

# Aquarium Monitoring System

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## Abstract:

Aquarium Monitoring System is new generation innovative project based on Arduino. This Aquarium is fully automated and works on the input supplied to the system through our Smartphone or Laptop. This project is help to those people who are handicapped as well as normal human beings. The utilization of this checking framework the clients can screen and keep up their aquarium consistently. This Aquarium Monitoring System is deals with Arduino and Sensors. The job of this framework is to empower the clients to screen the Aquarium, for example, sustaining the fishes on schedule, maintain their water level and changing water on time, cleaning all glasses and inside base of the aquarium which are covered with small stones. In order to continuously check all these above working status. In this project we are using databases to store all the status information record. The Arduino is the central part of the project to get all the data from the sensors which are using in this project and sent to the databases to update the status. This monitoring system is operating by using of Smartphone, Laptop or Tablet.

## Article History

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## I. Introduction

An Aquarium is a holder or fake lake wherein living oceanic creatures or plants are kept. Aquarium is utilized for fishkeeping reason for leisure activity and for indoor and open air adornment. Other than that fishkeeping in aquarium is additionally identified with different societies. Aquarium is ideal blend of amicability and parity. The water symbolizes the progression of life, development and exercises of living things. The movement and hints of the percolating water as it moves all through the fish tank initiates and builds the positive vitality around the territory, in this manner bring favorable luck, riches and wealth. Aquarium is generally use for the decoration purpose in our home, industry and tourist places etc. The Aquarium gives a sense of peace and feeling connection to the nature. Nowadays we can see most of the people are interested to petting the fish therefore they collect

Different types of fishes. This time it is very difficult to maintain and monitor the Aquarium. So we are going to make advance Aquarium as a Automated Aquarium. In this project we will add features like that to changing and maintaining water level, temperature, walls cleaning, fish feeding etc. All these features will do automatically by giving input through our smartphones, laptop. We can operate from anywhere. After all these features added in the normal aquarium then Aquarium will become an Automated Aquarium. This Aquarium will give perfect environment simulated from natural environment where the fish came from and to help the fish to live longer and healthier. An Aquarium is a holder or fake lake wherein living oceanic creatures or plants are kept. Aquarium is utilized for fishkeeping reason for leisure activity and for indoor and open air adornment. Other than that fishkeeping in aquarium is additionally identified with different societies. Aquarium is ideal blend

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## II. Related Works

Here proposed venture is to help the individuals who are experiencing issues in keeping up their indoor aquariums, particularly the individuals who are as often as possible outstation, in this manner unfit to always screen their aquariums. Using this framework, clients can screen and keep up their fish aquarium routinely by means of web, utilizing gadgets, for example, cell phones and laptops.[1] Aquarium the board needs opportune social event of water parameter esteem changes. These progressions may influence the life of oceanic creatures in the aquarium. The proposed framework gathers the continuous information from aquarium condition utilizing sensors, forms it and applies the progressions to the water accordingly of any negative circumstances through actuators. It will reduce the manual effort required in large aquariums by automating the aquarium management process.[2] Keeping fish as pets is much less demanding than taking care of other animals. The maintenance of fish aquariums is very difficult task. Some of the problems faced are changing the aquarium water, feeding the fish. Maintaining the temperature of aquarium, controlling the lights. The idea is to minimize the problem of fish keepers or aquarists by shifting it from manual to automatic mode. [3] Numerous individuals feed the pet fish in the aquarium tanks that should be appropriately set up and kept up, or the fish will be bound to an undesirable and short life. Along these lines, it is essential to screen water conditions eagerly and improve the water quality for the littler than anticipated aquarium tanks. Considering an IOT course of action called

IOTtalk, this paper proposes the Fish Talk structure that uses the aquarium sensors to drive the actuators ceaselessly. [4] The fundamental motivation behind this undertaking is to help the individuals who are experiencing issues in keeping up their indoor aquariums, particularly the individuals who are as often as possible outstation, along these lines incapable to always screen their aquariums. Using this framework, clients can screen and keep up their fish aquarium routinely by means of web, utilizing gadgets, for example, cell phones and PCs. The significant job of this framework is to empower clients to screen and keep up their fish aquarium through a server of database, which incorporate undertakings, for example, encouraging the fishes on schedule, checking the water temperature, water level, and changing the water naturally, at whatever point the turbidity level of the water arrives at a pre – decided perilous point for the fishes. [5] This paper exhibits the structure and execution of an all-inclusive wise control framework that robotizes the activity of an aquarium framework called water tonics. In our methodology, the water temperature control, lighting of aquarium condition, encouraging of fish, depleting and infilling of the aquarium tank are generally naturally constrained by a product implanted in a clever controller. [6] The Aquarium and numerous other aquarium gear are creating from usefulness to intelligentize. Through the business investigate, a ton of remote motorization watching and control equipment for the aquarium will have noteworthy significance and improvement prospect. The system stores and transmits the video of the aquarium gathered by camera through the Envision World center stage programming. The Internet client gets to the middle stage to screen the aquarium by IE or versatile terminal software.[7] Amphibian lives in the aquarium are adequately affected with the movements of the aquarium condition, for instance, temperature, PH level and the lighting. These conditions are extremely basic for the

making due of the oceanic lives in the aquarium. For the tremendous scale aquarium, human supervisory is inadequate. In this manner the usage of Programmable Logic Controller (PLC) is applied to supplant the supervisory position's duty. Without the PLC and sensor, the criticism state of the aquarium isn't acquired in a quick manner.[8] The aquarium will play out every one of the means consequently like temperature control, turbidity level control, light screen, sustaining, water restoration and so forth. It will reduce the manual effort required in maintenance of aquariums by automating the aquarium management process. also automatic food feeding system operated by servo motor mechanism which used to feed fishes on regular time intervals. Dead fish component is there which will distinguish the dead fish. In addition camera is connected to aquarium system using which user can see live operation occurring in system with the help of smart phone. The point of our venture is to supplant manual upkeep of fish aquarium with an Automated framework by utilizing IOT.[9] This paper intends to introduce a portable application framework with IOT and android application to control the aquarium water framework. Android studio, Java, C, Arduino IDE, SQL and Firebase programming product used to create in this examination. Hub esp28266 MCU V.2 board, Wemos-D1 sheets and module ultrasonic equipment were utilized to make the control system.[10] The undertaking is intended to fabricate a programmed aquarium pack.The aquarium kit consists of electronic components that control the fish-tank environment by maintaining the parameters such as temperature and PH. The project is very useful for the people who like decorating their houses with an aquarium. Therefore, here the project presents how this smart system works. The smart system has three main functions; food supplying, water filtration, and maintaining system). The food supplier system provides food for the fishes in the aquarium kit automatically.[11] The observing of

cultivating procedures can upgrade the utilization of assets and improve its maintainability and gainfulness. In fish develops, the water quality, tank condition, and fish lead must be watched. Remote or remote sensor frameworks (WSNs) are a promising decision to play out this watching. Taking everything into account, its noteworthy cost is moving back the advancement of its use. In this paper, we propose a lot of sensors for checking the water quality and fish conduct in aquaculture tanks during the encouraging process[.12]

### III. Literature Review

We are going to implement the Arduino based system which will monitor and maintain the whole Aquarium automatically and provide real time status on user's Smartphone application or laptop application. It contains water quality management in which it will monitor the water level and daily change 30% water at specific time and maintaining the ammonia and oxygen requirement. It will perform temperature control, water renewal, feeding, maintain ammonia, gravel cleaning all these steps automatically.

Nowadays everyone wants to become a well-developed person. This aquarium also help to show ours personality, almost people like to keep fish in ours home, offices etc. it is very useful for decoration purpose, some people having hobby to keep aquarium in home. In that system we will fit the position of feeder and set the fixed feeding times. We are using temperature sensors to maintain the temerature of the aquarium inside environment because temperature is very critical to survive the fish here we are using gravel cleaner to clean the gravel portion of the aquarium.all these steps perform automatically and send the status to user smartphone.



Fig3.1:- Aquarium overview

#### IV. Objective

The objective of my project is the aquarium monitors and maintaining automatically through our smartphone or Computer systems. This aquarium will help to those people who are outside the home or those who are not able to maintain the aquarium. This system will take less time to maintain and monitors all. This aquarium is very reliable to us, it will send all status information to us and updating the status. This system is easily monitors by the smartphone or laptop. In large scale aquarium monitoring is done manually. A person may do mistakes due to the human nature. It is hard to keep up aquarium for working individuals. Unsuitable changes in the degrees of water parameter esteems influence the life of sea-going creatures. This motivated us to build a system which automates the manual work to maintain the aquarium with minimum persons required using internet technology.

#### V. Proposed System

Initially, when we start the system it will take the input values of all the sensors present in aquarium. There are predefined values which are already dumped into the micro controller. By checking with predefined values the micro controller

decides what are the operations should do? There are dash sensors in the aquarium. Those are water detecting sensor, ultra sonic sensor, temperature sensor, ammonia sensor, oxygen sensor, LDR or light detecting sensor, water flow sensor and time module.

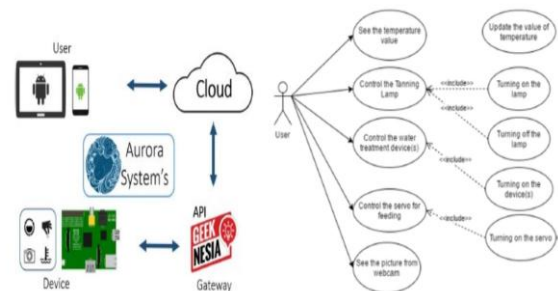


Fig5.1:- Internet working model

The micro controller gives the 1<sup>st</sup> priority to the water sensor, 2<sup>nd</sup> and 3<sup>rd</sup> to the ammonia and oxygen sensor, 4<sup>th</sup> priority to the temperature sensor and 5<sup>th</sup> priority for the LDR.

We are giving the first priority to the water because without water there will be no fish and if there is any fish it will be in a problem. If there is no water without any delay, automatically the water gets filled by using water flow sensor. This water flow sensor measures the water and gives the respected data to the aurduino at the same time the ultra-sonic sensor releases the sound waves, gets back the reflected waves as a input waves, sends the data to the micro controller. The data sent from both ultra-sonic sensor and water flow sensor to micro controller will be considered for the filling the water to 100% water. The aquarium size is pre-defined in the microcontroller. Again these sensors will works for daily or 24 hours after filling the water for exchanging the 30% water with fresh water.

2<sup>nd</sup> priority is for ammonia and oxygen levels. These levels are very important to survive. If oxygen level decreases and ammonia level increases fish can't survive in aquarium so depending upon the ammonia and oxygen levels

in water, we are performing operation called 30% water out and 30% water in. This process includes a pumping motor to pump 30% water out and this water will go out of aquarium through pipe to drainage to maintain ammonia levels in water.

For oxygen levels we have the oxygen pumping motors and 30% water out and 30% water in. oxygen pumping motor takes the input of water and oxygen. By mixing the both inputs i.e water and oxygen and releasing to water we can improve the oxygen levels in the water.

To connect all the output electric devices we are using the relay modules.

As a 4th priority we should maintain the temperature in the water for fishes. We are using the temperature sensor for measuring the temperature after measuring the temperature if the water is very cold we using heating module which is dipped in the water to heat the water to room temperature i.e 25 degrees.

Finally, we are using the LDR sensor to sense the outside light. If there is no sufficient light to fishes automatically micro controllers send a command to switch on the light

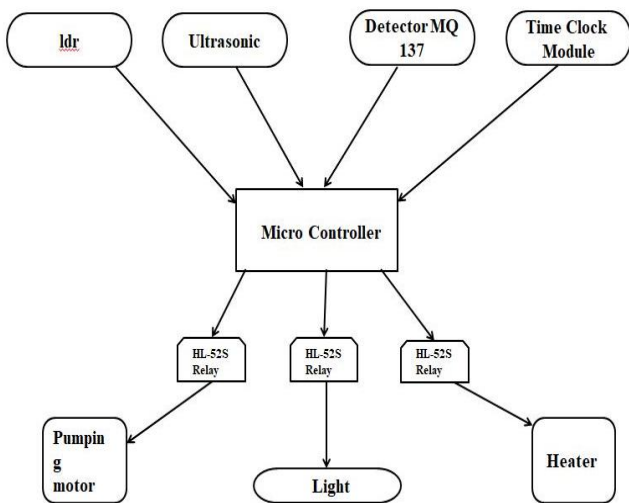


Fig5.2:-Flow chart

This is the working model of aquarium monitoring system.

## VI. Proposed Algorithm

Algorithm aqurium:-

While(TRUE)

    If(mode==1)

        Manual();//wait for user command

    Else//auto mode

        controllight();

        changetankwater();

        controlwaterlevel();

        controltemperature();

        fishfeed();

## VII. Experiment Results



Fig7.1:- Aquarium Monitor

This figure shows the starting message as Aquarium Monitor.



Fig7.2:- Ammonia percentage

This figure shows the ammonia percentage which is done by using the Detector MQ 137 sensor.

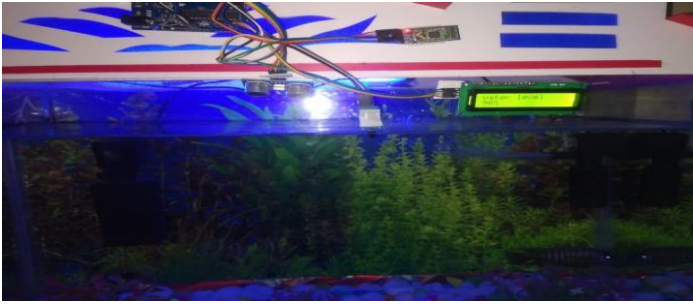


Fig7.3:- Water level

This figure shows the water level of the aquarium how much filled by using Ultrasonic sensor. The Ultrasonic sensor generates the waves to detect the water level.

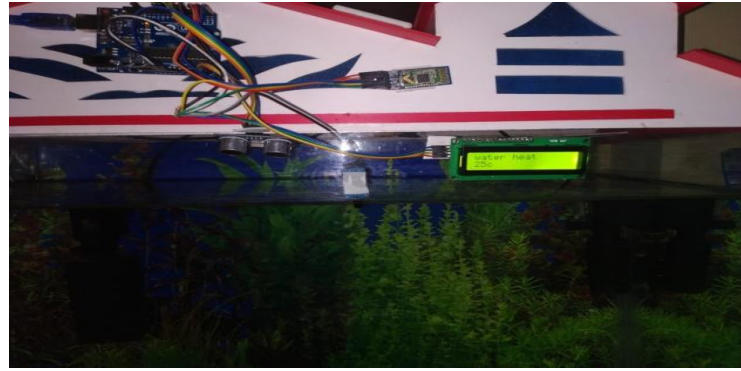


Fig7.6:- Water temperature

This figure shows the temperature of the water which is done by using the Temperature sensor.



Fig7.4:- Light ON

This figure shows the light is in ON condition which is done by using LDR sensor.



Fig7.7:- Water filled

This figure shows the aquarium is totally filled which is done using the Ultrasonic sensor. The Ultrasonic sensors generate the wave to detect the water how much filled.



Fig7.5:- Oxygen level

This figure shows the oxygen level which is done by using mathematical calculation by the value provided by Detector MQ 137 sensor.

## VIII. Conclusion And Future Enhancement

This automated Aquarium system provides a healthy environment to the fishes. Keeping fishes in healthy condition is very tough to maintain and manage all operations. Therefore this project is giving a healthy environment by applying all these features (filtration and maintaining water level, feeding system, temperature maintaining). Filtration system is very important function that keeps the Aquarium clean. We are using ammonia and oxygen to make healthy for fish and it will give life long to fishes. So the water needs to be kept clean from dirt because dirt water affects the fish health. Therefore we used water pump and it is working at given some threshold time to filter the water. Feeding process is also very significant function to feed the food to fishes automatically.

This system is very useful in case if user forgets to feed the fishes.

#### FUTURE ENHANCEMENT:-

In this project after added all these features, still it has many future advancement possibilities.

**Solar cell:-** we will provide solar cell energy to aquarium to do all function in 24 hours. So it will be very useful for aquarium and power consumption is also efficient. initially if you are using your own pocket power it can be a burden, so in order to reduce this, solar cell can be used to get power 24 hours at constant rate. And there will be no overbilling on your pocket poer. The main thing of this is aquarium will not stop its work.

**Chemical:-** Normally the Aquarium is filled with water regular so after some days the some sliding materials is formed on the walls of the Aquarium and also making water as which is affecting the fish health. Therefore we can use chemical as to clean the walls of the aquarium and water regularly. This will be very good for the fish as well as walls cleaning.

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