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Smart Aquarium Monitoring System Using IoT

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Abstract: ***Smart aquarium monitoring system is an automatic system that is taking care of the pet fish in the aquarium is a tedious process and should be properly set up and maintained in a healthy manner or else the fish will be destined for an unpleasant and short period of life. Therefore, it is critical to monitor aquarium conditions and improve the water quality of the mini aquarium tanks. Fishes require the utmost care, they need some specific conditions like a temperature level, pH, and suitable oxygen. The aquarium in which they are kept should contain proper monitoring parameters to keep it in good health condition. The parameters include automatic fish feeding motor temperature, pH, and dissolved oxygen level indicators. They can be accessed through a database that stores the values determined by the indicators where we can connect the database to the developed IoT mobile application and get information in mobile. This reduces human effort and errors in owning an aquarium full of aquatic animals and prevents unusual death of fish.***

Keywords: Arduino, database, pH sensor, Temperature sensor, Dissolved oxygen (DO) sensor, Total dissolved solid (TDS) sensor, reverse osmosis (RO) & ultraviolet (UV) sensor

I. INTRODUCTION

Nowadays the pets are increasing and people are keeping all types of pets. There is high bonding between the pet and the humans. All pets need the intense care but humans are failing to reach their needs. By this, the death rate of fishes can be reduced by the smart and automated system of aquarium is very much necessary. So, the aquarium should be frequently monitored and cleaned. All of these animals require special care and sometimes humans cannot attend to their needs, so it should be monitored properly to keep an aquarium in a good health condition. They have used Arduino Mega as the microcontroller connected with the Wi-Fi module and RTC module. There are some of the sensors which help to perform the aquarium tasks such as dissolved oxygen sensor, temperature sensor, pH sensor, Electrical conductivity sensor, water level sensor , total dissolved solid sensor and many more as the sensors which is connected to the NB-IoT. Here, the internet user gets the access from the center platform to monitor the fish aquarium by IE or mobile software. The control of the oxygen adding, warmer and filtering equipment by alarm output of the video server.

1) The strong connection between pets and their owners is evident.
2) Animals require special care and sometimes humans cannot attend to their needs.
3) Likewise, fishes require the utmost care, they need specific conditions like a temperature range, pH, and suitable oxygen.
4) The aquarium should contain proper monitoring parameters to keep the aquarium in good health conditions

II. SMART AQUARIUM MONITORING SYSTEM

In general, the aquarium monitoring system consists of various sensors such as pH, temperature, DO sensor, TDS sensor, and many others. these sensors are connected to a microcontroller and the microcontroller controls the operation and gets data from sensors, compares the data with the standard values, and sends the observed data to the user through the help of the internet. Along with the advances in IoT technology, the smart aquarium monitoring system is becoming smarter with ease of operation. Figure 1 shows the general block diagram of smart aquarium monitoring system.

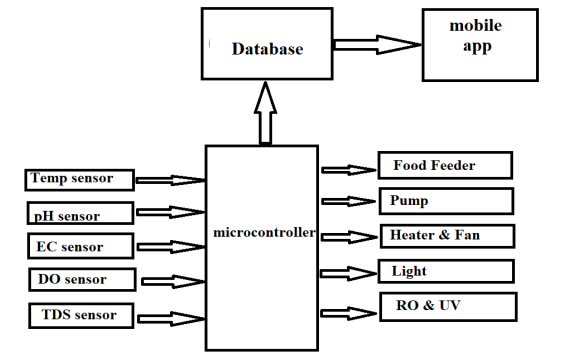


Figure 1: General block diagram of smart aquarium monitoring system

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III. LITERATURE REVIEW

Ahmad Kamal Pasha Mohammed Daud [1] introduced a sample of the Smart monitoring of aquarium by means of IoT. It uses different types of sensors to obtain the values of aquarium parameters and monitor them. The system functions and monitors the cleanliness of aquarium. This simple method of making the system of feeding the fish simpler. and it can be operated by the handset like smartphones. Here some of the sensors like pH sensor is used to detect the pH value of water and the value that is measured can reach users by the Liquid crystal display. The characteristics of this Smart aquarium makes monitoring of aquarium user friendly. The pH value detector by LCD display helps the user to take necessary monitoring actions like change of water etc. This pH display gives an idea about the quality of water like whether it is fresh or salty. Smart aquarium monitoring system basis on IoT helps people in monitoring the fishes in a better way. The main attribute of this developed system is that it can be tracked from anywhere by smartphones.

Prof Arun S tigadi, Tejaswini khilare, Nayan kesarkar, Zaid kittur, tejas kambal published this work. In this perspective, the water quality control and temperature monitoring, amount of lightning required, fish feeding, filling and un-filling of aquarium water is all automatically monitored by the software application in the controller. By this the user can access various values of parameters. This system provides a mobile app for easy access to the controller using mobile. The main aim of this system is to design and develop an aquarium controller that manages various situation of the aquarium such as lighting, feeding, water flow and temperature. The project is an automatic system which monitors aquarium in healthy manner. It eliminates disadvantages of manual maintenance of the aquarium with its modern monitoring approach. This is better way and user friendly. This project approach has created more demand in market by its smart features regarding taking care of fishes. This also saves our time and can also be implemented for the long-time monitoring of aquarium system.

Akash Ram S had proposed the project with the title smart aquarium monitoring system. As the fish care takers cannot feed their fish when they are in out of station which leads to lack of availability of food, poor quality of water, thus it is necessary to look after the starvation of the fish. An IoT Based system is Implemented to monitor and it delivers the status of aquarium this monitoring manages water quality and also the physical variation in the aquarium by performing various operations like humidity, temperature level, light monitoring and feeding automatically, aquarists also check the feed conditions and takes the necessary steps. here the food feeding is done for 3-4 times a day and cleaning of water is also done periodically water cleaning unit also includes the salinity removal as well automatic detection. which is the wireless network application for a large-scale aquaculture aquarium. This is using wireless network application and water quality assessment unit for large-scale aquaculture.

Authors Nesa hanum harani anggi, sholihaher sadiah and Anny Nurbasari had developed a project with the title a smart fish feeder using Arduino uno using fuzzy Logic controller and with the help of this with the owner of the fish can adjust the feeding schedule easily according to the dosage assigned to it. water turbidity and feeding according to time basis are the two important parameters for the fish farming. temperature parameter is also one of the important parameters to know about the temperature and oxygen content in the Aquarium. it is approximately estimated that the temperature is in the range of 23-30°C since fishes are poikilotherms, they are classified according to cold water habitats and warm water habitats. And the tolerance of the fish in warm water to turbidity is higher than cold water habitat fish and gives a maximum response during the feeding process. added to this fish's immune system also works optimally on these conditions, the innovative technology is used for the fish farming specifically for fish farming. And a smart fish feeder using a microcontroller that is Arduino as a microcontroller which serves as the main part of this system.

The authors Walter Leal Filho, Yinchi Ma, and Wen Ding with the title Design and implementation of aquarium remote automation monitoring and control system. At present, people opt fishery for their recreation purpose. There are many varieties of ornamental fishes which is used in the aquarium. The control modules such as oxygen adding equipment, filtering equipment, light and monitor modules such as temperature sensor, charge couple device sensor is connected to input-output control unit and data service unit and they are connected to internet and stored in cloud. In this paper, they have made the complete design of the automation monitoring and controlling of the aquarium. The main and uniqueness in this paper is that they use Imagine World center platform software. Here, the internet user gets the access from the center platform to monitor the fish aquarium by IE or mobile software. The control of the oxygen adding, warmer and filtering equipment by alarm output of the video server.

The authors Yi-bing lin and Hung-Chun Tseng [6] with the title Fish talk: An IoT-based Mini Aquarium System published This work. Here in Fish Talk, we have come across the IoT solution for the aquarium tasks. There are some of the sensors which help to perform the aquarium tasks such as dissolved oxygen sensor, temperature sensor, pH sensor, Electrical conductivity sensor, water level sensor , total dissolved solid sensor and many more as the sensors which is connected to the NB-IoT based control board and the actuators such as food-feeder, pump, heater, fan, light, UV, RO filter and many more which are connected to the IoT platform and both the actuators and sensors are connected to the database or to the cloud and the results are projected in the mobile

application. In this paper, the aquarium is automatically cleaned, and the basic features which is required are integrated and setup in the single model.

Mohammad Abdul Hye, Md Manjural Akter et al authors[7] with the title a Novel Design and Implementation of Automated Feeding Mechanism in Fish Aquariums published this work. In this paper, there is an automated fish feeder, which feeds the fishes time to time without any human interruption. Here they have used the keypad, microcontroller connected to website, power supply, motor, display, and the food dispenser. They have used Arduino Mega as the microcontroller connected with the Wi-Fi module and RTC module. The database stores all the information about the timings and display it in the LED display. In this paper, they have taken food feeder as the main topic of the project and the user can use manual control or by website to give the inputs. Here, the device is easy to operate and budget friendly. In the future work, they are planning to design the sensors and make it automated and the smart aquarium monitoring system.

The author Fares Ahmed Zahid Shaikh and Utkaarsh Bhaskarwar created a smart aquarium monitoring system which takes care of the fish automatically and increases the ability to monitor the fish's health and also takes care regarding the parameters which is required to maintain the aquarium. It is essential to maintain proper pH value, temperature parameters, and also the water level and this process has been controlled with the help of IoT application, this monitors the parameters, and also visualizes the data, and even controls some of the feature manually, over the IoT application which is implemented in this smart aquarium monitoring system. And the thermistor-based sensor is used that is capable of monitoring water temperature. ESP8266 is a Wi-Fi module used which facilitates an application or internet. Another important feature is the mechanical design and implementation of the fish-feeding system, which is an original design. It is a simple design. And it efficiently does the job, this design is simple when compared to other complex designs, so this project is efficient, time-saving, and cost-saving. This project helps us in achieving a nearly ideal environment for fishes in an aquarium.

The authors R. Hafid Hardyanto, Prahenusa Wahyu Ciptadi and Andik Asmara [9] developed the system. And this system is frequently monitored by sensors that measures the humidity, light and water level. power source used in this system is solar panels. This system is observed by the users through the internet. Users can control the working of the water pump through a web-based interface. This smart aquarium monitoring system consists of a hardware and the software system. The hardware part consists microcontroller at mega328 and also the sensors that feeds input data to the microcontroller. The sensors that have been used in this article are light sensor which detects the light received by plants water level sensor to monitor the water level and humidity sensor which checks the humidity. The software

Used in this system consists of a web-based interface ant it allows the users to monitor the aquarium system The smart aquarium is a concept of the hobby combining an aquarium with an IoT System

The author Daniel Patrick Hutabarat, Rudy Susanto, and Barry Linando [10] published this work and this system is developed in such a way that it can produce the accurate light intensity which is according to the input given by the user and it is almost 96% accurate. The developed system maintains the temperature of water according to the required temperature and the maximum difference is around 0.4C. Through the cloud the iot application and the ESP32 wi-fi module are connected using internet network. The wi-fi module uses a DS18B20 temperature sensor. The system which has been developed is 100% successful to control the working of the fan and the heater. And it also responds to the change in the temperature. The IoT application covers most of the needs of human life. And its application in the field of agriculture helps in controlling the spraying, weeding and most of the manual mechanisms automatically and reduces stress. The most important thing of this work is that the water quality monitoring system has come up with many advantages like high frequency and mobility. The model that has been developed uses low power. Some of the parameters that measures the quality like hardness, Ammonia, fluoride, conductivity, chloride and iron content. The values which are measured are used to check the cleanliness of water.

IV. CONCLUSION

By the reference of the above published papers, we have come across some of the information about the sensors such as pH sensor, DO sensor, TDS sensor and many more things. The working of this system is used to solve the problems and it gives assistance for maintaining a healthy aquarium.

By using application of IoT, it monitors these values, and visualizes the data and even controls some of the features manually and also through the internet. The design used in these papers are little bit complicated and have a single feature about the project and the future work is also pending. So, we are combining most of the features together in order to come out with smart and automated aquarium for the daily recreation purpose.

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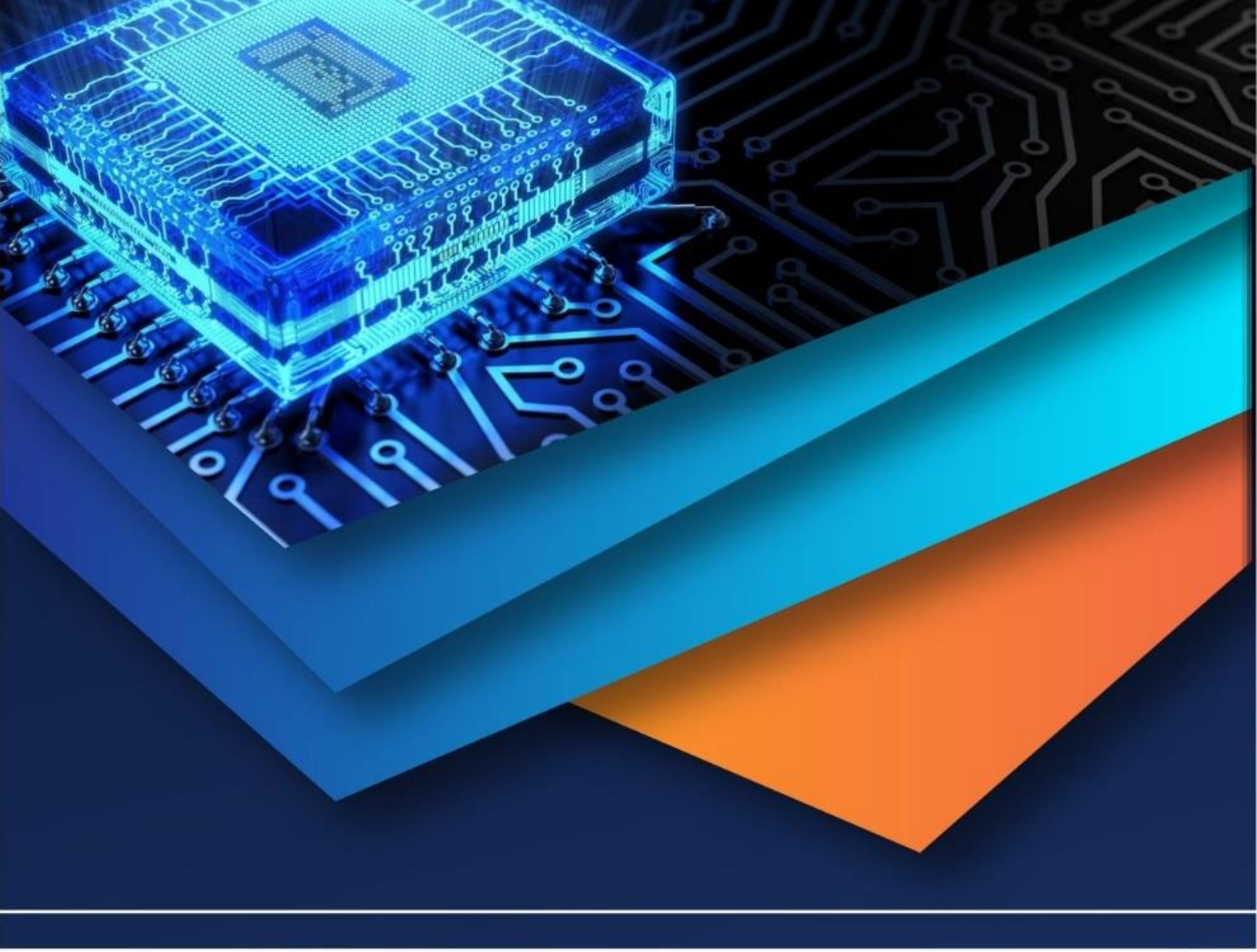
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