

## IOT Based Fishery Management System

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### Abstract

Research in aquaculture is an input to increase stabilized production. In last decade various scientists have made sustained efforts that resulted in development of modern production technologies that have revolutionized farm production. Fish cultivating is getting to be a standout amongst the most rewarding enterprising exercises because of the low innovation, minimal effort arrangement venture and the 3 to half year collecting cycles. IOT technologies have revolutionized farm production in the country. In this paper, we propose a concept to identify remote monitoring of the fish farming system by using the various sensors to reduce the risks. In this paper, we use various sensors like pH value, temperature and level sensors. By using these sensors all the work is automated and it will also be easy to monitor the fish farming remotely from other location.

**Keywords:** Aquaculture, Internet of things, fish farming, sensors.

### 1. INTRODUCTION

In the recent years with advancement in monitoring and automation technology, research in aquaculture resulted in development of production technologies that improved the quality of the fish farming ponds, thus leading to improvement and increasing of fish production. Fish farming pond is an artificial man-made eco-system and on the most basic level we can differentiate two types of ponds, ponds that breed tropical fish that are used as pets commonly known as aquariums instead of ponds, and ponds that breed fish for food. Our focus in this paper are the ponds that breed fish for food, typically build and maintained in remote eco-clean areas, near to water springs, and any outside environmental stress will negatively impact on the fish production. This is due to the fact that fish are cold-blooded animals that regulate

their temperature directly by the surrounding environment. Consequently on this, “temperature is one of the many key parameters that is needed to be monitored, combined with other important factors like light intensity, water level in the pond and etc”. Therefore, the monitoring of this eco-system is a problem combined of some multiple sub problems that are linked between each other, and they are in constant interactions. Their interaction is a complex process that needs a lot of time, dedications and knowledge by humans to be controlled and maintained.

Aquaculture, otherwise called water cultivating, is the cultivating of amphibian life forms, for example, fish, shellfish and crabs by utilizing the different sensors to lessen the dangers. IoT [11] has effectively demonstrated its enormous measure of uses areas in the most recent years. Notwithstanding, little are the fish cultivates today outfitted with clever gadgets with real-time and associated water observing abilities. There are numerous precedents where IoT could assist aquaculturalists with improving their working conditions. For instance, some fish ranches are far from the land and utilizing IoT to screen water at a separation could decrease their expenses. Another model is that adjustments in water quality can happen in all respects rapidly and whenever, so observing water continuously with cautions cannot miss a specific occasion.

Fisheries and aquaculture bolster the earnings and occupations of 660-820 million individuals, around 10-12 percent of the total populace. The part has an essential task to carry out in sexual orientation fairness, neediness and sustenance security. With worldwide fish supply more than 150 million tons, in excess of 85 percent of this supply is utilized straightforwardly for sustenance; providing 15 percent of the world's protein and fundamental nourishment for around 4.3 billion customers.

### **1.1 Water Quality Impact on Fish Growth**

The nature of water accessible to the fish is a standout amongst the most imperative factors in fish creation. This is made increasingly serious for fish kept in lakes or contained water conditions as the fish are not ready to move or migrate when the water quality turns out to be excessively poor. Water quality straightforwardly influences feed effectiveness, development rates and in general wellbeing status of the fish. Various parameters can be utilized to quantify the nature of the water accessible to the fish however the disparaging of these parameters incorporate broke up oxygen, un-ionized smelling salts, carbon dioxide, nitrite and nitrate focus, pH, turbidity and alkalinity levels [1].

### **1.2 The significance of the water quality observing**

The fisheries the executives depends absolutely on the water quality checking. Fish infections are exceptionally incessant and sway straightforwardly the gathering yield [2]. A low water quality can likewise affect the fish development and postpone the collect. The ideal fish creation is absolutely reliant on the physical, synthetic and natural characteristics of water [3], regardless of the sort of office. Subsequently, water quality is the way to succeed a decent fishery the board. It is dictated by factors, for example, temperature, turbidity, carbon dioxide, pH, alkalinity, smelling salts,

nitrite, nitrate, and so forth. Among them, the most basic are temperature, disintegrated oxygen and pH. Ideal temperature is reliant of the fish species, however as fish are inhumane creatures, it is crucial that the temperature is controlled and kept up in the right range. What's more, even in the right range, higher temperature builds the rate of biochemical movement of the microbiota thus expands the oxygen request. To confine ailment and oxygen utilization, temperature must be finely directed. Ideal disintegrated oxygen ought to dependably be over 5 ppm. Fish needs enough oxygen in the water to endure, else they remain at the surface to make up for lost time more oxygen, have slower digestion and develop slower, and at last amazing absence of oxygen. It is even a more concerning issue for oceanic living being to acquire adequate oxygen than for earthbound ones, because of low solvency of oxygen in water.

## **2. RELATED WORK**

Fowler et.al. [4] proposed the concept of recirculating Aquaculture Systems. In this paper, “they used temperature, DO, and pH scale be monitored directly on a continuous basis since they have an inclination to alter quickly and have a big adverse result on the system if allowed to work out-of-range”. Therefore, these three parameters are chosen to be monitored in this system.

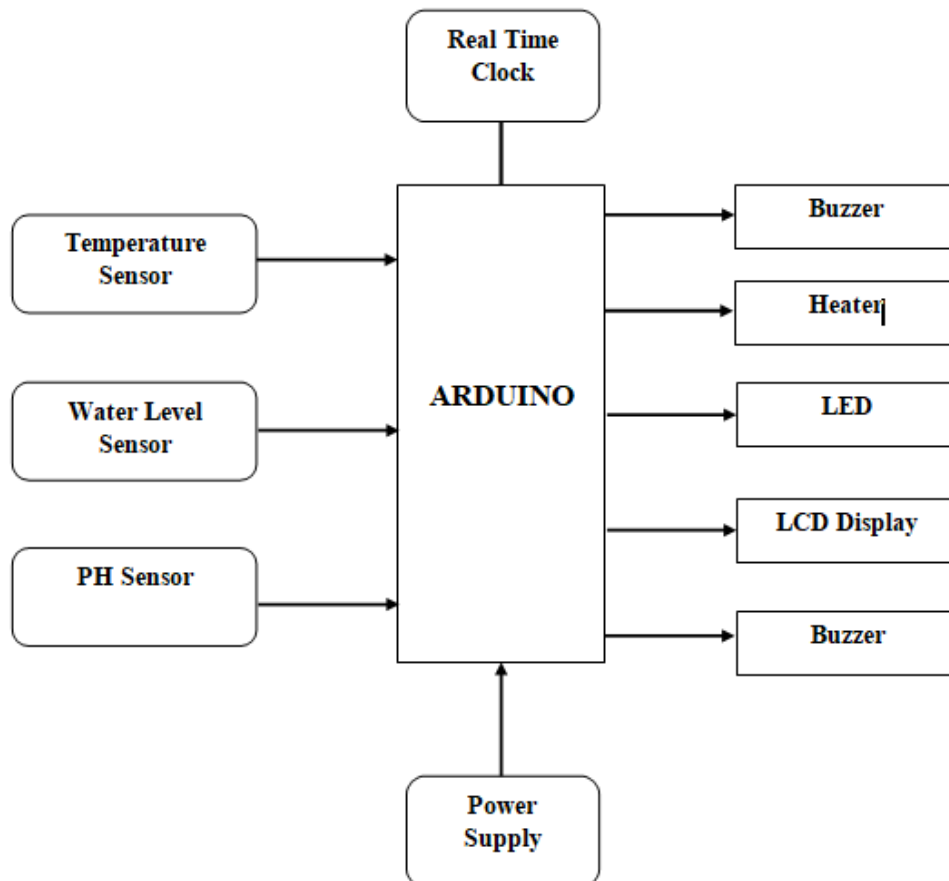
Merino et.al. [5] examined the achievability of supporting present and expanded per capita fish utilization rates in 2050 dependent on broad information: expectations of changes in worldwide and local atmosphere, marine biological system and fisheries creation gauges, human populace gauges, fishmeal and oil value estimations and projections of the innovative improvement in aquaculture innovation. They reason that gathering present and bigger utilization rates is possible, regardless of a developing populace and the effects of environmental change on potential fisheries creation. Notwithstanding, it is conceivable just if fish assets are overseen reasonably and fisheries the executives are powerful. The fisheries the executives depends absolutely on the water quality checking. Fish infections are successive and sway straightforwardly the collecting yield [6]. A low water quality can likewise affect the fish development and postpone the gather. Today, the water observing frameworks are over the top expensive and absence of affectability. Executing and keeping up this sort of framework is assets expending. A great deal of little maker decide not to utilize it and go out on a limb to get a littler yield. That is the reason water quality is the way to achievement in aquaculture and improves water quality is a major test, particularly in little fish cultivates in creating nations.

Ceong et. al [7] proposed partner degree eco water ranch framework that screens water temperature, broke down oxygen and saltiness. The framework may likewise send partner degree caution to the ranchers once the scopes of ecological data square measure observed to be anomalous. Han et. al [8] exhibited style on setting watching framework for development ranches. The arranged framework offers omnipresent access to the checked information from the lake either from the net or on the cell phones. Shifeng et. al [9] examined and suggest a framework that is bolstered remote RF and GSM to gauge such parameters as disintegrated substance component and

temperature. in accordance with the setting, the framework will indicating knowledge the executives the oxygen expanding machine and may remotely the board the information and get the report through nomad. Another attempt was made by Sharudin [10]. In this paper, they proposed partner degree shrewd framework to watch the water quality remotely through SMS. The framework screens and records timeframe learning of 2 parameters; pH scale level and DO level, that square measure reportable through brought together station exploitation GSM organize through Short electronic informing Service.

### 3. SYSTEM ARCHITECTURE

The current system includes the Arduino board one of the many small board computers, that consumes very low power and it is widely available. Connected to this control unit are various sensors for monitoring some of the parameters which can be labeled as input units, actuators such as relays that can be labeled as output units, executive units that affect some parameters, such as the heater and some interactive elements such as LEDs, buzzer, LCD display. It is presented in the figure 1.



**Figure 1:** System Architecture

#### **4. CONCLUSION**

In this paper we have presented IoT based fishery management smart system for managing and improve the fish productions in fish farming ponds. The current implemented system consists from the most vital sensors that are needed to monitor the water quality and notify the fish pond manager on-site. We upgraded this system by adding a hardware module that will allow the end-user to monitor and in the future to control vital parameters in the most remotely fish pond locations. Additionally to this, if the end-user requests, the Arduino platform can be remotely configured as remote server or client with ease, as well as other hardware settings. Further on, module for mobile and web interface should be developed for easier user interaction. In future we plan to expand the IoT water monitoring system by adding a variety of other sensors, like sensors that will measure pH or dissolved oxygen vital for the fish life cycle.

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