Automated Aquaponics for the Home

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ABSTRACT

Aquaponics is a system of aquaculture in which waste produced by fish is used to supply nutrients to plants, in exchange, purifying the water for the fish. Aquaponics is however a very involved practice that requires a level of time, equipment and knowledge that the average person does not possess. Our solution aims to make the act of operating such a system as effortless as possible. This is achieved through the automation of the aquaponics cycle as well as providing users with remote monitoring facilities through web and mobile apps. The home friendly system gives anyone the opportunity to grow their own food without much hassle.

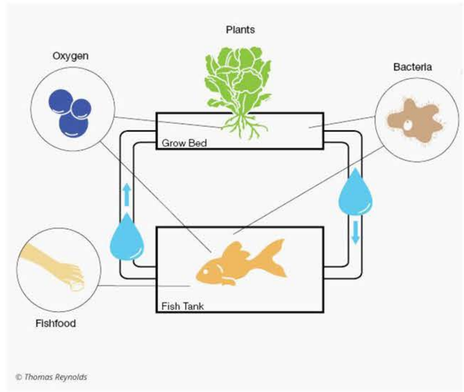


Diagram of Aquaponics Process

METHOD

The system leverages the internet to provide remote monitoring and alerts to users from anywhere they have access to the internet. The system is made up of three main parts:

•Aquaponics Setup with Embedded Microcontroller - the microcontroller reads data from the setup through the three sensors (temperature, pH and ultrasonic range). The controller (connected to a laptop/computer) would then send this environment and state information to a remote server through an API.

•Remote Server and API - receives data from the microcontroller and stores readings from the setup for use by end-user applications (mobile and web app)

•Mobile and Web Application - Offers remote monitoring of system. Also gives alerts based on abnormalities within the system

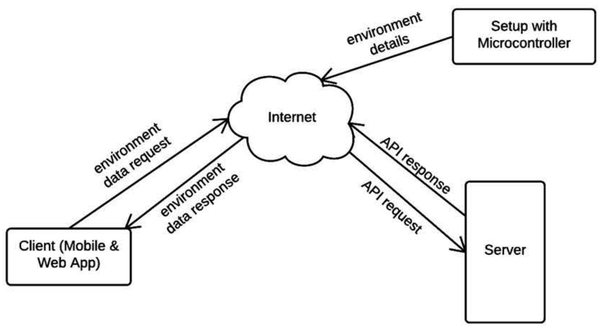
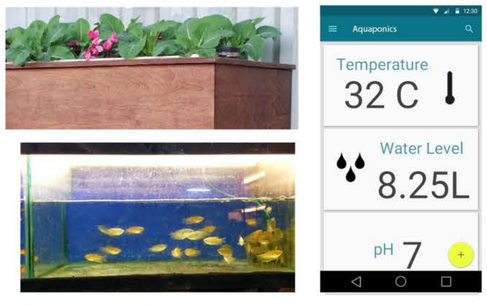


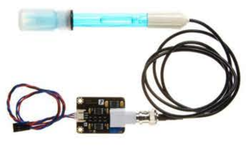
Diagram Showing Architecture of System



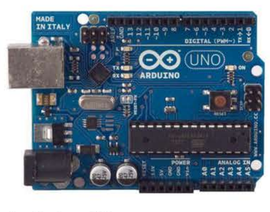
Initial System Proposal Concept

COMPONENTS

Ultrasonic Range Sensor


Analog pH Senor


Waterproof Temperature Sensor



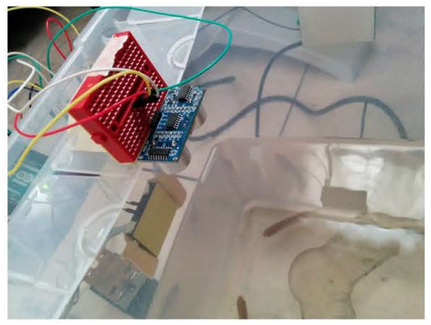
Arduino Uno


Submersible Water Pump

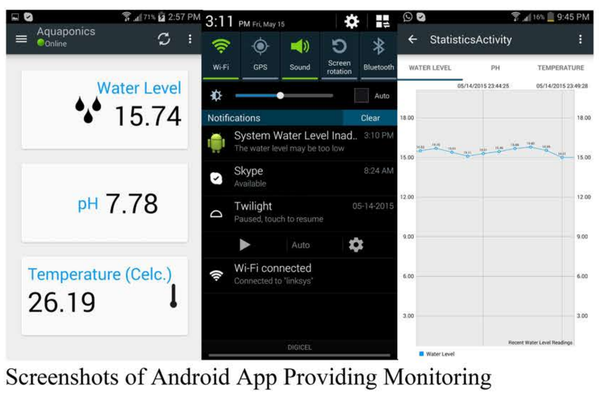
RESULTS

- The system is able to sustain both aquatic and plant life.
- Using the ultrasonic sensor to monitor water levels, a sustainable pumping cycle was achieved successfully filtering the water


Picture of Complete Setup


Picture of Ultrasonic Sensor Measuring Water Level

- Remote monitoring apps implemented in Android and through web interface; offers up to date environment information and alerts



Screenshots of Android App Providing Monitoring

Screenshot of Web App Providing Monitoring

CONCLUSION

With such a solution, it allows anyone to be able to maintain their own aquaponics system and to grow their own food. Ostensibly, this solution could become the next home aquarium, becoming common place in many household.

The concepts of the solution can be employed in a larger scale providing full automation and monitoring for commercial scale aquaponics or other agricultural practises such as hydroponics or more traditional techniques.

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