aquaponics system easier for the average home gardner.
- Eliminate the tasks it takes to manually measure factors such as
  a) water level
  b) temperature
  c) sunlight exposure
  d) pH balance
  e) plant moisture
- Develop a mobile application that receives information from an Arduino so that the user can monitor their aquaponics system.

Key Concepts

- The Arduino board will act as a monitor for the plants by tracking important factors sent from insertable probes, these factors will be sent to a database hosted on Google Firebase.
- Insertable probes track factors like water levels, plant moisture, pH levels, water temperature, and light.
- A mobile application will receive the data pulled from the Arduino software and stored in Google Firebase as JSON objects. Notifications will then be sent to the user in case the plant moisture is not wet enough, the water levels are low, the pH levels are out of a specified boundary, the plant is not getting enough light, or the water temperature is out of range. The application will support functionality that allows a user to have multiple systems.

Requirements and Use Cases

Requirement: Measures sunlight, water level, temperature, plant moisture, and pH

Use Case: Allows the user to know if the plants and fish are in a healthy living environment

Requirement: collects the data from the probes to send to the server

Use Case: allows the server in turn to update the user via the mobile app

Requirement: must stay connected to internet/WiFi

Use Case: Send data to the server to update the user

Requirement: Receive, send, and store data

Use Case: The user wants to view current or past data

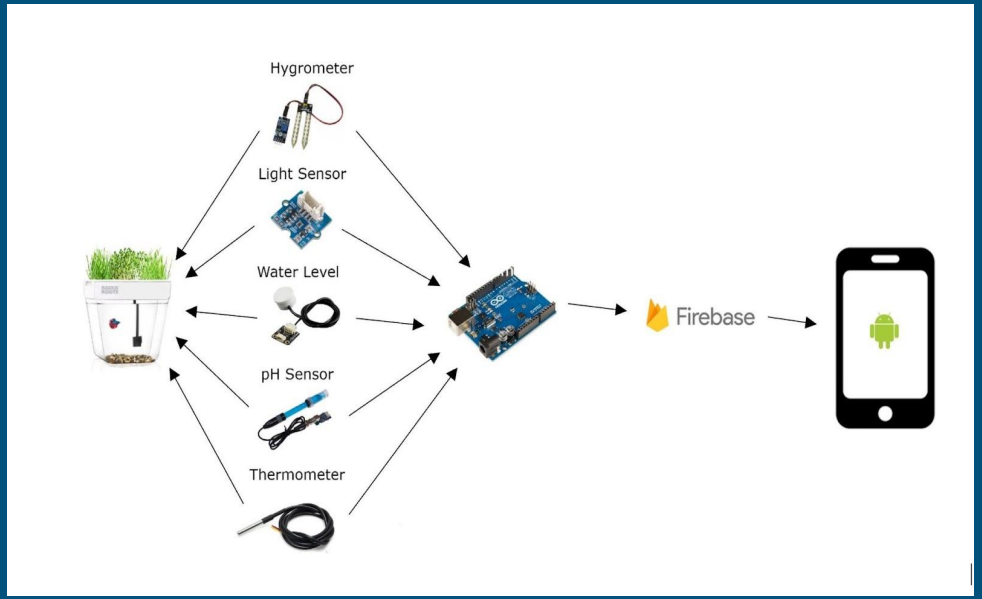
Requirement: Store a username, password, and Arduino ID for each user

Use Case: Server can support multiple systems

Requirement: Allows user to set bounds for measured data
Use Case: App can send an alert if a measurement is outside the bounds
Requirement: has support for user login
Use Case: user can monitor their system from any supported device
Requirement: app should refresh periodically and on command
Use Case: keeps the user up to date wherever they are

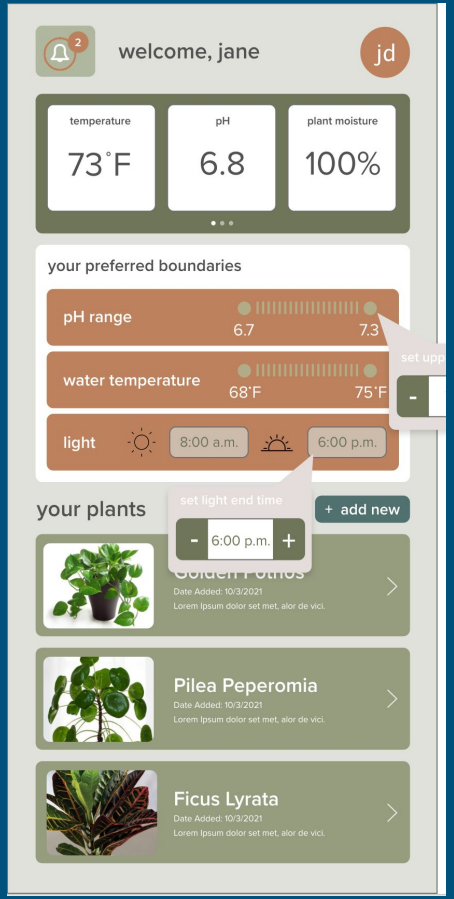
Design

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



Mobile Application

- Receives data or information from the Arduino software that's sent to Google Firebase.
- Hosts factors such as water levels and temperature, plant moisture, pH levels, and light.
- Allows a specified user to sign in or create an account
- Alerts the user in case the plant moisture is not wet enough, the water levels are low, the pH levels are out of a specified boundary, the plant is not getting enough light during a set time of day, or the water temperature is out of range.
- Allows for the user to add, remove, or switch between monitoring systems.



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, Java IDE, and a server will be used through Google Firebase that will host the code and receive information from the Arduino board.