V.Nagamani, 2023, 11:2
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

IOT Based Smart Fish Farming Aquaculture Monitoring System

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Abstract-Internet of Things (IoT) is a very fast growing technology and the field of IoT is extending its wings in every one of the areas today. With the progression in computers like Arduino, Raspberry pi, the innovation is achieving the ground level with its application in farming and aquaculture. In this work, we have outlined and actualized monitoring of water quality of aquaculture utilizing Raspberry Pi, Arduino, various Sensors, Smartphone Camera and Android application. Water quality parameters used in this work are Temperature, pH, Electrical Conductivity and Colour. Sensor acquisition is conducted by Arduino and Raspberry Pi is used as data processing device as well as server. Photo acquisition is also performed by Raspberry Pi with the help of the Smartphone camera to detect the colour of the water. Android phone is used as the terminal device. A user can monitor the water condition using an android app through Wi-Fi within Wi-Fi range and through Internet from anywhere in the world. Some analysis is performed with the four parameters value to determine the overall approximate condition of the water and required action. Every feature in this checking gadget can work legitimately and easily.

Keywords- Raspberry Pi, Arduino, various Sensors, Smartphone Camera and Android etc.

I. INTRODUCTION

Aquaculture is one of the thriving areas in many countries in the world since demand for fish and the fish prepared food is expanding day by day. According to The United Nations Food and Agriculture Organization (UNFAO) "2012 State of World Fisheries and Aquaculture ", Worldwide yearly production of fishery items add up to around 128 million tons. The animal protein intake per individual is about 15% and increases the human reliance on fishery resources. The average consumption of fish products is 19 to 20 kg per person per year today and will be 16.7 kg per year in 2030 according to UNFAO. Production of fisheries, advancement and future food needs are firmly related [1].

Aquaculture comprises of the set of exercises, information and techniques for the rearing of aquatic plants and a few animal groups. This activity has an awesome significance in financial improvement and food production.

Commercial aquaculture is confronting numerous issues because of sudden climatic vacillation leading to changes in water quality parameters. Aqua farmers are relying upon manual testing for knowing the condition of the various parameters of the water.

But this manual testing is time consuming and also gives inappropriate results as parameters for measuring water quality changes continuously. It will be better if automatic monitoring can be done somehow.

So modern technology should be brought to aquaculture to overcome this problem. For rural development, technologies have to support several key application areas, for example, living quality, wellbeing, environmental change etc. [20]. So we have to be more selective in choosing the appropriate technologies for this kind of advancement.

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II. LITERATURE REVIEW

A few papers in literature overview centers around how the aquatic life will impact because of progress in water quality parameters [2] and how IoT is utilized to overcome the issue. A great deal of research work is done with IoT to take care of this kind of issues as recently IoT is achieving the ground level with its application to agriculturists [3], [4].

A lot of numbers of the papers focuses on few kind sensors like pH, DO, Turbidity [5], [6], [7] and so forth and a solution for those issues. Be that as it may, the optimum fish production is absolutely subject to numerous chemical, physical and biological characteristics of water to the vast majority of the degree Thus, effective pond management requires a realization of water quality. Water quality is determined by factors like Dissolved Oxygen (DO), temperature, turbidity, transparency, water colour, pH, carbon dioxide, alkalinity, hardness, conductivity, salinity, TDS, unionized ammonia, nitrate, nitrite, primary productivity, plankton population, BOD, etc. [8].

K.Raghu Sita Rama Raju and G.Harish kumar Varma (2017) performed a work entitled as "Knowledge Based Real Time Monitoring System for Aquaculture Using IoT" which uses several sensors such as Dissolved Oxygen, Temperature, Ammonia, Salt, pH, Nitrate and Carbonates [9]. But maintaining lots of sensors is costly and tedious. So a system is needed which is not much costly and can determine the overall quality of the water effectively. This is the point which is the base of our research.

III. PROPOSED SYSTEM

This work designs and implements a unique aquaculture monitoring system based on IoT. Both Wi-Fi and Internet are combined in this system for convenience. This work finds a way to give better result with low cost than other available systems.

Aqua farmers can avoid time consuming manual testing now. This will help the aqua farmers to produce more number of fishes which will help to fulfil the demand for fish. Though we have created a system to control a demo aeration system, more actuators such as heating rods, fish feeder etc. will be integrated to this system. We will develop a better way to capture image and use better image processing techniques to provide better result.

IV. METHODOLOGY

The proposed system is made for fishermen to monitor the quality of water for a healthy environment for fish to live in. Healthy water is essential for aquatic animals. Water quality is decided by some factors like pH level, oxygen level, temperature etc. Some sensors have been integrated with the proposed system to collect the values of some parameters from the water. For this purpose, pH sensor, temperature sensor, oxygen kit, and ammonia kit have been used. This system was created by connecting a pH sensor, a temperature sensor, and some other equipment.

The temperature sensor and pH sensor collect value from water and send that value to the server through the Wi-Fi module. A mobile application was made to see values. pH level is important for fish. To grow a healthy fish, it's essential to maintain the pH level. So, a pH sensor was used. Freshwater ponds have a natural pH in the range of 6–8. When the pH level of water is low, it means the water is acidic, and high pH means it's alkaline. If pond water becomes highly alkaline, it can damage the skin, eyes, and other outer surfaces of fish. Acidic water harms the reproduction of fish. Fish can die because of low pH levels.

V. BLOCK DIAGRAM

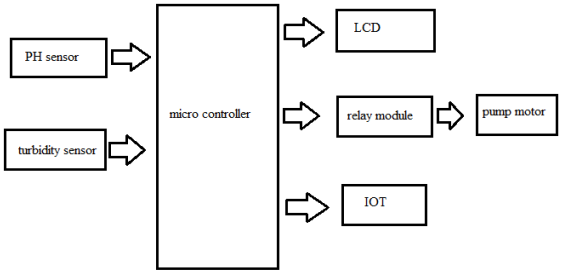

Fig 1. Image:-block diagram.

VI. HARDWARE COMPONENTS

1. pH sensor:

A pH sensor is one of the most essential tools that are typically used for water measurements. This type of sensor is able to measure the amount of alkalinity and acidity in water and other solutions.

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Fig 2. pH sensor.

2. Turbidity sensor:

Turbidity sensors measure the amount of light that is scattered by the suspended solids in water. As the amount of total suspended solids (TSS) in water increases, the water's turbidity level (and cloudiness or haziness) increases

Fig 3. Turbidity sensors.

3. LCD:

Depending on how many lines are used for connection to the microcontroller, there are 8-bit and 4-bit LCD modes. The appropriate mode is determined at the beginning of the process in a phase called "initialization". In the first case, the data are transferred through outputs D0-D7 as it has been already explained. In case of 4-bit LED mode, for the sake of saving valuable I/O pins of the microcontroller, there are only 4 higher bits (D4-D7) used for communication, while other may be left unconnected.

Fig 4. LCD.

Consequently, each data is sent to LCD in two steps: four higher bits are sent first (that normally would be sent through lines D4-D7), four lower bits are sent afterwards. With the help of initialization, LCD will correctly connect and interpret each data received. Besides, with regards to the fact that data are rarely read from LCD (data mainly are transferred from microcontroller to LCD) one more I/O pin may be saved by simple connecting R/W pin to the Ground. Such saving has its price. Even though message displaying will be normally performed, it will not be possible to read from busy flag since it is not possible to read from display.

4. Relay module:

A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an electrical circuit.

Fig 5. Relay module.

VII. RESULT

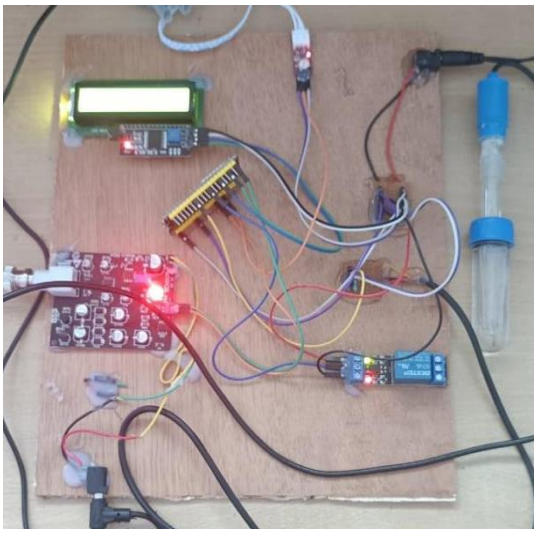

Fig 6. Image: Results.

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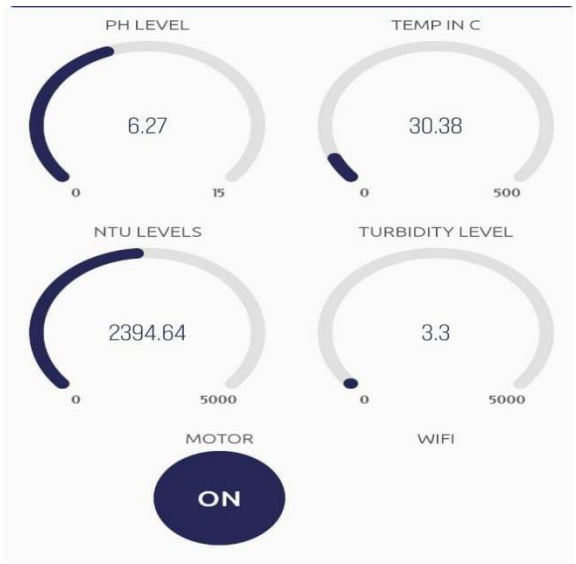

Fig 7. Image:-Blinky App.

VII. CONCLUSION

With this work carried out we were able to achieve the main objective using IoT-based smart fuel station system which will help in upgrading the mainstream gas station by curbing manpower, capital and allowing smart transactions. In future enhancement the system can be installed with a bill printer, density checker, and touch screen display can be installed to provide a clever interface for the user.

This system provides the feature of prepaid card recharge facility and it also provides the authority to customers to access the petrol in all the petrol stations through a single RFID/Wi-Fi card. In future enhancement the system can be installed with a bill printer, density checker, and touch screen display can be installed to give the user a smart interface. Thus, the proposed Smart e-fuel station embraces the data analysis, functional processing, and acquisition of data and its visualizations in the effective manner. This model proposed is based on open source platform with low cost model and smarter for IoT Applications.

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