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E-Aquaculture Monitoring Using Internet of Things

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ABSTRACT

Technological significance has been a great support for settling on choice in various fields especially in aquaculture. The advancement of aquaculture has been on under advance for as long as a couple of years because of the absence of aquaculture learning and natural changes. Here, it generally concentrates on the upgrading of rural and aquaculture development through advanced information and communication processes. It extends the aquaculture organization's ability to meet the needs of its farmers. There is prove that ammonia, nitrogen and dissolved oxygen, pH is implicated in fish kills occurring on the ponds of Andhra Pradesh coastal areas due to the delay of problem identification.

By utilizing IOT, it improves the simple access observing framework to diminish the human worry in aquaculture. The outcomes acquired, through GSM (Global System for Mobile correspondence) and GPRS for every day ready SMS can send to the rancher in case of crisis, he can ready to see the factual review report by regardless of area and motor has been ON consequently if the water level is diminished. On the off chance that does is additionally diminished, the aerators will likewise be naturally exchanged on. This study gives the preferred data at any moment of time from any part of the world and screening their concern instantly at any part of the location.

Keywords: *Smart Aqua culture, Internet of Things, GSM, GPRS, pH Sensor, DO Sensor, Humidity Sensor.*

1. INTRODUCTION

Aquaculture has encountered terrific development in the previous decades, amid which persistent advancement has assumed a noteworthy part, yet it faces expanding feedback with respect to its biological and social sustainability practices and the subsequent difficulties for future development forms. However, in the aquaculture literature, there is limited systematic knowledge of how innovation has been approached in terms of how the focus and the scope of aquaculture innovation processes are understood and managed. The goal of this paper is, therefore, to break down the diverse ways to deal with advancement utilized as a part of aquaculture improvement.

Web of things is an innovation which has a tendency to associate the entire object in the world to the internet. Applications are produced based on IoT enabled gadgets for checking and control in different areas including procedures, home appliances. In aquaculture domain, few types of research have proposed an architecture based on IoT to monitor supply chain management of aquaculture product. Therefore, it gives a remote sensor checking framework utilizing GSM and GPRS innovation, which could possibly be a necessary piece of E-aquaculture Productivity [1].

How to keep the ecological equilibrium around the water surroundings for aquaculture is the key technology. A proverb from fisherman says “one needs to take care of the pond before nursing a school of fish in the pond [2]
Water quality maintenance is the crucial component to achieve a healthy aqua-farming environment. Its main purpose is to control the following quantities, i.e., water temperature, pH, dissolved oxygen (DO), salinity, turbidity, ammonia nitrogen, chemical oxygen demand (COD), biochemical oxygen demand (BOD), etc., the parameters that strongly associated to the incubation environment of aquaculture. Presently aqua-farming sites are lacking constantly monitoring capability of the aforementioned parameters.

Due to the wide spread of Internet users and the advancement of sensory technologies, the Zigbee applications and its related technologies have been advocated/developed such as smart power grid, intelligent traffic control, intelligent architecture, home medication/nursing, location monitoring, and being applied to lots of sites surveillances[3-5].

In fact, Indian Prime Minister has announced the "Digital India" in 2009. IOT is the trend for the flourish of industries in the next 10-15 years; the global economy will be flourishing in 2020 accordingly. The probable growth will be up to tens of billions. Internet of Things (IoT) will bring lot of convenience to all mankind, so every country around the world is focusing on it with strategic viewpoint [6]

The main objective of this research is to reach farmers for their consciousness, usage, and perception in E-Aqua culture. The aquaculture sector in India is currently facing a hard phase. India is moving towards an aquaculture emergency due to inadequate investment in irrigational and aquaculture infrastructure, lack of attention, ineffective pond management, non-given of fair prices to farmers for their crops and insufficient land reform in India. This invention is very helpful for formers for their aquaculture informatics and aquaculture services. The Smart e-aquaculture has the dependency among the various components. It has the dependency between:

1. pH Sensor
2. Water level Sensor
3. Humidity Sensor
4. Moisture Sensor
5. DO sensor
6. Arduino Uno microcontroller Output
7. Relay
8. Electric Motor
9. GPRS Technology

In this system, we use different sensors for measuring the position of the water and soil. The pH sensor, humidity sensor, water level sensor, oxygen sensor and moisture sensor are the sensors which measure the level of the water and soil. The pH sensor measures the acidic or basic nature of the water and soil. The moisture sensor is used to measure the volumetric water content in the soil and just near the pond atmosphere. The humidity sensor measures the amount of water vapour in the air. The water level sensor measures the water level. The analog signals are directed to the microcontroller and process.

2. METHODOLOGY

Logic for Measuring the Status of the water

To measure the status of the water, pH sensor, humidity sensor, water level sensor and dissolved oxygen sensor had been used. The pH sensor measures the acidic or basic nature of the water in the pond. The moisture sensor is used to measure the volumetric water content in the soil. Because soil test is also required to identify the humidity and moisture. The humidity sensor measures the amount of water vapor in the air. The water level sensor measures the water level of the pond. There by satisfying the needs of the water. Then, the pH value, dissolved oxygen Percentage, Humidity and moisture value of the soil and water can be viewed through LDR [light dependent resistor].

Logic for Automatic Motor Detection

The whole system consists of sensors which constantly observe the state of the soil and water. The signals are sent to the microcontroller. If there is any deficiency of water level in the pond, the microcontroller pumps the water to the required level by using motors. The desired level is measured by sensors. The information about the position of the water level is sent to the database.

SMS Based Information

Bio-medical sensors are attached to the cultivated crops at appropriate positions to collect real time data about their land. These data are then compared to standard threshold values to check if the crop is in normal condition. If the value has been over increased or decreased means alert SMS will be sent to the particular person in case of emergency by GSM.

Stastical Survey Information

In statistical survey report, GPRS technology is utilized. Farmers can get the required information through graph model at any particular time from any part of the world and they can also get the help from experts viewing their problem immediately without moving anywhere.

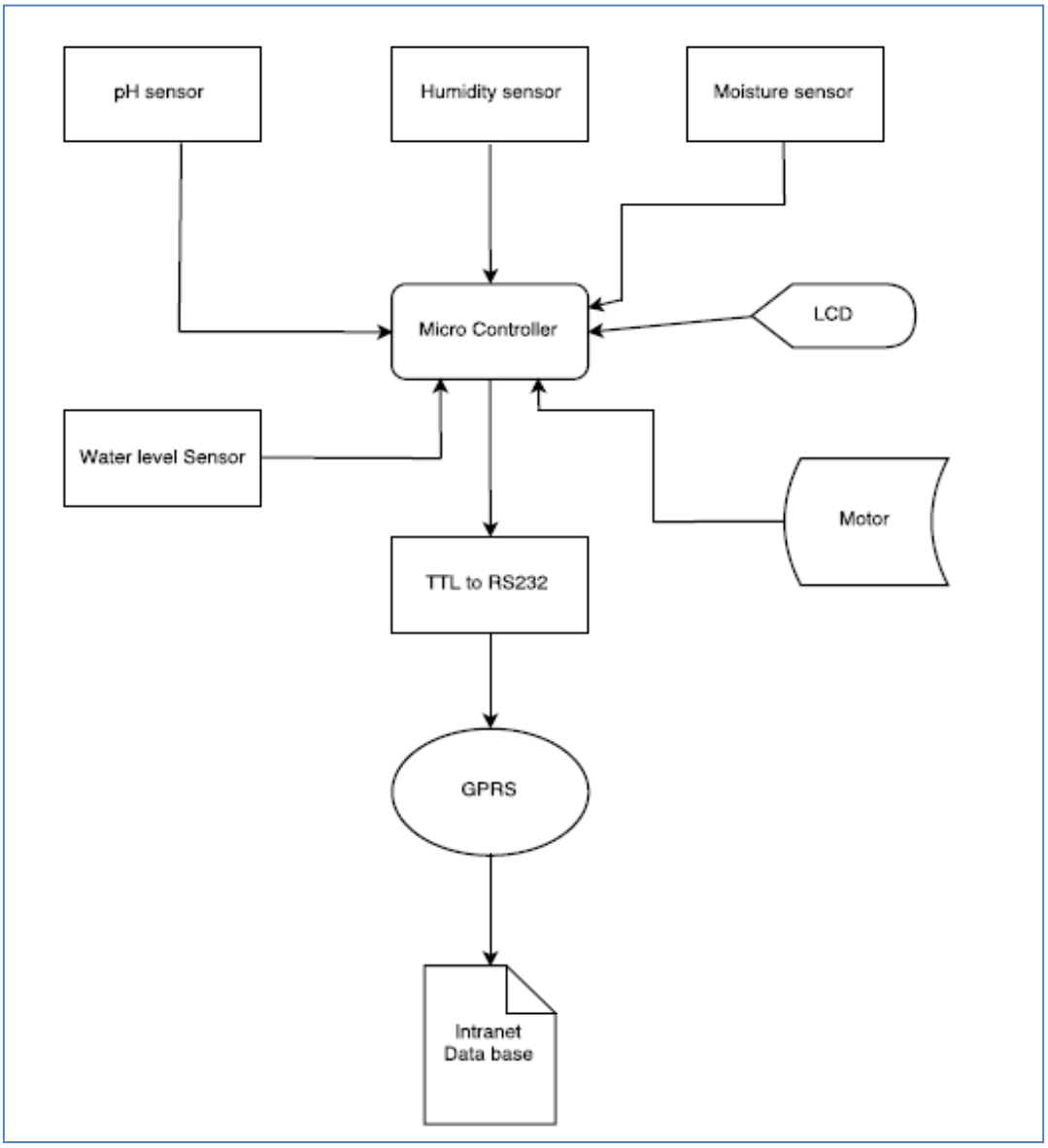

Figure- 1: Block Diagram of Smart E- Aquaculture

2. FUNCTION FLOW

It generates the modern aquaculture which is highly knowledge intensive which also requires timely, reliable and accurate information on natural resource endowments. It consists of two detection systems one monitoring and another warning system. Bio-medical sensors are attached to the cultivated crops at appropriate positions to collect real time data about their pond. These data are then compared to standard threshold values to check if the pond is in normal condition. Accordingly, the information about the pond is updated in the Microcontroller. If there is any lack of the desired level, the microcontroller activates the motor circuit, which pumps the water to the pond. Then, the automatic motor has been ON if the water level is decreased. There by satisfying the needs of the fish. Then, the status of the pond can be viewed by LCD panel. In warning system, GSM and GPRS technology have been used. In case of urgent situation alert, SMS can be passed by GSM and current information are viewed through internet database by using GPRS. In case of the emergency automatic motor has been ON if the water level is decreased. Similarly, the dissolved oxygen level is less than the required then the aerators will be started immediately So that oxygen level will be increased.

3. RESULT

The figure 2 and 3 depicts the transmitter and recipient procedure to enhance the data and correspondence innovation. Accordingly checking the estimation of different levels of the sensor can be observed. In the below figure every one of the signs of the different sensor can be changed over into simple to the advanced converter and put away in Adriano microcontroller.

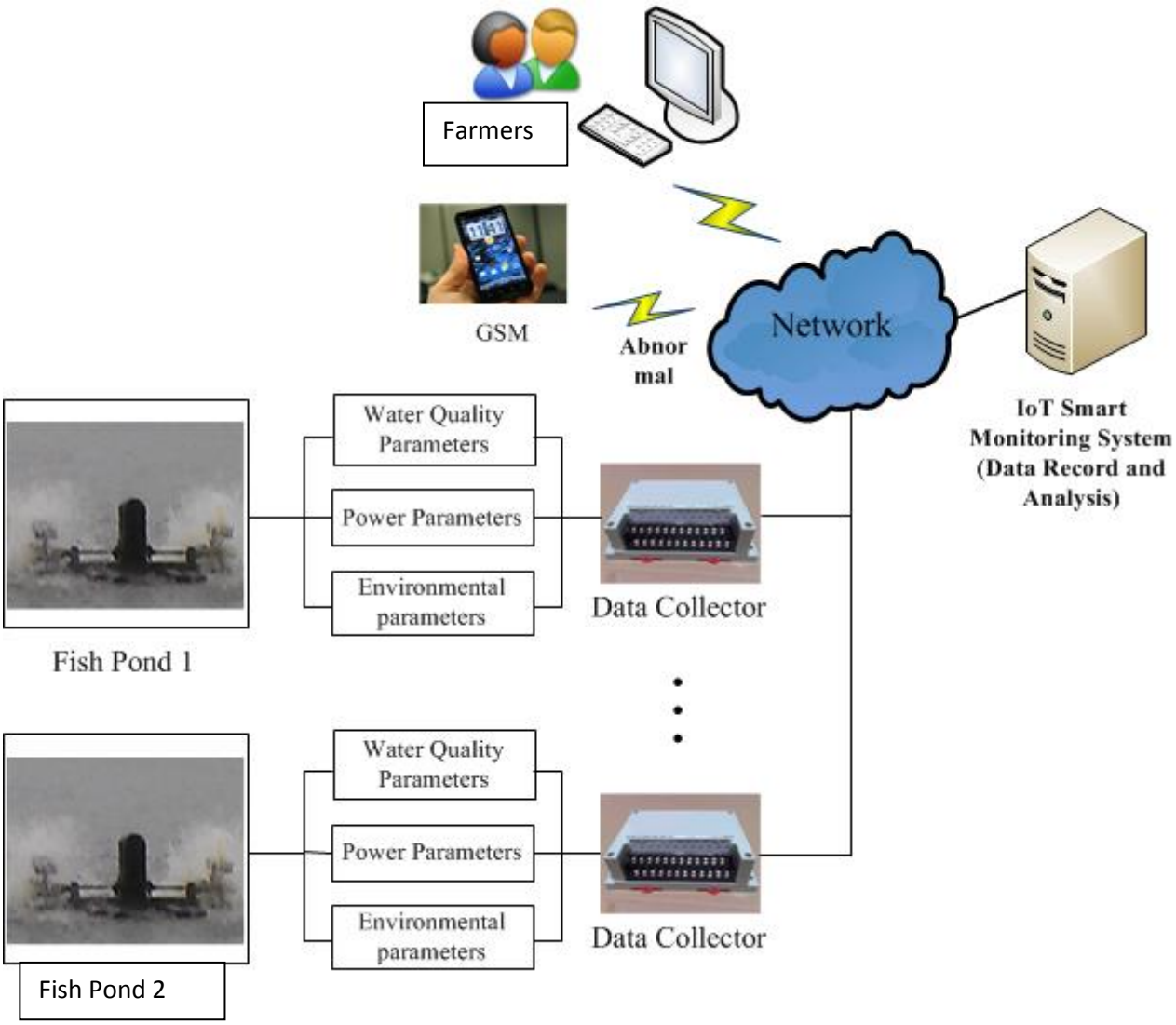

Figure-2: IOT Architecture

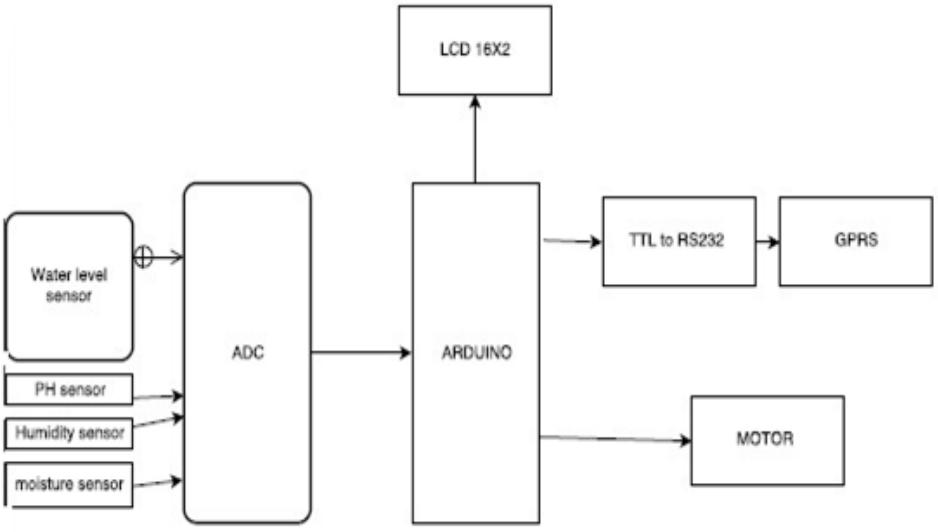

Figure-3: Working Diagram of E-Aqua Culture Monitoring System

Internet Data Base PHP- Front End WAMP- DATA BASE

Figure-4: Receiver of E-Aqua Culture Monitoring System

Table-1: Sample Table of Data

Sl. No	Ph	Humidity	Temperature	Moisture	Water level	Motor ON/OFF

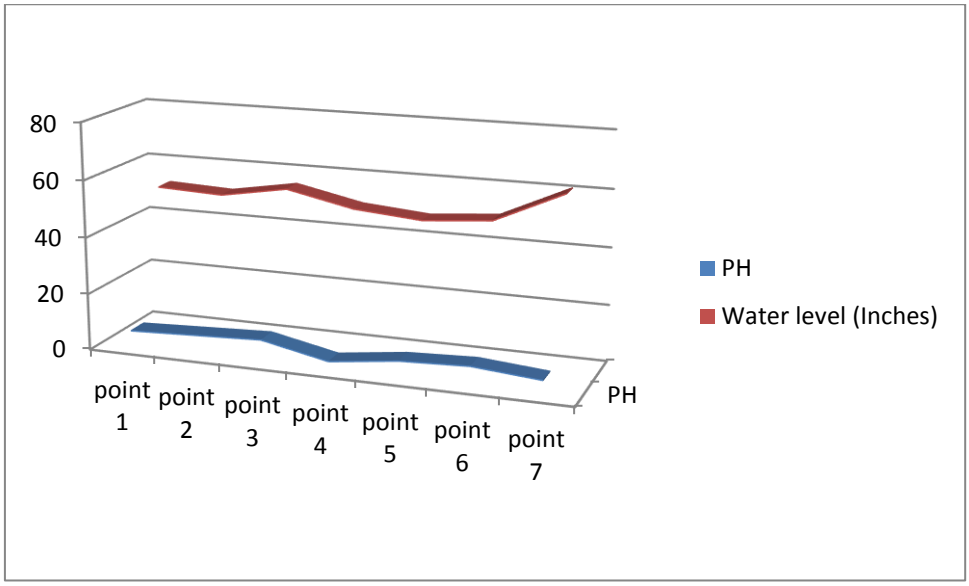

Figure-5: Model Block Diagram for Receiver

The figure shows the statistical survey report by graph model. Through that, the human can able to view the pond report continuously by irrespective of location.

The logic for the Relay Operations in Automatic Motor Pump:

Case1:

The above logic explains if the water level is increased means the motor works on off state and relay doesn't work.

Case 2:

If the water level is over decreased then the motor can be on automatically with the help of relay operations.

Table-2: Logic for the Relay Operations in Automatic Motor Pump

Water level sensor	Relay	Electric Motor
High	Off	off
Low	On	on

Table-3: Logic for the Relay Operations in Automatic Aerator

Dissolved Oxygen sensor (%)	Relay	Aerator
High	Off	off
Low	on	on

Case3:

The above logic explains if DO Percentage is increased means the motor works on off state and relay doesn't work.

Case 4:

If DO water level is over decreased then the aerator can be on automatically with the help of relay operations.

4. CONCLUSION

By utilizing Internet of Things, the larger part of farmers knew about the checking and cautioning discovery strategy in aqua business. This will encourage the e-aquaculture to survey the execution of the ranchers doing freely. It empowers to give the ready messages and factual overview answer to the ranchers by regardless of area.

This study is to give incredible potential to enhancing basic leadership in aquaculture. From this report, it stretches out the aquaculture association's capacity to address the issues of its farmers.

5. FUTURE WORK

In Future work, a thorough research about the e-aqua culture ought to be finished. It meant to dissect the new innovation for solid transmission which enhances the productivity of the E-Aqua culture item. It incorporates some new algorithm for upgrading the aquaculture item and condition administrations.

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BIOGRAPHY/BIOGRAPHIES

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