IoT Based Water Quality and Level, Food Disposal, Light and Temperature Control

AQUARIUM CARE SYSTEM

BY

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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DHAKA, BANGLADESH

2ND JUNE, 2021

APPROVAL

This Project titled "**IoT Based Water Quality and Level, Food Disposal, Light and Temperature Control Aquarium Care System**", submitted by **ISHTIAK AHMED, MD. NAIM HOSSAIN** and **ADNAN SHAHRIAR** to the Department of Computer Science andEngineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 2nd June, 2021.

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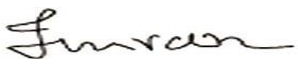

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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Mr. Aniruddha Rakshit, Senior Lecturer, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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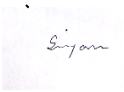

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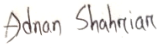

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ACKNOWLEDGEMENT

First, we express our heartiest thanks and gratefulness to almighty Allah for His divine blessing makes us possible to complete the final year project/internship successfully.

We really grateful and wish our profound our indebtedness to **Mr. Aniruddha Rakshit, Senior Lecturer**, Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of "*Internet of Things*" to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior drafts and correcting them at all stage have made it possible to complete this project.

We would like to express our heartiest gratitude to Professor Dr. Touhid Bhuiyan,Professor & Head**,** Department of CSE, for his kind help to finish our project and also to other faculty member and the staff of CSE department of Daffodil International University.

We would like to thank our entire course mate in Daffodil International University, who took part in this discuss while completing the course work.

Finally, we must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT

Aquarium System is a water-filled water tank for the maintenance of marine life that is used for surveillance purposes. It gives people the feeling of interaction with the countryside, gives them a sense of calm, life, and tranquility, and then almost every home, hospital, and restaurant can see the Aquarium Kit. Besides, we find that so many people are pleasantly surprised to find in petting fish, which means that they catch various species of fish and give them an appropriate aquarium kit, but petting fish is a difficult task since it takes full time to make the tank adaptable to the fish by creating a suitable atmosphere. With a smart equipment kit, people can then easily take care of their fish. This project develops a device that provides the ideal aquarium water environment and automatically controls the fish feeding process, to help fish live longer and happier lives without a direct person monitoring. One solution to the problems is an IoT-based smart aquarium surveillance system. This study introduces a prototype of an IoT-based Smart Aquarium Monitoring System to maintain fresh water for fish life environments in an aquarium. The machine monitors the healthy fish ecosystem in fresh water. The machine works like a fish feed system and in service is operated by a smartphone. The designed framework is used with Arduino MEGA and NodeMCU controllers. NodeMCU Wi-Fi networking is used for controling the process between the handset and the device. The pH analog sensor is used to detect and monitor the pH value of water.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

Introduction

1.1 Introduction

For the past 20 years, possession of animals has steadily increased. The most common animal is freshwater fish after cats and dogs. It is a very challenging job to maintain fish aquariums. Whenever you have to vacuum or feed your fish, you have a lot to do. You must disconnect the control head/air pump in your aquarium and manually feed it and turn the air on again after an hour. The current system requires manual control of all devices such as a lamp, heater, and filter by electrical switches, so the person has to approach the aquarium and manually control the electric switches to turn the device on and off. The fish must be fed twice a day even so that the owner goes to the fish tank and personally feeds the fish, which makes it much more difficult to operate an aquarium. Sometimes while the proprietor is on holiday, the tank is not under control and the fish will not even be fed. An intelligent aquarium is research that we have created. The project is now more effective than the systems on the market. It would also be less expensive in addition to performance. The audience of the project is the community of people who want to maintain fish at home or workplaces and have little time to care or are concerned that their neighbors will continue to remind them to attend to the fish in the absence of them. The project is an integrated fishing device. It replaces the manual cleaning and automatic features of the fish tank. Proper treatment of aquariums requires care and much time. Clear awareness and standards in aquatics should be understood. It seeks the development of an aquarium device capable of maintaining the normal saltwater parameters by checking the undesirable growth of the algae and maintaining the appropriate pH (powerful hydronium) level and the aquarium water temperature.

1.2 Motivation

The combination of hydroponics and aquaculture in aquaponic systems includes the combination of water quality parameters in plants, fish, and nitrifying bacteria for their survival and development. Plants and fish are cultivated as cash crops, whereby bacteria can oxidize ammonia into nitrite and nitrate the plant can eventually use. The aim of this project is to establish the pH reaction of nitrifications between 5.5 and 8.5 in the recirculation of perlite-containing trickling biofilters. In 12 (pH 8.5), 20 (pH 7.5), and 20-24 (pH6.5) days after nitrifier bacteria have been added to the perlite biofilters, total Ammonia Nitrogen concentration decreased from 5 to 0 mg L-1. At 8 (pH 8.5), 16 (pH 7.5), and 20-24 (pH 6.5) days after nitrifying bacteria were introduced, nitrite was measured in the biofilter water. In biofilters held at a pH of 5.5 no nitrification occurred. These findings show that conversion of ammonia to nitrate was slightly higher at pH 8.5 than at pH 7.5 and 6.5 in the perlite medium trickling biofilter start-up period. For aquaculture systems, the recommended pH is between 6.5 and 8.5, and for hydroponic systems between 5.5 and 6.5. Results suggest that the ideal nitrification-pH for this method is 8.5. In order to maximize fish development, the pH-conciliation for aquaponics is likely to be between 6.5 and 7.0.

1.3 Objective

It seeks the development of an aquarium device capable of maintaining the normal saltwater parameters by checking the undesirable growth of the algae and maintaining the appropriate pH (powerful hydronium) level and the aquarium water temperature. Growing algae affects marine ecosystem growth's healthier lifestyle. Via effective filtering, illumination, control, and monitoring of temperature, pH, and water level, this project will carry out tasks to control unwanted algae development. The pH control mechanism is a dynamic physical-chemical process that is highly individualized with time and non-linear characteristics. Therefore, the varying pH without statistical modeling does not provide an optimal method to monitor. Even for structures whose mathematic model would be difficult to acquire, some alternate approach may be used. In the course of clarification, the system was used for temperature regulation and monitoring and pH value. A diagram is developed in the system and our laboratory work achieves the calculation sum of alkaline and acid to be applied to the process tank to preserve the appropriate pH level of the saltwater. Pumps that are managed to allow either acid/base to be injected into the aquarium must be considered during mixed tank management and monitoring of the pH. A block diagram has been developed for the control and monitoring mechanism. In the research work, the whole output of the machine could be observed and the output from the logic controller could be analyzed. This GUI has been developed and interconnected with a prototype designed to perform pH, temperature, and aquarium water levels management and tracking processes. Repeated experiments have been performed to assess the efficiency of the regulated and tracked device parameters. The monitored set-point, which was successfully reached during all the testing, was located within the range pH of 7.6-8.4, temperature 25-29.440C, and water level 20cm.

1.4 Expected Outcome:

We aim to produce an integrated system for feeding aquarium fish. The fully automatic feeder system is an electronic unit, primarily intended for feeding livestock fish at regularly fixed intervals. This device is often used to alleviate the owner's complexities and challenges while he is away from fishing. This design helps to overcome few issues like overfeeding, very little feeding, which contributes to fish hunger and fishery emissions. The intelligent water nutrition system is the principal subsystem of the architecture, which consists of many sub-systems. The feeder container consists of the fish feed storage container. The outlet is powered by two dc engines, one outlet is used to store the food pellets and the dc motor is transferred to the intended foe and the food is spread over the second outlet. In addition, consumers are able to customize the feeding period and feed quantity that must be feed accordingly. The Internet of Things nowadays is a technical revolutionary phenomenon. It shapes the landscape today and is used for data collection, tracking, and analysis from distant locations in various areas. Internet of integrated networking if anywhere, from intelligent towns, intelligent power grids, and the intelligent supply chain to the intelligent watch. While the internet is still in the environmental sector, it has enormous potential. It can be used for detecting forest fires and early seismiques, reducing air inhabitants, monitoring the snow, preventing earthquakes and avalanches. In addition, the measurement and control system can be used in the field of water safety. We may build a water quality control system in the intelligent city where a network of devices is linked to remote stations and water supply parameters are stored via the WSN in a microcontroller.

1.5 Report Layout:

In the first chapter of our report, we have discussed the introduction of our research work on aquarium care. And we also discuss in this chapter the motivation and objective and what will be the expected outcome of our work. In the next chapter, we have discussed the related research work done by other people and the comparative studies we have done so far, and also discuss the challenges and scope of the problem we are solving here. In the next chapter we have discussed the methodology and requirement specification, the components we have used and how they work, the power circuit diagram we have used for this research purpose, and the threshold values of different sensors and components. In the next chapter, we have discussed different requirements and factors we have to look after to complete the aquarium system and what are the ideal values we should follow, and how our device will work and generate the result. In chapter 5 we have discussed the impact of the environment and the sustainability of our work. In the last chapter, we have discussed the future scopes and conclusions of our research work.

CHAPTER 2

Background Studies

2.1 Introduction:

Arduino is an open-source project for the construction of digital interfaces and virtual objects for microcontroller-based sets for sending and controlling physical devices. It is used for sending instructions to the driver and for the transfer of data with Wi-Fi. The key objective and agenda of the development of this feeder were to resolve the unhealthy fisheries environment which resulted in fish death by addressing several dysfunctions in the feed system and chemical conditions in the area. This device is fully integrated and eliminates manual strain by supplying users with many features to keep track of the area, even though they are away from the field. People of ancient culture liked very much to hold pet fish for entertainment purposes. This has recently also become a hobby among people. Some many advances and innovations made this increasing demand easier, and the machine for feeding animals and their surveillance was one of those inventions. There are five key elements in the environment around us. The earth, water, climatic conditions, natural flora, and types of land. The most important thing for people to survive among these waters. The survival of other residents is also significant. For public health purposes, clean and readily available water is essential for bathing, domestic use, and the processing of food or leisure purposes. It is also very important that we ensure the balance of water quality. Otherwise, human wellbeing will be seriously damaged and the ecological equilibrium of other animals at the same time affected.

2.2 Related Work:

The machine functions as a fish feed system and is operated by a smartphone. The designed system is equipped with Arduino MEGA and NodeMCU controllers. The NodeMCU Wi-Fi networking is used to manage operations between the handset and the device. In order for a water pH value to be detected and showed by the fluid crystal display, the pH sensor is used (LCD). The coding is done by Arduino Software IDE, while BLYNK is used for developing Android operating system software applications. The device has been developed to track and manage, via mobile android applications, the pH value suitable for types of fish life. This research is relevant to the advancement of the framework IR4.0 to help fish pets. This initiative, which leads to the economic impacts of the region, can be used to sample the bigger fish breeding project in a pond.[1] This paper suggests the FishTalk method using aquarium sensors to drive actuators in real-time based on the IoT approach known as IoTtalk. We define the relationship between the sensors and the actuators of the aquarium and set the threshold. Intelligent regulation can be used easily for different water conditions by the designer. Our approach. For instance, we are using a smart fish feeding system that does not allow fish to be fed or fed over, and the fish owner can at the same time watch fish eat remotely. An analytical model, simulation, and calculation tests have also been created to examine the impact of IoT message delays and failure on the regulation of water quality.[2] Owing to the size and financial pressures, conventional offline aquariums have decreased. This article uses OpenCart to build a smart recommendation framework for online aquariums. OpenCart is a PhpStudi optimized e-Commerce framework that consists of PHP, MySQL, and Apache servers. This article first examines literature and then presents the techniques for designing and implementing the whole structure. A smart recommend system then uses alliance rules and k-means to support and recommend useful items for users automatically.[3] The method is interpreted as the Laravel architecture while the Firebase is interpreted as the database administration system. The Android has a strong interaction with the user as its front end. Arduino microcontroller and feeding prototype instruments are used to incorporate automatic fish feeding systems. The Fuzzy Logic controller approach was

used for this analysis. The platform functions well both in terms of the controller and pushes data with the development of the smart fish feeder prototype. In smart fish feeds, the results of the measurement of fish feed length using the Fuzzy Sugeno Algorithm were implemented successfully. [4] The study has introduced a modern electrical valve aquaculture system, which is referred to as the vertical aquaculture system. The electrical valve is intended to control the flow and keep the aquarium water constantly temperature. The electrical valve is automatically closed to avoid the inflow of water after the necessary water depth and the required temperature level. This electric valve is operated by tank level sensors and temperature sensors. Self-cleaning and reduced aquarium operating costs are the benefits of the electrical valve. A microcontroller is used for this operation. This electrical valve is specifically designed to satisfy the vertical aquarium energy management system specifications (VAEMS). [5] The designed framework is used with Arduino MEGA and NodeMCU controllers. NodeMCU Wi-Fi networking is used for controling the process between the handset and the device. The pH sensor is used to detect the pH value of water and show the value through the Crystal Fluid Monitor (LCD). The code is developed for the Arduino Software IDE while the BLYNK software uses the Android operating system to develop software applications. The device is programmed to track the pH of the fish life form and regulate fish feeding from an android smartphone. These study are essential for the construction of IR4.0 systems for fish animals and for a major fish breeding project in a pond, the project that contributes to the country'seconomic effects can be sampled with this project. [6] Of such 46 creature known to be reproductive in the open waters of the United States, about 65 percent is known or suspected to have come from the trade in aquarium fish. A number of aquarium fish farmsfled or were raised, with some imported by aquariums. There have been more than 50 additional, unsettled fish captured in the wild, particularly aquarium species. These presentations were not limited to so-called "Sun Belt Nations," but were conducted in theUnited States, with existing communities. Since many introductions have had and are mostlikely to do a lot of harm to indigenous species, the aquarium fish industry and trade musttake action to curb such releases. It is relatively inexpensive to do this. In order to limit

the introduction of aquariums, industry has to support public education.[7] Many study groups of zebrafish usually do not disclose the pH of husbandry under methodologies, nor do many research papers report the pH of drug therapies. This unknown element may play a major role in the differential effects of medicinal products. Therefore, in the case study we examined the effects in the alteration of pH of a number of misuse drugs and evaluated locomotive modifications linked to a particular drug concentration in various pHs. In the pH ranges widely used for zebrafish farming, we observed that a modification of a single pH unit was adequate to modify locomotive operation at set drug concentrations. In order to decide the bioavailability several pharmacological agents rely on environmental factors including pH. Efficacité is based on the level of ionization for several types of drugs in which changes to untouched organisms will easily affect biological membranes of drug crossing. Therefore, in husbandry and in medication therapies, we advise users to record pH to increase replicability and inter-study comparisons. [8] This paper suggests a method called FishTalk using the Aquarium sensors to move actuators in real time based on an IoT approach called IoTtalk. We define the connection between the aquarium sensors and drives and provide specific examples of the threshold environment. Intelligent regulation for different water conditions may be easily deployed by the designer. For instance, we have a smart fish feeding system, such that the fish is neither over nor fed, and the fish owner may even enjoy seeing fish eat from a distance. We also developed an analytical model, simulation and calculation experiment to examine the impact of delays and failure of the IoT message on the regulation of water conditions. [9] Most aquarium fish exist in a closed environment such that chronic and devastating effects of toxins can take place. Most toxicity incidents are due to husbandry and tank repair failures. Poor water quality kills more fish than infectious agents, making customer education for aquatic professionals a very effective precautionary measure. A discussion on water safety, chemotherapeutics, pesticides and household compounds is included in this report.[10]

2.3 Comparative Studies:

After the work is done, the machine will create an ideal world that is simulated in the actual environment from which the fish come. The system also monitors a series of critical parameters including temperatures ranging from approximately 20 to 30° Celsius, pH approximately 7, oxygen dissolved, water filtration, humidity, and feeding phase that should be preserved for nearly all types of fish from approximately 20 and 40. The framework offers several features:

1. A safer aquarium habitat filtering scheme.

2. The parameters of temperature, humidity, water level, dissolved oxygen level, water filtration, and PH are regulated automatically and maintained in the proper range.

3. A method of supplying foodstuffs.

The device contains three sensors that quantify significant variables, such as pH, conductivity, and temperature since we know that these variables are significantly affecting the health of fish. Furthermore, there are four separate actuators for maintaining the water status in the kit, such as the water cooling or heating, to maintain a correct water temperature. It also provides a web-based program that saves all collected data to be downloaded on the personal phone or laptop of the user. It is not the current system, since it has a more efficient filter mechanism that retains water clean for a long time, and a controlled feeding procedure for the arrangement of feeding fish in the aquarium. The system uses a display system that shows all the machine details to provide information about the various factors that may influence the health of the fish rather than a web application. This device also provides protection and security, since it can only be used by the user following the application of a certain authentication saved in system memory to adjust the humidity and temperature level of the system earlier.

2.4 Challenges:

In our research work, we tried to find all the sensors and components according to our work. But during this pandemic situation, we are not able to find all the components. We have made most of our system, two components we want to add with our project but those are still not available in the local market. So we have to order those components from abroad. We also faced some difficulties while doing the project. We have to monitor manually the Automatic food disposer that if it is working on time and properly. Monitoring the water level and temperature was another challenge we have manually measured the temperature by the time being to ensure our device is performing well and give us accurate results.

2.5 Scope of the Problem:

For the past 20 years, possession of animals has steadily increased. The most common animal is freshwater fish after cats and dogs. It is a very challenging job to maintain fish aquariums. Whenever you have to vacuum or feed your fish, you have a lot to do. You must disconnect the control head/air pump in your aquarium and manually feed it and turn the air on again after an hour. The project we started with is an artificial fish tank, the Smart Aquarium. The project is nowadays more effective than the systems on the market. It would also be less expensive in addition to performance. The party is engaged in keeping fish in their homes or workplaces and has little time to attend to or is concerned that they will have to ask their neighbors in their absence to take care of their fish. The project is an integrated fishing device. It replaces the manual cleaning and automatic features of the fish tank. It monitors and maintains physical improvement in the water in optimal conditions with necessary modifications. Both measures including temperature management, pH control, lighting monitoring, feeding, water refresh, etc. will be performed automatically by the aquarium. The objective is to replace manual fish tank care with an automated system.

CHAPTER 3

Methodology and Requirement Specification

3.1 Methodology

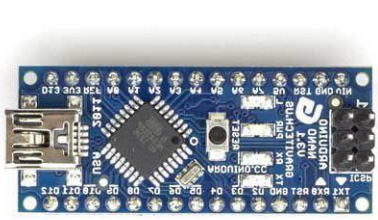
Water consistency in an aquarium is difficult to monitor; fourthly, water is difficult to alter in an aquarium; fifthly, pH importance, oxygen content, and water turbidity in an aquarium can be monitored with difficulty. The pH value, oxygen content, and water turbidity are three parameters that are hard to track. The researchers are able to devise practical goals based on the problems and draw up a proposal to create a prototype system to measure aquarium water quality using IoT. The oxygen level in the water reduces as pH levels become acidic or alkaline as the water is polluted. Research suggests that when the temperature of the water is too high or too cold, seafood is vulnerable to Carp viruses. Goldfish are vulnerable to brain tissue-related diseases under unusual or high water temperatures. The goldfish is to die as the aquarium water temperatures do not satisfy the conditions the fish need to survive in. Problem research was performed using the 5W1H approach to identify the consumer specifications. The researchers provide a better understanding of this methodology of the product characteristics and characteristics of the market.

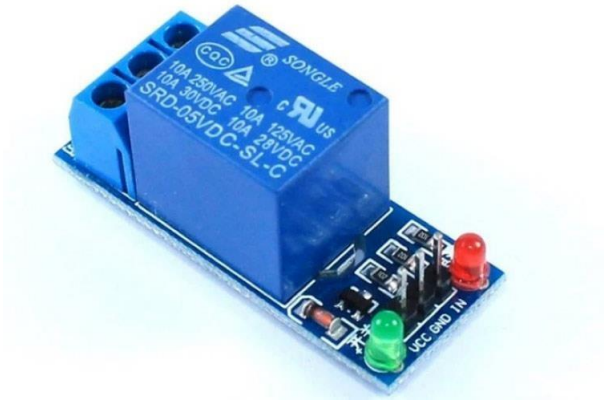
3.1 Requirement and workflow

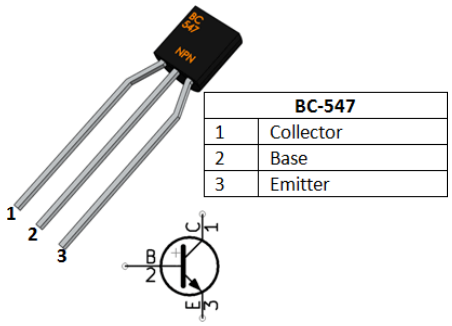
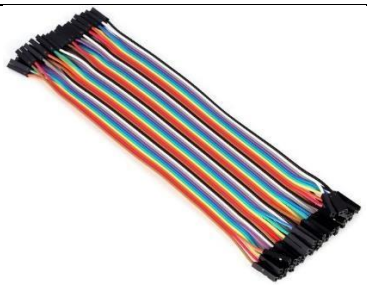
From the workflow given below, the criteria for this research can be understood and clarified.

Required components:

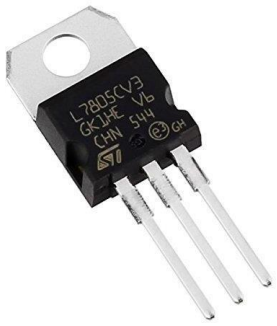
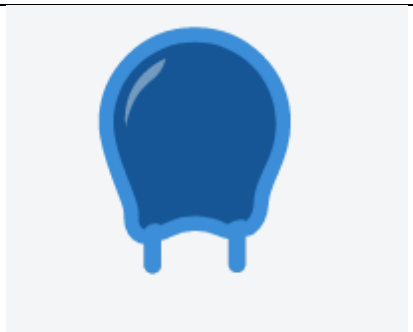
Table-1: List of Components

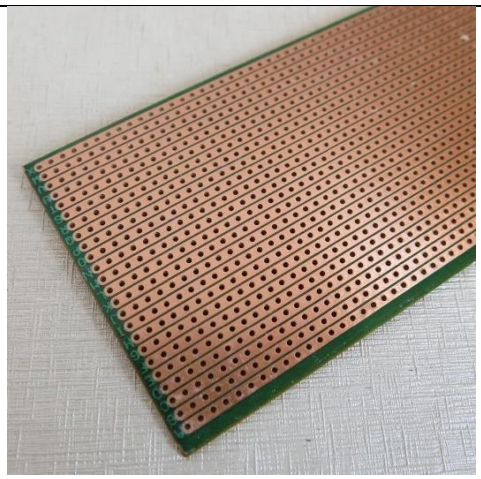
Component name	How it works	Image of the component
Arduino Nano	The Arduino Nano is a lightweight, full, and easy-to-use ATmega328 based board (Arduino Nano 3. x). The Arduino Duemilanove has almost the same features but in a different box. There are just one DC power port and a Mini-B USB cable rather than a regular one.	
Ultrasonic sensor	A sensor is an electronic device that measures the distance of an object with ultrasound waves and transforms the sound into an electrical signal. Ultrasound-waves accelerate more quickly than the detectable sound speed.Two key components of Ultrasonic Sensors	

	are the transmitter and the receiver	
Servo motor	A closed-loop mechanism with position feedback is a servo engine that controls the rotational or linear velocity and position. The motor is operated by an analog or digital electrical signal, which specifies the movement quantity that is the shaft's final control point.	
Relay module	The relay is the instrument that opens or closes contacts so that the other electrical control is controlled. For an allocated area, it senses the unpleasant or unwanted situation and gives the interrupter command to disrupt the area impacted.	
LED	To enable an LED to be activated, the Arduino must send one of its pins a HIGH signal. To disable the LED, a LOW signal must be sent to the pin. The length of HIGH and LOW states can be	

	adjusted to allow the LED flashes.	
BC547 Transistor	The BC547 is an n-p-n transistor such that when the baseline pin is kept at ground level and closed (forward-biased) when the signal to the base pin is given, the collector and the emitter will be left open.	
Jumper wires	Jumper wire is a wire or group in wiring, with a socket or pin (or occasionally with no wire, merely tinned), usually used to interconnect the breadboard or other sample parts or testing	
Water Pumps	Pumps, like powerheads, perform two important functions: development and aeration of streams and water movement by different peripherals such as sumps, filters, skimmers, etc. They also work in coral tanks as wavemakers	

Temperature Sensor	A temperature sensor is an electronic instrument that monitors its environmental temperature and transforms input data into electronic information for recording, monitoring, or signaling adjustments in its temperature. Temperature sensors have several different styles.	
100-watt bulb	Watt is the electricity unit for generating or using energy. So it draws 100 watts of electricity each second when you switch on a light set containing a 100watt bulb	
AC fan	To reduce the fan's rpm, you can use TOROIDAL TRANSFORMER for lower voltages. It would not hurt fans by supplying fans with a lower voltage	

Fluorescent bulbs	Fluorescent lamps are also advised to provide natural light to improve the color of fish, for both freshwater and saltwater tanks.	
pH sensor	A pH sensor helps calculate water acidity or alkalinity between 0 and 14. The water begins to get more acidic as the pH value falls below seven. Any figure higher than seven is more alkaline. To calculate water content, each type of pH sensor operates differently	
7805 Voltage Regulator	7805 Voltage Regulator, a part of the linear control system 78xx to preserve these variations, is a common integrated circuit for the voltage regulator (IC).	
Capacitor	To start and time a constant voltage charging a condenser through a series of resistors uses a HIGH digital power pin collection.	

Resistor	A resistor is a passive electrical two-terminal part and is a circuit feature with electrical resistance. Resistors are used in electrical circuits for reduced current, adjusting signal frequencies, dividing voltages, activating components, and terminating transmission lines, among other applications	
Veroboard	It is a general material for the construction of electronic circuits - different fromPCBs since several electronic circuits can be built utilizing a regular cable board. There are parallel strips on either side of the stripboard of the copper track	

- **Circuit Diagram:** By combining all the components we have completed the final circuit and it is working properly.

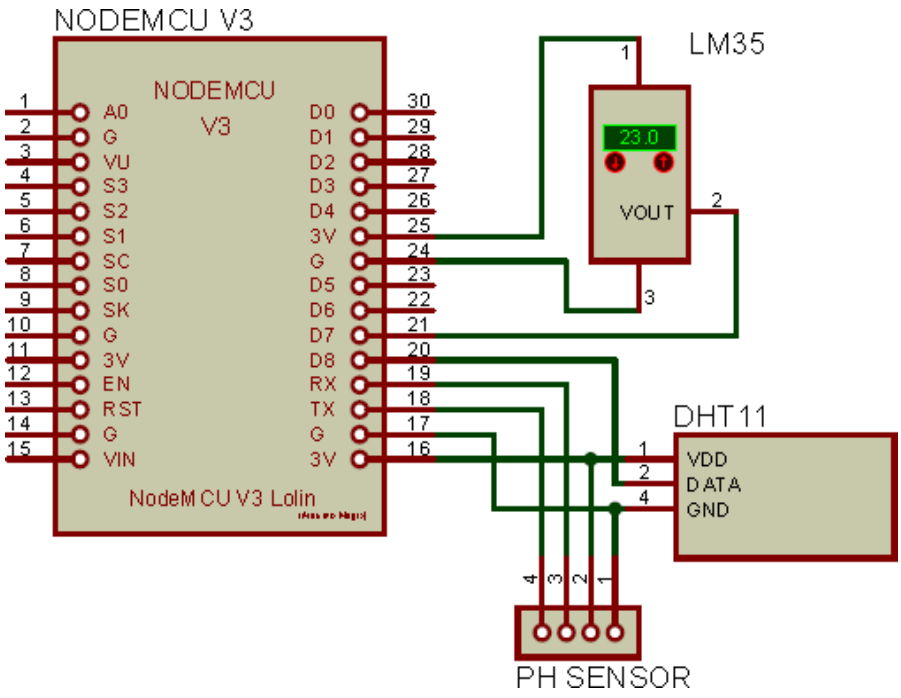


Figure 3.2.1: Final circuit diagram

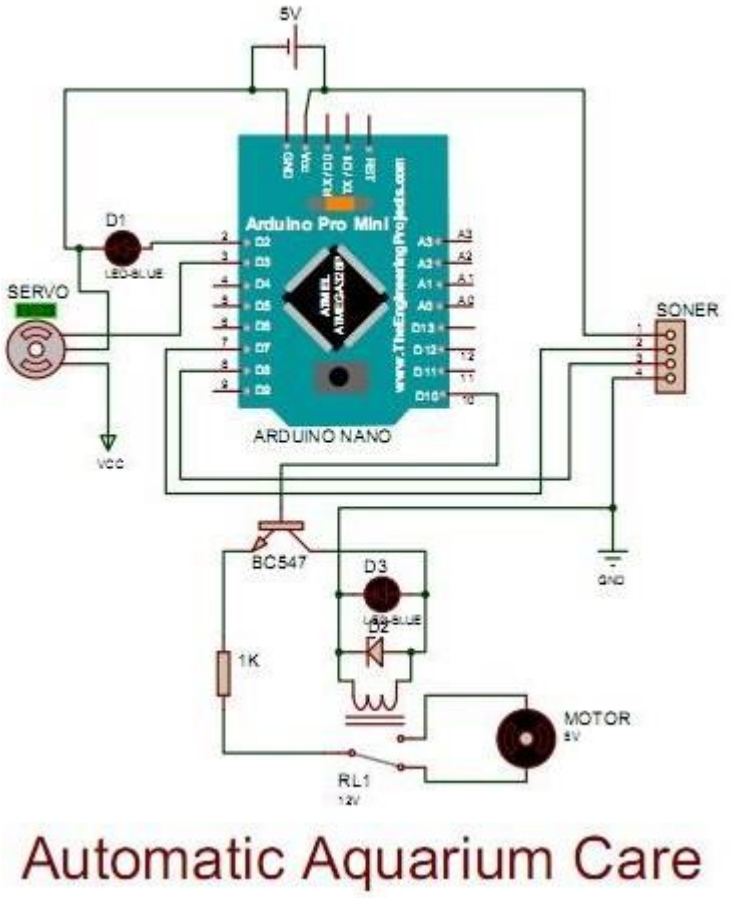


Figure 3.2.2: Final circuit diagram

In the future, we have a plan to add some more sensors to make a better-automated system. The Prototype system is now completely developed, but before it is placed into use, its functionality and reliability must be checked and evaluated. There have been two ways of measuring the system, namely components and user acceptability checks. The Prototype system is now completely developed, but before it is placed into use, its functionality and reliability must be checked and evaluated. There have been two ways of measuring the system, namely components and user acceptability checks. The circuit growth, usability, and safety checks were carried out on each unit of the system. The sensor modules are attached to an entire Arduino circuit. There were also tests to make sure the circuit works correctly. The tests were reviewed by an expert. The pH sensor was tested under three

conditions. As acidity is seen by the pH of the stream, the green LED lighting indicates a hazardous pH status. The pH of the aquarium water is shown. If the water's pH is optimal, the correct pH read values are shown. It doesn't turn on the green LED and the display shows it's clear. At medium, optimal, and high-temperature settings the temperature sensor measurements were carried out. In the morning, from 10 am to 11 am, the optimal temperature measurement was carried out. At night around 10 pm, the low-temperature test was conducted. The temperature of the water is poor at night while sitting is affected by the environmental temperature. At 1 to 3 pm, high-temperature testing was performed. It was observed that the temperature increased.

Ideal values and threshold values:

pH:

Waters Ph(hydrogen power): The pH is a solution acid-base equilibrium determined in the range of 0 to 14. 7.0 is called neutral. Most tropical fish in freshwater aquariums have a pH of 6.8 to 7.6. pH 6.5-8.0 is a healthy supply of freshwater trout. The pH value of acidic solutions is less than 7.0. The pH rating of basic solutions is more than 7.0. Bacterial nitrification under a pH of 6 is observed. As pH falls below this amount, the aquarium may absorb ammonia and nitrite. For instance, if your aquarium has a pH of 6, the acidity is 10 times higher than the acidity of a 7-pH-tank. Or if it has a 5 pH, the acidity is a hundred times more than a 7 pH level.

(pH) results

1) 4.0 Fish dies due to acidity.

2) 4.0 --- 5.0 fish do not breed.

3) 4.0 --- 6.5 fish grows slowly.

4) 6.5 --- 6.0 fish grow well.

5) 6.0 --- 11.0 fish grow slowly.

6) 9.5 --- 11.0 Fish are not bred.

7) > 11.0 Alkaline causes cause the death of fish.

Preferred pH of Common Freshwater Fish:

• Angelfish 6.5 - 7.0

• Clown Loach 6.0 - 6.5

• Goldfish 7.0 - 7.5

• Harlequin Rasbora 6.0 - 6.5

• Hachetfish 6.0 - 7.0

• Neon Tetra 5.8 - 6.2

• Plecostomus 5.0 - 7.0

• Silver Dollar 6.0 - 7.0

• Tiger Barb 6.0 - 6.5

• Zebra Danio 6.5 - 7.0

PH impacts in the aquarium:

High alkaline: pH variations in the aquarium can have significant health effects on your fish, even though they are few. High alkaline water, also known as simple water, may impact the gills of your fish. Check your pH if your fish dart back and forth is a typical sign of high alkaline and can lead to fish death. Check your pH.

High Acidity: The formation of excess mucosa by your fish could be caused by an acidic aquarium. This is due to a rise in acidic aquarium water radioactive elements. Fish gasping, hyperplasia (skin and gill thickening), and eye injury may also be seen. Other symptoms include Fish death can occur, as with high alkaline.

How to lower pH in aquariums:

• To generate the desired pH and buffer, use reverse osmosis (RO) or deionized (DI) water. Before applying it to your aquarium still make water and pH-test.

• Decorate a live driftwood aquarium. The driftwood-released tannins can contribute a lower pH, but remember that the desired result is due to a reasonable amount of driftwood.

One or two small parts, in particular in a large or heavily buffered Aquarium, can do nothing.

• Fill your filter with peat or peat pellets. Tannins containing less pH like driftwood have tannins. Using a mesh medium bag to keep it and only use turf materials for aquariums. Recharge to retain the optimal pH as required.

Some methods to lower pH:

- Peat Moss
- Driftwood
- Cappella Leaves
- Reverse Osmosis

To increase pH in aquariums: To provide the desired pH and buffers, use reverse osmosis (RO) or deionized water (DI). Before applying it to your aquarium still make water and pH-test. Use gravel for substratum, crushed coral, or dolomite. Over time, these gravels dependent on calcium carbonate degrade and buffer the pH. Decorate with calcareous or coral rock your tank. Use safe quantities of calcium carbonate rock to produce the desired effect, as with driftwood for pH reduction. Put your mesh medium bag in your filter with broken coral or dolomite gravel.

3.3 Checking Maintenance:

The pH should be checked at least once a month, preferably every two weeks, before patterns are detected. For future reference, test results should be stored in a logbook. Recall that since pH can vary on a time of day basis, research can produce varying outcomes at different times of the day, even if nothing is wrong. Therefore, the evaluation should be carried out on the same day, preferably in the afternoon. Testing the water before buying new fish is also advisable. In the shop you buy the fish, check to see what their pH is. The pH of water the fish currently have mustn't vary considerably from that of your home water (preferably within 0.2 units above or below the home pH value).

3.4 Monitoring and other Influences:

There are some ideal values and influences that should be checked properly.

• pH level will vary before and after changes in the water, particularly if the pH of aquarium water varies and the aquarium itself

• Driftwood can soften pH

• Adding CO2 will reduce pH

• High nitrates will cause the pH to drop

• Pollutant and waste in the water is reduced pH

• broke coral (substrate or ornament).

• The pH of the aquarium can change before and after water changes.

CHAPTER 4

Requirements, Measurement, Factors, and Output

4.1 Different factors for aquarium care:

Temperature:

• Fish at the best temperature in 75-80°F (24-27°C) would be more stable.

• The optimal temperature depends ultimately on the aquarium fish types.

• 80°F as the ideal reef temperature.

Bacteria die at 95°F (35°C), which can cause spikes of ammonia. Lower temperatures make microbes less aggressive, making our tank much longer to cycle.

• Warm water has less oxygen than colder water. 32°C (90°F)

• These fish can become weak and slow at lower temperatures and many may die quickly.

• Fish in cold water: Like goldfish, under 68°F (20°C)

• Fish: 75-80 degrees F (24-27 degrees Celsius) •Temperate fish: a broader temperature spectrum frequently overlapping the types listed above.

• Tropical fish do well between 75° and 80°F for example

• Goldfish and other species in "cold weather" prefer below 70°F.

Now that we understand how critical it is for our fish to sustain the right water temperature, let's see how it can be achieved:

• Avoid putting your aquarium next to sunny windows, external doors, air conditioning, and heating ventilation systems, fireplaces, and water temperature-resistant areas.

• Select a quality heater built to accommodate the tank size. (More than one heater may be needed in large aquariums.) Use the Aqueon Heater Guide to pick the correct

aquarium heater size. Make sure the ventilation around your heater is sufficient to ensure even distribution of heat. (This also extends the heater's life). Install an exact thermometer and constantly inspect it to ensure that the heater keeps the same temperature. •When exchanging water, match your aquarium as closely as possible to the temperature of the replacement water.

Ammonia:

• Safe amount of ammonia is null. (0)

• It starts at about 0.05 mg/L to cause unionized ammonia and death at about 2.0 mg/L. Please be careful to note that most test kits measure total ammonia and do not use unionized ammonia.

In freshwater aquariums, ammonia is extremely poisonous. In coral and saltwater habitats, it's much more toxic because of higher pH. The greater the pH, the more the ammonia gas that is considerably more poisonous, becomes extremely soluble.

Ammonia should be checked once a week during the cycling cycle. After a well-managed aquarium has been developed, no ammonia levels should be detected. If ammonia is present, aquarium maintenance should be checked to ensure: • The biofilter is sufficiently broad.

• No cleaning is essential for the biofilter.

• Not overeating the aquarist (based on what the biofilter can handle, not what the fish will consume).

• Not overboard the boat.

• Not that disgusting is the tank.

• Biofilters are not clean enough (vigorous cleaning of the biofilter will remove nitrifying bacteria).

• The biofilter has not fallen in alkalinity, or pH and has adverse consequences

• No chemical products destroyed in the biofilter have been used.

Dissolved Oxygen:

• Most fishes need to get DO "5 ppm." Dissolved oxygen:

• The best DO degree of water is 7ppm.

• If DO levels are below 5ppm, fish are expected to exhibit astonishing growth, a greater infestation, and a lower conversion rate into energy.

• It is known to be necessary for most aquarium inhabitants to maintain a dissolved oxygen concentration of 5-7 parts per million (pm = mg/L).

• DO levels impact the various chemicals and water pollutants. Like Cd solidifies and sinks out of the water body in the presence of oxygen. In the lack of oxygen, the water would dissolve and the secondary would cause damage in fish through products.

• Based on Dissolved Oxygen the concentration of nutrients is altered as if in water, "phosphorus," very little DO is seen, leaching out into the water and leading to phytoplankton populations.

Low Oxygen:

Low Oxygen: The number one cause of low oxygen in an aquarium is overcrowding. Indeed, if the aquarium is not already over-alloyed, such oxygen appeasing causes seldom cause death alone. That does not mean that all factors should be overlooked, but that the correction of other factors would not fix this problem in full if the aquarium is over-spread.

• Overpowering

• Elevated temperatures of water

• Mismotion of water

• Excess collection of waste

• Low illumination of live plants

• Apply some chemical substances

4.2 Implementation Requirements:

- Components
- Arduino
- Windows 10 operating system

4.3 Output of our device:

This is how our device is working and will generate results:

1.An automatic food disposer will provide fish after every 6 hours. 2.An

automatic water level controller will keep the water level constant.

3.An automatic temperature control device will reduce the water temperature by turning on a fan when the temperature rises above 30. When the temperature drops below 25, a 100-watt bulb will turn on the temperature.

4.An automatic system will keep a fluorescent light on for 6 hours a day so that the aquarium plants can grow properly.

5.The device will be fitted with pH, TDS, ammonia sensors from which the data will go directly to the app of the phone. The user will be able to see the water quality from the phone and will also give some suggestions to improve the water quality.

6.The mobile app will provide all kinds of information about aquarium fish so that users can easily know how to raise fish.

CHAPTER 5

Impact on Environment and Sustainability

5.1 Impact on Environment:

We are trying to create automated aquarium care. There are no bad impacts on the environment from our device. There are no such components that can cause problems. And we have a plan to add some more sensors and more components to make this automated system more accurate.

5.2 Sustainability:

As you have already told about that we have some limitations during this pandemic situation to get all the necessary sensors and components, but we have plans to bring some components from abroad. And in our plan we have some plans to create this automated system more improved and with some more features to get an efficient system and device.

CHAPTER 6

Conclusion and Future Scope

In this part, we list our decision and conclusion. Here we explore the scope of the future and how it might have been best.

6.1 Conclusion :

Overall, researchers have noted that it has succeeded in developing the prototypes measuring the water content of aquariums using IoT; it can also be used to track aquarium water temperature, pH, and turbidity following consumer needs.

6.2 Future Scope:

1. Dissolve Oxygen Measure: Maker of the water-quality sensor, delivery types: O_2, pH, COD, BOD, etc. Many types, online, handheld, laboratory analyzer, low-priced high accuracy. Manufacturer. - Manufacturer. Direct Sales Factory. Customization support. Support. Business 24-hour.

2. Automatic PH controller: Operations such as CO_2 added to water can be easily monitored and managed by pH value, depending on the pH value.

The pH seramic control measures the pH value of the aquarium water and checks the modified parameters for the associated CO_2 fertilizing device. The device to be controlled is attached through a socket to the seramic pH controller, the target pH range is set and the seramic pH controller controls it autonomously and efficiently.

3. Observation camera: A Webcam for Aquariums is a tiny camera connecting to your home wireless internet and when you link to your camera.

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