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Aquaculture Monitoring System using IoT

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Abstract - *Internet of Things (IoT) is one among the rapidly developing fields for giving social and financial points of interest for rising and creating an economy of the state . Presently IoT field is flourishing in areas like medical, agriculture, transportation, training, etc. This is of most importance due to aquaculture may be a backward region of engineering . Contrasted with other zones like agriculture, consequently, it's essential to work out the problems that are during this area with the help of technology. Aquaculture is that the farming of aquatic organism in natural or controlled marine or freshwater environments. The real-time monitoring of environmental parameters is extremely important for both shrimp aquaculture and paddy farming. Here, an electronic system is proposed for the efficient monitoring and effective control of varied environmental parameters like ph., temperature , DO related to the shrimp aquaculture.*

Key Words: **IoT, Aquaculture, D.O , Ph ,shrimp , temperature .**

1.INTRODUCTION

Aquaculture is one of the prospering segments in developing countries like India because it contributes 1.07 percent of the GDP. It is found that fish necessity of the country by 2025 would be in terms of 1.6 crores tones and thanks to the overfishing regular fisheries are drained therefore commercial aquaculture has been appeared. Aquaculture comprises the arrangement of exercises, information and methods for the rearing of underwater plants and a couple of sorts of animals within the water[1]. This action has incredible significance in monetary advancement and food development. Shrimp culture habitat comprise parameters like temperature, humidity, soil composition, nutrification, biological oxygen demand, chemical oxygen demand which are requirements of shrimp culture[2] . Due to high price and demand, many farmers in coastal region are shifting from vegetation to shrimp culture. Shrimp cultivation is encountered with abnormalities in temperature, soil composition, BOD, COD, pH and sophisticated problems like slow growth diseases, nutritional imbalances, pathogenic diseases can downfall yields of cultivation. Both WSN and IoT revolutionized through remote sensing with centralized monitoring of agriculture, fisheries and Industrial processing. This paper presents a prototype design monitoring the shrimp culture parameters like temperature, pH, DO, etc[3]. The prototype design will improve the practice of conventional Shrimp culture by remote sensing monitoring system and this is able to substantially increase the yield of the shrimp. The prototype was implemented and tested by deploying in pond for at some point . The variation of parameters is measured by using fixing a ThingSpeak channel[4]. The results show that the system is capable is monitoring the essential parameters and any change within the se parameters resulting in abnormal conditions in the pond are often easily communicated with the concerned person through message.

2. METHDOLOGY

The methodology is divided into two parts

2.1 EXISTING SYSTEM

In previous systems, an automatic system for automated fish farming where they monitor the water temperature, pH and water level, using Wi-Fi remote connection, which might be a drag for systems that are placed faraway from areas where cellular or any sort of internet connection is out there . In order to address this problem, another system a GSM type of notification by sending SMS messages to the end-user.

One disadvantage of this proposed system, is that the process of notification to the end-user after specific time intervals or after a particular parameter value is reached, and not in real-time.

2.2 PROPOSED SYSTEM

The proposed work supports remote monitoring of the fish farming system supported Internet of Things (IOT) for

Realtime monitor and control of a fish farming system[10]. This will be helpful to remember of the danger and may take necessary safety measures. IoT is employed during this project helps updating the knowledge about water quality through mail. pH sensor, Temperature Sensor & LDR is used to monitor the .Esp32866 takes the information and sends the information through the mail if the water quality is not in the given thresholds suitable for aquatic organisms.PH sensor and temperature sensor are used to monitor the water quality level. And aerator will be controlled based on LDR sensor i.e.

3. COMPONENTS REQUIREMENTS

Components required is specified into two parts i.e., Hardware Components and Software Components

3.1 HARDWARE REQUIREMENTS

*POWER SUPPLY
* ARDUINO UNO [It is a microcontroller based on the ATmega328P has 12 I/O]
* DS18B20 TEMPERATURE SENSOR [It is a liquid temperature sensor which measures in the range of - 55 ºC to 125 ºC with ±0.5 ºC]
* Ph SENSOR [It measures the acidic/ alkaline nature of water, ranges from 0 to14. (Ph < 7 is acidic, >7, p H is alkaline, p H=7 is neutral). Accuracy is ±0.1(25ºC) , Response Time ≤1 Min]
* D.O. SENSOR [It is a galvanic probe- type whose detection range is 20mg/ L with temperature range 0 to 40ºC]
*RELAY
* DC WATER MOTOR [It is used to oxidize water when dissolved O_2 falls below 4 ppm]
* ESP8266 WIFI MODULE
* PH UP AND DOWN SOLUTIONS

Table -1: pH values limits in aquaculture

pH	Impact on Shrimp
4	Acid death point
4 to 5	No reproduction
4 to 6.5	slow growth
6.5 to9	Desirable ranges for Reproduction
9 to 10	slow growth
≥11	alkaline death point

3.2 SOFTWARE REQUIREMENTS

*ARDUINO IDE
*EMBEDDED C

4. MODULE DESCRIPTION

The module is divided into three parts
* Power Supply
* Hardware Connections
* Software Interfacing

4.1 POWER SUPPLY

The power supply mainly consists of four parts
* Step Down Transformer
* Rectifier
*Filter Capacitor
*Regulator

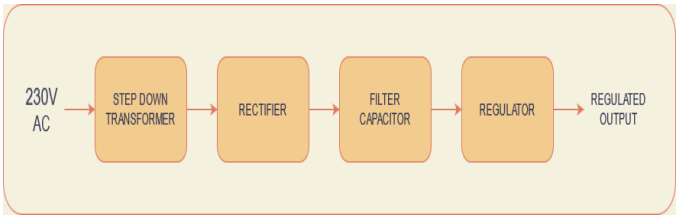

Fig – 1: Power supply block diagram

4.2 HARDWARE CONNECTIONS

In this section, The system contains several sensors for measurement of parameters. The sensors used in this project is DS18B20 temperature sensor, Ph sensor, do sensor and we also use lcd to display the parameters .The relay is used to operate motors in order to transfer solution from tank to cultivating pond.

The major hardware components are
*Arduino uno
*pH sensor
*D O sensor
*Temperature sensor

4.2.1 ARDUONO UNO

Arduino may be a single-board microcontroller meant to form the appliance more accessible which are interactive objects and its surroundings. The hardware features with an open-source hardware board designed around an 8-bit Atmel AVR microcontroller or a 32-bit Atmel ARM.

4.2.2 pH SENSOR

The Analog pH Sensor Kit is specially designed for Arduino controllers and features a built-in simple, convenient, and practical connection and features. it's an LED that works because the Power Indicator, a BNC connector, and a PH2.0 sensor interface. To use it, just connect the pH sensor with

the BND connector, and plug the PH2.0 interface into the analog input port of any Arduino controller.

4.2.3 DO SENSOR

This product is employed to live the dissolved oxygen in water, to reflect the water quality [7]y. it's widely applied in many water quality applications, like aquaculture, environment monitoring, science then on[11]. The probe may be a galvanic probe, no need of polarization time, and stay available at any time. The filling solution and membrane cap is replaceable, resulting in the low maintenance cost. The signal converter board is plug and play, and has the good compatibility. It are often easily integrated to any control or detecting system.

4.2.4 DS18B20 TEMPERATURE SENSOR

The sensor works with the tactic of 1-Wire communication. It requires only the info pin connected to the microcontroller with a pull up resistor and therefore the other two pins are used for power. The pull-up resistor is employed to stay the road in high state when the bus isn't in use. The temperature value measured by the sensor are going to be stored during a 2-byte register inside the sensor. This data are often read by the using the 1- wire method by sending during a sequence of knowledge .

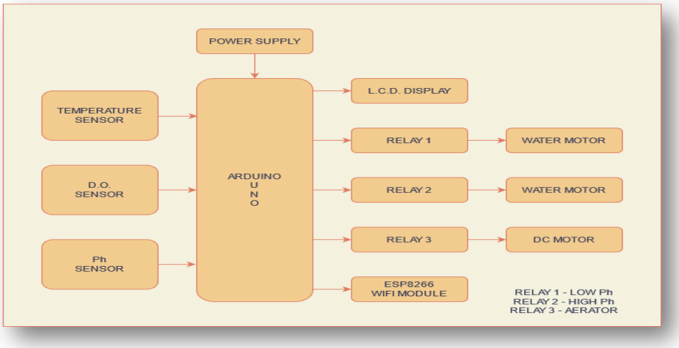

Fig – 2: Block Diagram of project

4.3 SOFTWARE INTERFACING

The software interfacing is done by using Arduino IDE along with embedded c

4.3.1 ARDUINO IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menu[8]. It connects to the Arduino and Genuine hardware to upload programs and communicate with them.

Tools required for Arduino IDE are
* ARCHIVE SKETCH
* FIX ENCODING AUTO FORMAT & RELOAD
* SERIAL MONITOR
* BOARD
* PORT
* BURN BOOTLOADER

5. OUTPUT

The system measures the temperature 24/7 for monitoring , it also monitors ph. values and automatically adjusts the ph. values for better shrimp growth. It also features a LDR sensor to automatically turn on the aerator during night times for better aeration.

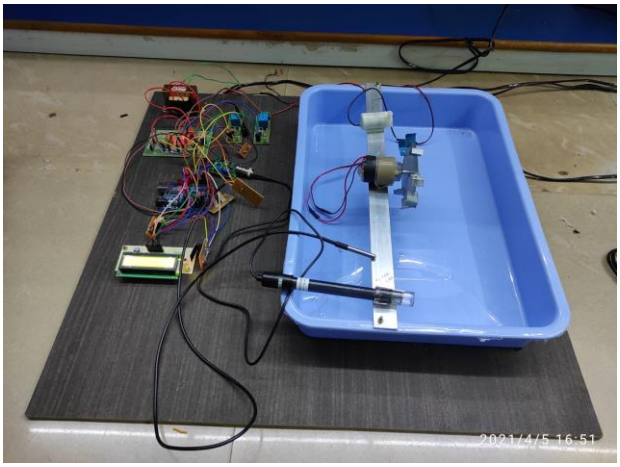

Fig – 3: photo of working model of project

Fig – 4: Temperature Characteristics plotted for 24hours

Fig- 5: pH variation in 24 hours

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