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IoT Based Fish Farming Aquaculture Monitoring System

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ABSTRACT: Aquaculture, also known as aqua farming, is the farming of aquatic organisms such as fish, crustaceans and crabs. Unhygienic water is the major effect for the growth of fish. Water quality monitoring is essential, this can help to save number of lives. The proposed work supports remote monitoring of the fish farming system based on Internet of Things (IOT) for real-time monitor and control of a fish farming system. This will be helpful to be aware of the danger and can take necessary safety measures. PH sensor, Water level Indicator, Temperature Sensor & Turbidity sensor is used to measure the water quality level. Microcontroller (Esp32) takes the information and sends the information through the mail if the water quality is not in the given thresholds suitable for aquatic organism. IoT is used in this paper helps updating the information about water quality through mail.

KEYWORDS: Aquafarming, NodeMCU, IoT.

I. INTRODUCTION

Aquaculture also called aqua-farming, breeding, raising, harvesting of fish, seaweed, algae and many other organisms. It is also defined as breeding species which develop in the aquatic environment under controlled conditions. Aquaculture is one of most reliable and low environment impact process producing high quality protein for humans. This process is more efficient than other forms of agriculture because of higher food convergence. Aquaculture has become famous all over the world. Asia contributes 40.1 percent of total world fish production, aquaculture production, which is 88.5 percent of world aquaculture production. In South Asia especially in the last 15 years, the performance of aquaculture is increasing more rapidly. Of the seven countries in Southeast Asia, Indonesia, Malaysia, Myanmar, the Philippines, Cambodia, Malaysia, Thailand, and Viet Nam, all but in terms of the volume of aquaculture, Cambodia with its productive inland fisheries rank among the top according to UNFAO 2007. In India currently fisheries contribute only 1.0 percent to the gross domestic product (GDP).

The model proposed in this work will assist the fish farmers in monitoring fish ponds using IoT. Integrating sensor and internet technology in combination with a user-friendly interaction interface smartphone application, desktop application, and web services to provide real-time monitoring of fish ponds; system database contributes significantly to reducing the risk of losses and improving efficiency.

II. OBJECTIVES

Our objectives of this project are:

1. Remote Monitoring and Controlling
2. Data Analytics for Decision Making and Compliance and Reporting
3. Fish Health Monitoring and Water Usage Optimization

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III. METHODOLOGY

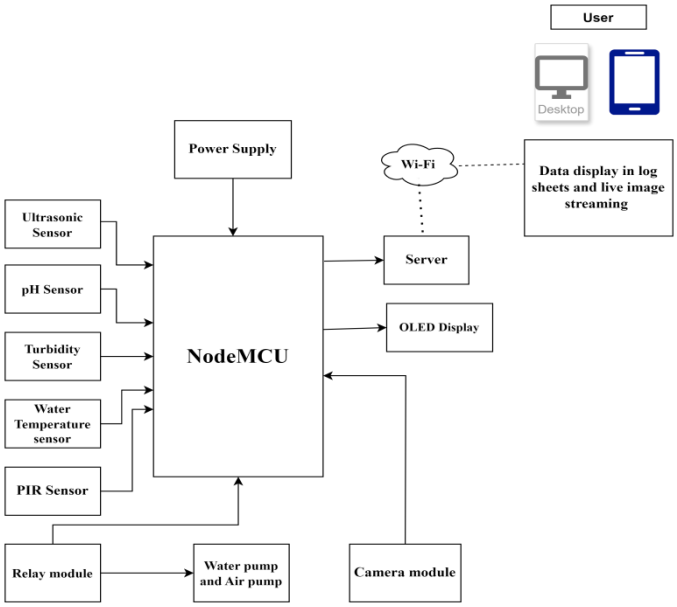

Fig1: Block Diagram

IV. HARDWARE REQUIREMENTS

A. NodeMCU

These MCUs serve as the central processing units of the monitoring system. They are low-cost, low-power microcontrollers with built-in Wi-Fi capabilities, making them ideal for IoT applications. The ESP8266 is suitable for basic monitoring tasks, while the ESP32 offers more advanced features such as Bluetooth connectivity and greater processing power.

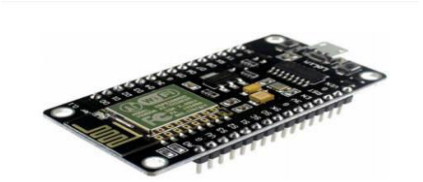

Fig.2: ESP8266 Microcontroller

B. Ph sensor

One of the most crucial devices that is frequently used for water measurements is a pH sensor. This kind of sensor can determine how much acidity and alkalinity is present in water and other liquids. When utilized properly, pH sensors may guarantee a product's safety and quality as well as the operations that take place in a manufacturing or wastewater facility.

The typical pH scale is represented by a number that can vary from 0 to 14. A material is regarded as neutral when its pH value is seven. Larger levels of alkalinity are represented by compounds with pH values over seven, whereas higher levels of acidity are thought to be present in substances with pH values below seven.

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Fig.3: Ph sensor

C. Turbidity sensor

We have also used turbidity sensor, for measuring turbidity rate or opacity, the Arduino gravity turbidity sensor senses water quality. The sensor uses measuring light transmission and the dissipation rate to distinguish dissolved particles in water that differs in water with total suspended solids (TSS) (displayed in the Fig.4. A turbidity monitor responds by transmitting a laser rays into the water for analysis. Any suspended particles would then disperse the light. The sum of the reflected light is used to identify particle density within the water.

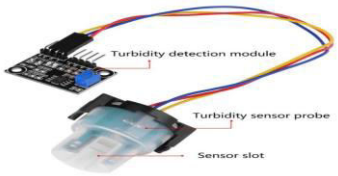

Fig.4: Turbidity sensor

D. PIR sensor

The PIR sensor used for motion detection, itself includes two slots, each of which can be made of a special IR-sensitive material Fig. 5. The lens used here doesn't really too much, so we see that the two slots can 'see' some distance past (basically the sensitivity of the sensor). Both slots detect the same amount of IR, the number of ambient radiation from either the room, walls, or outside the sensor while free.

Fig.5: PIR sensor

E. Water temperature sensor

Maxim Integrated makes the DS18B20, a 1-wire programmable temperature sensor. In harsh settings like chemical solutions, mines, or dirt, it is frequently employed to gauge temperature. The sensor's enclosure is sturdy and has the option to be waterproof, which makes installing it simple.
With a respectable accuracy of 5°C, it can measure a broad range of temperatures, from -55° to +125°.Since each sensor has a distinct address and only uses one MCU port to send data, it is a great option for taking several temperature measurements without using too many of your microcontroller's digital pins. The sensor works with the method of 1-Wire communication. It requires only the data pin connected to the microcontroller with a pull up resistor.

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Fig.6: Water temperature sensor

F. Ultrasonic sensor

The ultrasonic distance sensor in question is the HC-SR04. With a range accuracy that can reach up to 3mm, this affordable sensor offers non-contact measuring capabilities from 2 cm to 400 cm. An ultrasonic transmitter, a receiver, and a control circuit are all included in each HC-SR04 module. The HC-SR04 only has four pins that require attention: VCC (Power), Trig (Trigger), Echo (Receive), and GND (Ground).

Fig.7: Ultrasonic sensor

G. Relay

One class of electro-mechanical switch-like component is the relay. DC energizes the relay coil so that contact switches can be opened or closed. A coil, two contacts marked as ordinarily open (NO) and usually closed (NC), and a single channel 5V relay module are often included (NC). This article provides a general overview of the 5V relay module and how it operates, but before we can understand what a relay module is, we must first understand what a relay is and how its pins are configured. In order to regulate a large current using a low current signal, a 5 volt relay is a type of automated switch that is frequently used in automatic control circuits. The relay signal's input voltage spans a range of 0 to 5V.

Fig.8: Relay

H. OLED display

An organic light-emitting diode (OLED), also known as organic electroluminescent (organic EL) diode, is a type of light-emitting diode (LED) in which the emissive electroluminescent layer is an organic compound film that emits light in response to an electric current. This organic layer is situated between two electrodes; typically, at least one of these electrodes is transparent. OLEDs are used to create digital displays in devices such as television screens, computer monitors, and portable systems such as smartphones and handheld game consoles. A major area of research is the development of white OLED devices for use in solid-state lighting applications.

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Fig.9: OLED display

I. ESP32 Camera module

The ESP32 CAM Wi-Fi Module Bluetooth with OV2640 Camera Module 2MP For Face Recognition has a very competitive small-size camera module that can operate independently as a minimum system with a footprint of only 40 x 27 mm; a deep sleep current of up to 6mA and is widely used in various IoT applications.
It is suitable for home smart devices, industrial wireless control, wireless monitoring, and other IoT applications. This module adopts a DIP package and can be directly inserted into the backplane to realize rapid production of products, providing customers with high-reliability connection mode, which is convenient for application in various IoT hardware terminals.

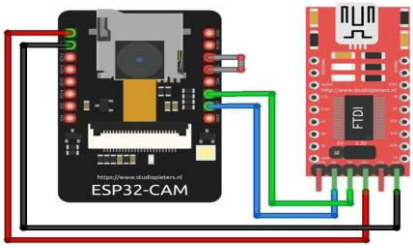

Fig.10:ESP32 camera module

J. Submersible pump

Micro dc 3-6v micro submersible pump mini water pump for mini water circulation system this is a low cost, small size submersible pump motor which can be operated from a 2.5 ~ 6V power supply. It can take up to 120 liters per hour with very low current consumption of 220ma. Just connect tube pipe to the motor outlet, submerge it in water and power it. Make sure that the water level is always higher than the motor. It is a compact and efficient water pump designed for various applications. It offers reliable performance with minimal energy consumption. Its submersible design allows for easy installation in small spaces, making it suitable for indoor and outdoor use. With impressive flow rates and water lift capabilities, this pump ensures efficient water circulation.

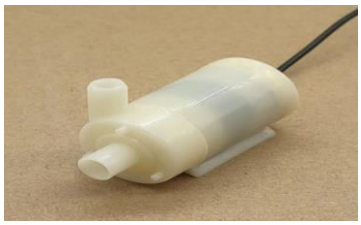

Fig.11: Submersible pump

V. SOFTWARE REQUIREMENTS

A. Arduino IDE

The official software offered by Arduino.cc, known as the Arduino IDE, is used primarily for authoring, compiling, and uploading code to virtually all Arduino modules and boards. Open source software, the Arduino IDE is

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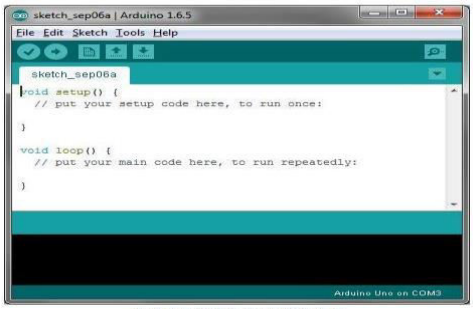
simple to download and set up from the official Arduino website. Almost all Arduino modules may be programmed, compiled, and uploaded using the Arduino IDE, an open source program created by Arduino.cc. Even the typical individual with no prior technical experience may get their feet wet in the learning process thanks to the official Arduino software, which makes creating the code quite simple. It operates on Java and is compatible with all operating systems, including MAC, Windows, and Linux platform containing pre-built commands and features that are essential for debugging, modifying, and compiling code. Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro, and many other Arduino modules are available. A microcontroller that is really programmed and takes input in the form of code is built into each of them. The Editor and Compiler are the two primary components of the IDE environment. The Editor is used to create the necessary code, while the Compiler is used to compile and upload the code to the specified Arduino Module



Arduino IDE Default Window

Fig.12: Arduino IDE

B. Web server

A **web server** is computer software and underlying hardware that accepts requests via HTTP (the network protocol created to distribute web content) or its secure variant HTTPS. A user agent, commonly a web browser or web crawler, initiates communication by making a request for a web page or other resource using HTTP, and the server responds with the content of that resource or an error message. A web server can also accept and store resources sent from the user agent if configured to do so.

C. Mobile Application

Mobile Hotspot Manager is an app to easily manage your Hotspot settings. You can easily turn on and off mobile Hotspot with quick switch button. With Hotspot Manager app you can manage Mobile tethering name and password directly from the app. Control the data usage by other connected devices.

Fig.13: Mobile Application

D. Log sheets

A log sheet is a document that keeps track of a series of events in a certain place. In the workplace, log sheets help in noting patterns and operations, ensuring certain procedures are followed during a set schedule and keeping track of the flow of information. Log sheets will keep record of real time information of temperature, ph. value, turbidity, water level of the water.

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E. Internet of Things

The Internet of things (IoT) describes devices with sensors, processing ability, software and other technologies that connect and exchange data with other devices and systems over the Internet or other communications networks. The Internet of things encompasses electronics, communication, and computer science engineering. "Internet of things" has been considered a misnomer because devices do not need to be connected to the public internet; they only need to be connected to a network and be individually addressable.

Fig.14: Internet of Things

VII. RESULTS AND DISCUSSION

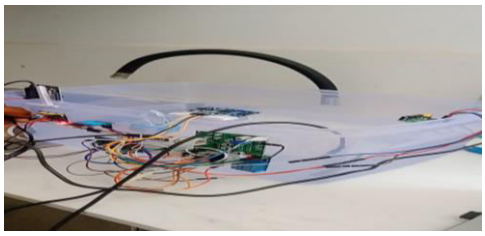

Fig.15: Overall model

In the figure.15 it shows the working model of the project. It consists of certain set of hardware components which are explained in the above context.

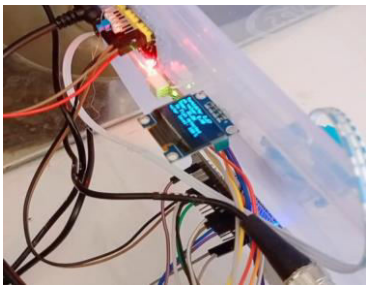

Fig.16: Sensors data

In the figure 16 it shows the value of the sensors present in the project. All the sensors that observe the values from the tank environment and the sensors values will sends to the microcontroller that is ESP8266 then the microcontroller processes the data and the results will displays through the OLED display.

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Fig.17: Live streaming video

In this project we used different types of sensors particularly for the observing the fish moment we use PIR sensor with this sensor we use the camera module through that live streaming of the aquarium is visible, these are useful for observe the health condition and detect the death fish. The figure 17 shows the live streaming video.

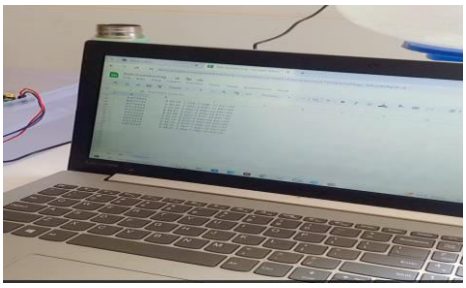

Fig.18 Data log sheet

In the figure 8.4 it shows the log sheets. The sensors values will update to log sheets through that we can observe the real time sensor value. By this module we can monitor the aquarium condition by our place. This will saves the time and presence of human is not required.

VIII. APPLICATIONS

- Water quality monitoring
- Fish health monitoring
- Environmental monitoring
- Production optimization
- Traceability and quality assurance

IX. CONCLUSION

The design and implementation of the aquaculture monitoring system are represented by the activities in this project. While creating this system, IOT technology is used. It is accurate, scalable, and portable. This will significantly contribute to raising aquaculture productivity. Additionally, manual testing is not required, losses are reduced, labor costs are reduced, and critical conditions are also avoided. Fish farms are challenging to operate using conventional, non-technical approaches. The created model offers a technology approach that would allow for real-time water quality monitoring. In this project, monitoring of the aquatic parameters such as Temperature, pH (potential of Hydrogen), Turbidity, Temperature, water level with food. Give Intimidation to the user in case of any action to be undertaken to prevent any compromise in the quality of the yield as well as take immediate precautionary measures in case of further increase of these variations using the actuators lime-stone dispenser and water in & outlet pumps. Machine Learning Model has been trained the type of disease the fish is infected with, to get a better understanding of the situation at hand where the input source is the camera.

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REFERENCES

1.Garcia, M., S. Sendra, G. Lloret, and J. Lloret. (2011). "Monitoring and control sensor system for fish feeding in marine fish farms". IET Communications, (5), Volume 8, Issue 11, Jan-1980 .

2.X.Kishore Austeen, V.Harish Kumar, S.Venkatesan, C. R.M Raghul, " Design and Implementation of Aquaculture Monitoring and Controlling " International Research Journal of Engineering and Technology (IRJET) Volume 9, Issue 15, Aug-2019.

3.Dr, A.Albert Raj, Dr. Selvan , Swasthik V K , RakesA , Saravanaraj D M "Arduino based Fish Monitoring System" International Journal of Scientific & Engineering Research Volume 11, Issue 7, July-2020 .

4.Tanvi Patkar, Komal More, Sarthak Lad, Rohit Tanawade, Amit Maurya, "IoT Based Aquaculture" in International Research Journal of Engineering and Technology (IRJET) Volume 02, Issue 23, May 2020.

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