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Aquarium Automation Using Iot

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Abstract: *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. Fish keepers or aquarists now would not have to watch out and keep an eye on their Aquarium and Fish again and again. In our approach, the water temperature control, lighting of aquarium environment, feeding of fishes, draining and infilling of aquarium tank are all automatically controlled by a software embedded in an intelligent controller. This system is user-friendly. This project will be more efficient than the system available nowa*days in the market.

Keywords-IOT,NodeMCU,AdafruitIO,Android Application.

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I. INTRODUCTION

Pet ownership has been increasing at a steady pace in the last 20 years. After cats and dogs, the most popular pet is now the freshwater fish. The maintenance of fish aquariums is a very difficult task itself. Whenever you have to clean up your aquarium or you have to feed, you have to do a lot of things. You have to turn off your aquarium's power head/air pump and feed manually and turn on the air again after an hour. In the Current system all equipment's such as light, heater, and filter are to be controlled manually using electrical switches for this the person needs to come near the aquarium and manually control the electrical switches to turn on /off the equipment's. The fishes needs to be fed twice a day even this requires the owner to walk upto fish tank and feed the fish manually which makes the task of maintaining an aquarium much more difficult. At times when the owner is on vacation he has no control over the aquarium and also can't feed the fish.

The project with which we came up is a Smart Aquarium. The project will be more efficient than the systems available in market, now days. In addition to the efficiency it will be of lower cost as well. The project's audience is the group of people interested to keep fishes at home or offices but don't have time to take care of, or they are worried to keep asking their neighbors to take care of the fishes in their absence. The project is an automated system to take care of fishes. It will replace the manual maintenance of fish aquarium with its automated functions.

II. Literature Review

The authors of [1] have implemented an IOT based system which monitor and control the whole aquarium automatically and provide real time status on user's Smartphone application. It contains water quality management in which it will monitor the physical changes in the water and will maintain it to the ideal conditions, with required changes. The aquarium will perform all the steps automatically like temperature control, turbidity level control, light monitor, feeding, water renewal etc.

The authors of [2] summarized the management process or guide for a successful fish culture. The aqua culturist monitors the pond in time domain and takes necessary action. Such actions include feeding, draining and refilling of water, water and temperature level monitoring, while feeding can be done 3-4 times a day, draining and refilling of water is based on the condition of water.

The temperature level of aquarium is critical to the survival of the fish and requires close monitoring. An embedded wireless network and water quality measurement system for large scale aqua culture is described in [3] and [4]. The developed portable water quality measurement units are installed on a floating platform to measure water quality parameters such as dissolved oxygen, temperature. All these units possess wireless communication interfaced to communicate with central unit for monitoring by using mobile app, control and data transfer. The system described in [3] and [4] are not only expensive but also not easy to maintain. It also

does not specify exactly how corrective measures will be taken electronically when abnormal conditions are detected.

III. Objective

Main aim is to make a simple, easily controllable and cheap device which helps to make aquarium owner's life easier. The Objective of this project is to design and construct an aquarium controller that manages many aspects of the aquarium such as lighting, temperature, water flow and feeding.

IV. Problem Defination

Usually Aquarium care takers face several problems in maintenance of health and vitality of Fishes along with the presentation of the Aquariums. Some of the problems faced are changing the aquarium water,feeding the fish, maintaining the temperature of Aquarium and controlling the Lights. So the idea is to minimize the problem of fish keepers or aquarists by shifting it from manual to automatic mode. Fish keepers or aquarists now would not have to watch out and keep an eye on their Aquarium and Fish again and again. SMART aquarium will be there if any problem occurs.

Block Diagram

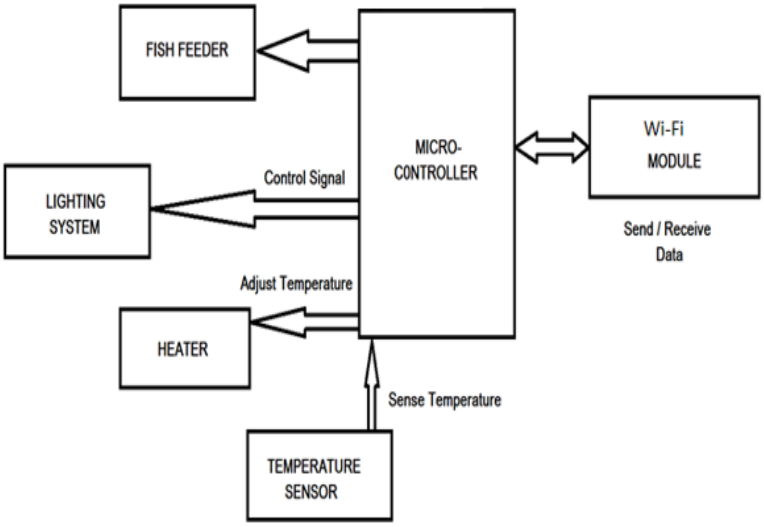


Fig. 1 Illustrates block diagram of IOT automated aquarium.

V. System Architecture

HARDWARE ARCHITECTURE**:** The Smart Aquarium's most components are taken from a normal aquarium such as glass box, filter, heater, and aquarium lights. These components are responsible to maintain clean water, specified temperature of water and provide lighting to the aquarium. The components required to automate this process were NODEMCU, Temperature sensor, Led strip, Float switch, Servo motor and RTC module.

A.NODEMCU:It is an open source IoT platform .NodeMCU is an Arduino compatible ESP8266 based micro controller with on-board Wi-Fi. In our project we are programming the NodeMCU using Arduino IDE.

B. TEMPERATURE SENSOR(DS18B20): It continuously monitors the aquarium water temperature and depending on temperature reading the heater is turned on.

C. LED STRIP: Waterproof blue led strip is used for providing lighting in aquarium.

D.FLOAT switch: Float Switch is a type of level sensor. It is used to detect the level of liquid within a tank. In our case, these switches are used to turn aquarium pump circuits on or off.

E.SERVO MOTOR: In our project servo motor is used to develop automatic fish feeding system.The feeder is powered by servo motor and controlled using PWM signals.On receiving signal the servo motor spins and drops the fish feed on the time set by the user.

F. DS3231 RTC Module: In our project RTC module is used to get time and date for controlling light and feeding system.

G. HEATER: Heater maintains the specified temperature of water in aquarium.

H.RELAYS: Relays acts as switches to control light, filter feeder, pumpand heater.

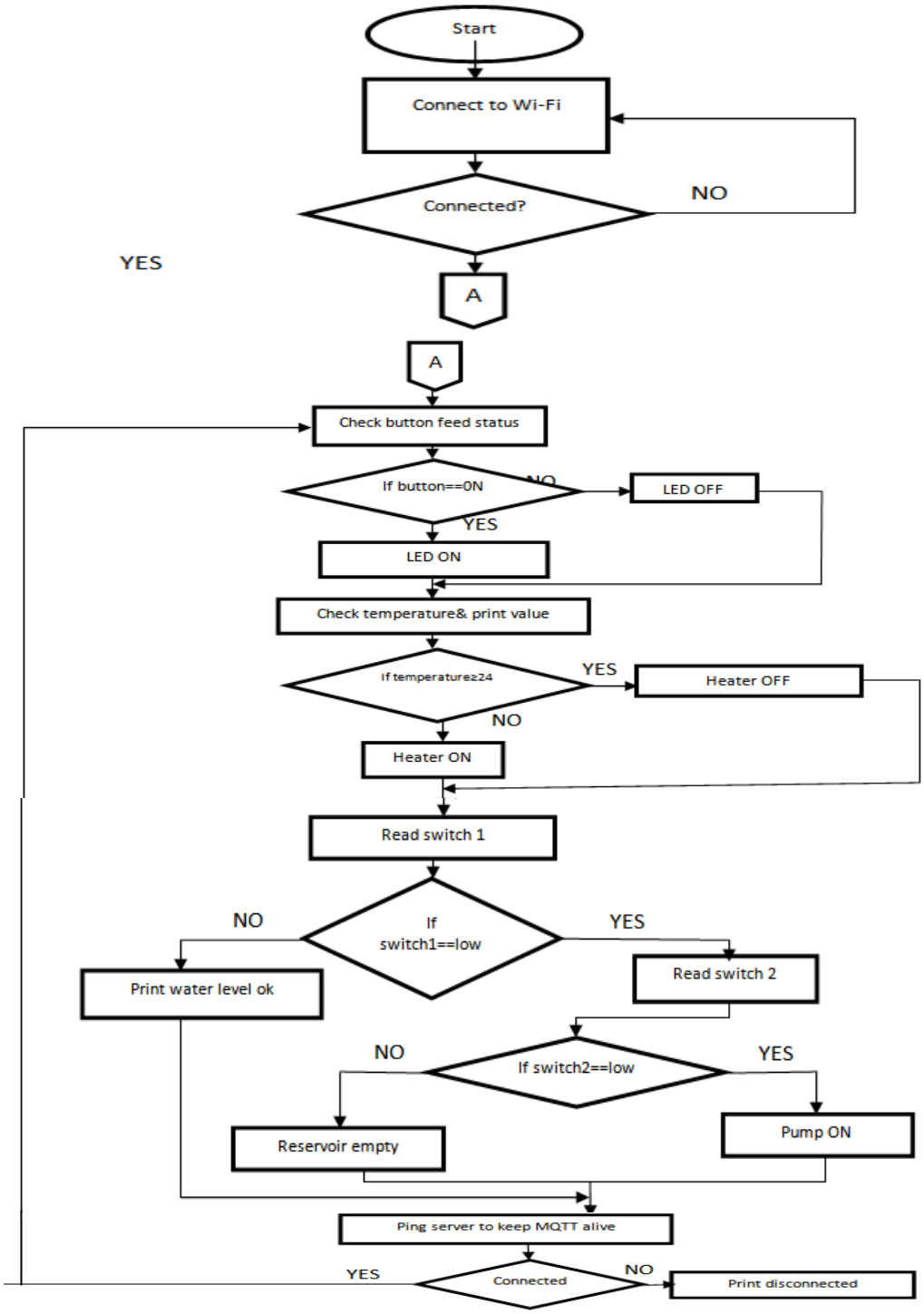
Software Architecture

Arduino IDE: The Arduino integrated development environment (IDE) is a cross-platform application that is written in the programming language Java. In our project it is used to write and upload programs to NodeMCUmicrocontroller.TheAdafruit IO Arduino Libraries can connect with Adafruit IO using NodeMcu.

We have created the Adafruit IO dashboard for the user, which enables user to control the equipment's of aquarium from any modern web browser. We have used MQTT or message queue telemetry transportprotocol for device communication that Adafruit IO supports. Using a MQTT library or client we can publish and subscribe to a feed to send and receive feed data.

We have also created a web mobile app for quick access to Adafruit Io dashboard through mobile.

VI. Flow Chart



VII. RESULTS

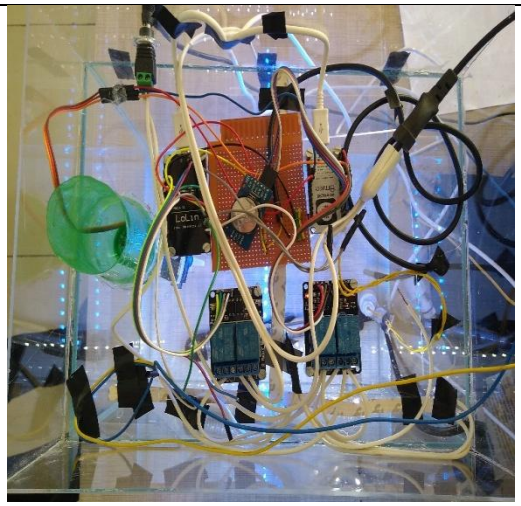


Fig 1. Automated Aquarium System

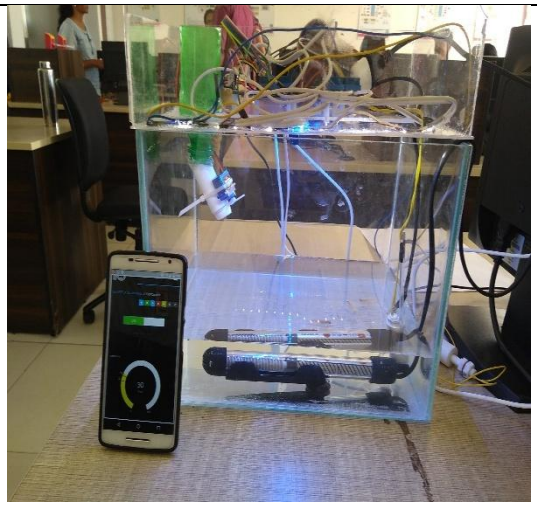


Fig 2. Lighting control through Adafruit IO dashboard

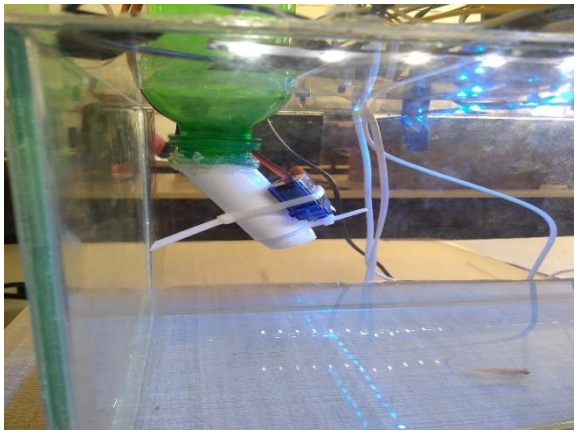


Fig 3.Automated fish feeder

Fg 4. Temperature control through Adafruit IO dashboard

We have designed an automated aquarium system based on IOT as shown in Fig 1. It has the following features

- An automatic and manual control of light, where in automatic control light(led strip)will be turned on/off at specific time and in manual control user can turn on/off the light through Google assistant /button provided on dashboard as shown in Fig 2.
- An automatic fish feeder, which feeds small portions of food at scheduled intervals as shown in Fig 3.
- An automatic temperature control, where the heater is turned on depending on temperature of tank water, also the continuous temperature values of tank water are displayed on dashboard as shown in Fig 4.
- An automatic control of water pump, where depending on the water levels of tank and reservoir the status of motor will be automatically controlled.

Thus user can monitor and control the aquarium using the Adafruit IO dashboard from any modern web browser using a computer/laptop.We have also created a web mobile app for quick access to Adafruit Io dashboard using mobile.

VIII. Conclusion

In our project, the water temperature control, lighting of aquarium environment, feeding of fishes, water level sensing are all automatically controlled by Adafruit Io dashboard. We have also provided manual control of lighting system where user can turn on/off the light through Google assistant /button provided on dashboard.The basic idea proposed in this project works well and can be implemented on any aquarium. Having

a Smart Aquarium, will save our time and we would not have to be worried for our fish and their aquariums for long time.

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