

# AN ARTIFICIAL INTELLIGENCE BASED ADVANCED SHRIMP FARMING

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**Abstract—** *In modern years, the development of technology has been rapidly improving and applying in aquaculture, also known as aqua-farming. A versatile, advanced shrimp farming based on Raspberry pi. A pH sensor, temperature sensor, water level sensor, turbidity sensor are used here to monitor the sudden abnormal change in the condition of the shrimp pond. Besides that, Raspberry pi is used as a server to control all the sensor nodes in this system. The system also sends an alert message through SMS service to prompt the user when needed or to monitor the system on the mobile phone. Thus, time consumption, man power, efforts of the farmer can be reduced. The proposed design has been successfully planned with a dependable, fast response and easy to use with a friendly environment. It is appropriate for small to mid-sized farming operations as it does not require any remodeling of the water front. In this work, a wireless sensor platform is developed, applied to the measurement of temperature, pH and water level in the environment shrimp ponds. The control platform consists of Raspberry pi to control all the system. Then the artificial intelligence system is developed to achieve data from sensor network anywhere via web application as well as Android application. The system is monitored in real-time and can be controlled manually or automatically.*

**Key words:-** *Raspberry pi, pH sensor, LDR, Turbidity sensor, Thermistor, Thing speak cloud, Twilio*

## 1. INTRODUCTION

As of late, the advancement of innovation has been quickly improving and applying in aquaculture, otherwise called water cultivating. An adaptable, low force arrangement in observing and control framework dependent on Raspberry pi. A pH sensor, temperature sensor, water level sensor, turbidity sensor are utilized here to screen the unexpected anomalous change in the state of the shrimp lake. Other than that, Raspberry pi was utilized as a server to control all the sensor hubs right now. The framework additionally sends a ready message through SMS administration to provoke the client when required or to screen the framework on a cell phone. In this manner, a minimization of ecological variances brought about by unexpected changes just as labor is diminished. The proposed framework has been effectively planned with a dependable, quick reaction and simple to use with inviting Conditions. It is reasonable for little to medium measured cultivating tasks as it doesn't require estimation of temperature, pH and water level in the earth shrimp lakes. The control stage comprises of Raspberry pi and it controls all the framework. At that point, the amicable framework is created to accomplish organized sensor information from sanyplace through web application just as Android application.

### A. pH metre board



Fig 1.1 pH meter

A pH Meter is an instrument used for measuring the acidity and base content. The concentration or the activity of hydrogen ions, of an aqueous solution is the main parameter used for measuring the pH value. The electrodes used in it are predominantly glass electrode plus a calomel reference electrode, or a combination of both the electrodes. [1] pH meters are usually used to measure the liquids pH content, although some special probes are sometimes used to measure the pH of semi-solid substances..

### B. Water level Sensor

Level sensors detect the liquids and other fluids levels that exhibit an upper free surface. Level sensors can be used to identify the point at which a liquid falls below a minimum or rises above a maximum level. The sensors implemented here is interfaced with the raspberry pi . The data will be sent to the raspberry pi for the further analysis.

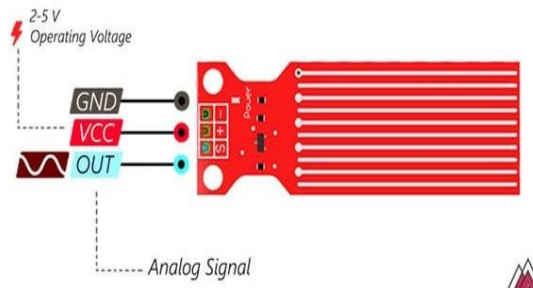


Fig 1.2 Water level Sensor

### C. Thermistor

An NTC thermistor is a heat sensitive resistor whose resistance abilities exhibit a huge, accurate and predictable decrement as the core temperature of the resistor increments over the range of operating temperature.

The data that is collected will be sent to the raspberry pi to take the further action.



Fig 1.3 Thermistor

#### D. LIGHT DEPENDENT RESISTOR

Photo conductivity is the principle behind working of a light dependent resistor. Photo conductivity is an optical occurrence in which the materials conducting capability (Hence resistivity) reduce when light is engrossed by the material.

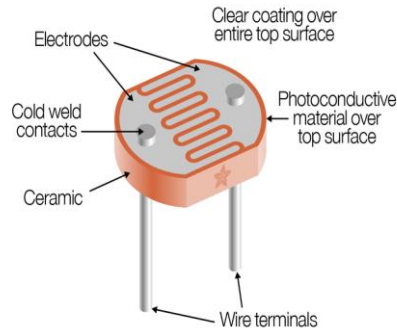


Fig. 1.4. Light Dependent Resistor

#### E. Turbidity sensor

The turbidity sensor directs a beam into the water segment under test. The particles in the water get reflected by light beam and the final light intensity is measured by the turbidity sensor's photodetector positioned at 90 degrees to the light beam. It gives the analog values as the output.



Fig. 1.5. Turbidity Sensor

### 2. LITERATURE REVIEW

From previous related works updating the sensor information and reflecting the real factors of environmental shrimp farming is not discussed. This system will be labor-saving for the farmer and report environmental changes immediately.

The experiment results in [2] show that the information fusion algorithm proposed in the paper works with high accuracy and it can estimate multi-index of water quality.

This model in [3] concentrates on providing the solution such as which medicine should be applied or necessary action to be taken in the form of an alert message when the parameters indicating the quality of water changes. The testing result in [4] shows that the percentage of errors are small and sensor data has been successfully sent to cloud server.

### 3. HARDWARE IMPLEMENTATION

In this work, a wireless sensor system is developed, applied to the measurement of temperature, pH and water quantity level in the shrimp ponds. The control platform consists of Raspberry pi to control all the system. Then the friendly system is developed to achieve data from sensor network anywhere via web application. The system is monitored real-time and can be controlled manual or automatically.

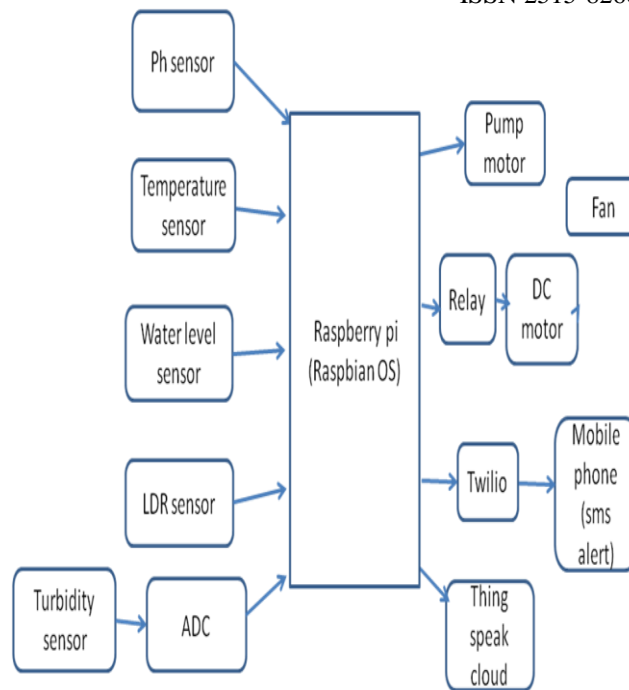


Fig 1.6 Block diagram

Here the pH sensor boards itself consists the sensors like thermistor, LDR, water level sensor. These sensors are linked with Raspberry pi. Since the turbidity sensor gives analog values it is connected with the ADC to convert them into digital values. Raspberry pi is used to store and analyze the values and also it will control the actuators to produce some output.

#### 4. SOFTWARE IMPLEMENTATION

##### A. Thing speak

ThingSpeak is an IoT analytics platform service that allows you to summate, envisage and investigate live data streams in the cloud. ThingSpeak provides instant envisions of data posted by your sensors to ThingSpeak. The ability to execute MATLAB® code in ThingSpeak eases the process of performing online analysis and processing of the data as it comes in. It uses RESTful API .

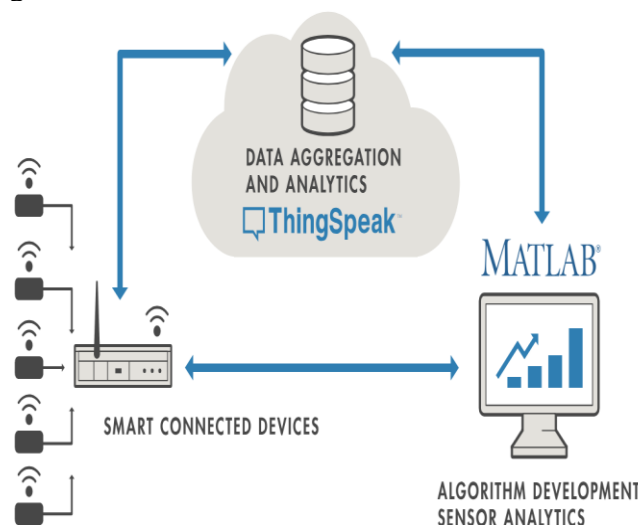


Fig. 1.7. Think Speak Framework

Sign In to ThingSpeak using your MathWorks Account. Click Channels My Channels. On the Channels page, click New Channel. Click the boxes next to Fields 1–3. Enter the following preset values.

Name: shrimp pond conditions

- Field 1: ph level
- Field 2: water level
- Field 3: light intensity
- Field 4: temperature

### B. Twilio

Any device connected by a Twilio SIM can send and receive Programmable SMS messages. SMS messaging support is mandatory for the device. The SMS cost also has to be done by the instrument. SMS messages to or from a instrument are controlled using TwiML program feature. For machine-to-machine (m2m) SMS, specifically for cloud-to-device and device-to-cloud communications the API commands are used.

Communications APIs enable voice, messaging, and video conversations within web and mobile apps. Programmable connectivity options offer implicit phone numbers, SIP trunking, messaging connections, and cellular connection establishment within devices. Use-case APIs power higher-level abstraction for errands such as authentication feature, call routing, and message control.

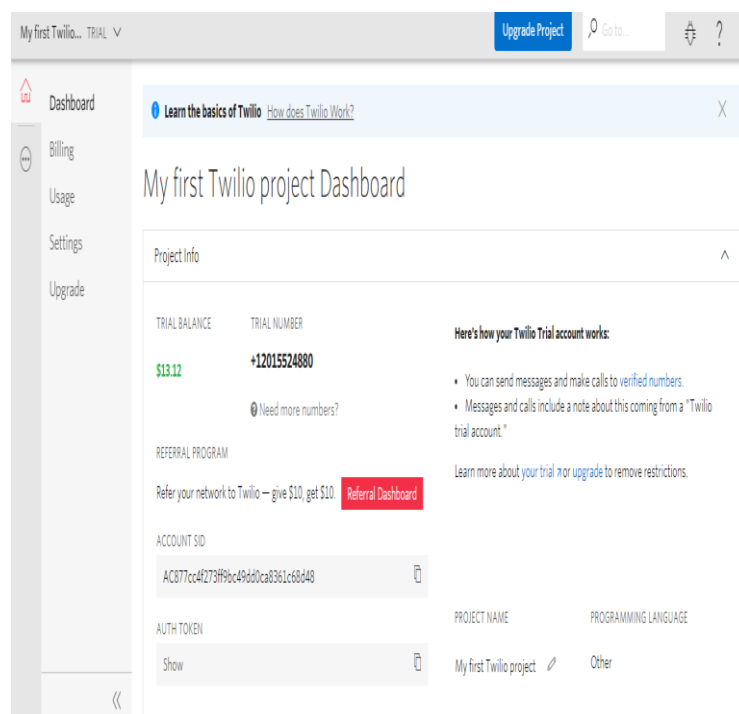


Fig. 1.8. Twilio Project Dashboard

## 5. RESULTS

Conditions of the shrimp pond are monitored by using the sensors and the data is analysed by using the raspberry pi. Immediate alert message is sent to the farmer using twilio cloud. All the data will be stored in the thing speak cloud and can be used for the future purpose. By using the actuators immediate action is taken in case of supplying oxygen by rotating fans. The following are the sequence of steps involved in measurement.

**STEP 1:** This is the initial step where all connections are given.

**STEP 2:** In this step the pH sensor and the turbidity sensor are placed in the water for testing the parameters present in the water. Here pH sensor is directly connected to the raspberry pi. where the turbidity sensor is connected with the ADC to convert the analog values to digital.

**STEP 3:** When the required power supply is given to the raspberry pi, if LED glows which indicates that the setup is properly connected.

**STEP 4:** With the remote view option present in the laptop the raspberry pi will be connected and the Raspbian OS will be viewed in the laptop.

**STEP 5:** The folder is opened where the required program is selected for execution.

**STEP 6:** The threshold necessary for maintaining the normal values is set using python program.

**STEP 7:** The terminal window is opened for executing the program.

**STEP 8:** The terminal window will have the current parameters of the pond that is monitored.

**STEP 9:** All the data is also stored in the ThingSpeak cloud and also the level increase or decrease will be denoted in the form of charts and also data can be collected in the form of excel sheet.

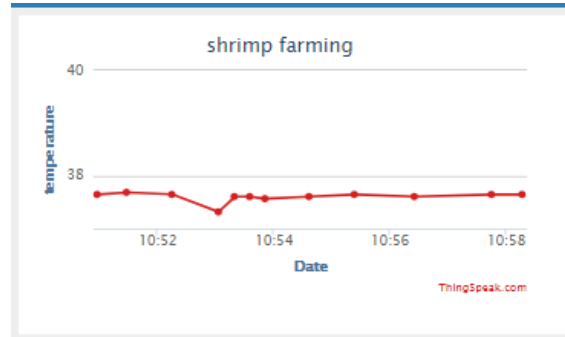


Fig 1.9 Temperature Output



Fig 1.10 Light intensity Output

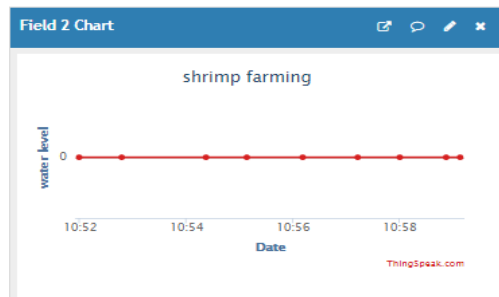


Fig 1.11 Water Level Output

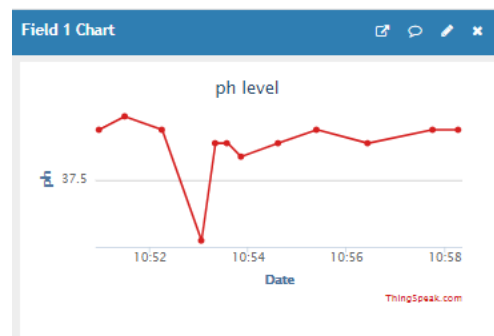


Fig 1.12 pH Level Output



Fig 1.13 Turbidity Level Output

The outputs from the sensors are directly linked with the network available through Raspberry Pi and the data are instantaneously available to the users through SMS.

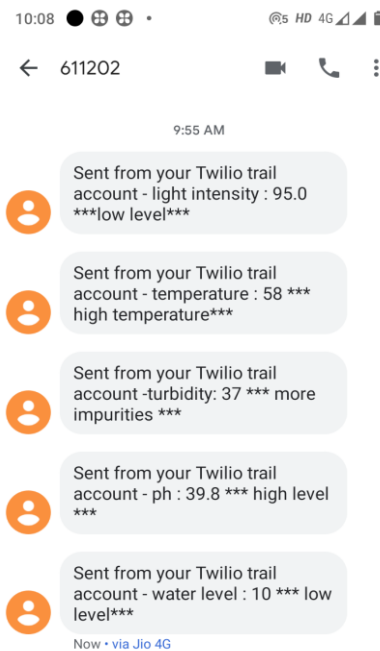


Fig. 1.14. SMS Alert in Mobile

## 6. CONCLUSION

This venture will help the water ranchers whose significant work is the shrimp cultivating. For them, it will be extremely difficult to persistently screen the lake which includes a parcel of cash, time and the endeavors of the ranchers. From this project we are going to monitor the condition of the shrimp pond by using the Raspberry pi. Also the time, money and the efforts of the farmers are reduced and the production of the shrimp will be increased. In the future for accurate results the oxygen sensor to measure the oxygen dissolved in the water can be included. Also the salt sensor can be used to get the salt content present in the water accurately and also the mixing of the salt into the water at right proportions can be made automatically

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