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Ammonia Monitoring in Aquarium for Fish Protection and Alert Generation

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***Abstract:** Fish is an important species that benefits human life in several ways. Fisheries are the best food provider and also aquarium is used at home and public places which becomes decoration cum mind relaxing item. There are lot of attack to fish which goes unnoticed. Large number fish die due to the ammonia (NH3) produced as a by product of protea metabolism and is the most common waste product of fish. There is a given level of ammonia that becomes dangerous and leads to death of the fish. One of the solutions to this issue is to monitor ammonia in aquarium for fish protection and alert generation. A prototype is developed for monitoring the ammonia in the fish tank using Intern is used for protection and alert generation. Ammonia is monitored by measuring pH values. In this project a prototype model is developed that is connected through Internet of Things (IoT) such that it can be monitored in a remote station through mobile app. The prototype model includes an LCD display for local readout. The project will reach the benefit to many engaged in fisheries industry and also who are using Aquarium.*

***Keywords:** pH sensor, nodeMCU, power supply, LCD, IoT.*

I. INTRODUCTION

Ammonia is poisonous may be a severe concern that results massive deaths in the poor aquaculture circumstances, and several species of fish have aesthetic aquaculture and commercial significance. If ammonia accumulates in the fish tank, it is hazardous to fish. Whenever ammonia levels reaches to high, fish are unable to take energy properly from their meal. The fish will become apathetic and possibly ship into a sleep and death if the ammonia levels rises too higher. In water, there of two types of ammonia content present in water they are un-ionized ammonia and the ammonium ion (NH_4^+) . The methods for measuring the ammonia yield a result that is the total of both kinds the resultant value is given as the total ammonia or ammonia. pH has a significant impact on the relative quantities of the two types found in the water. The hazardous form of ammonia is un-ionized is ammonia, which prevails when pH is high. When pH is low, ammonium ion prevails because it is generally harmless when the value of pH is generally less than or equals to 7, fewer than 10% of the ammonia. As the pH rises, percentage rises considerably. This paper will identify related works through literature survey. It will bring out methodology, implementation process, hardware and software used for executing the task. Finally it will carry out result analysis and conclude the work with future scope.

II. LITERATURE SURVEY

Smelling salts are harmful for fish. When allowed to collect in fish creation frameworks, smelling salts can be dangerous to fish. Fish are unable to effectively extract energy from diet when smelling salts accumulate to dangerous amounts. The fish will go dormant and finally slip into a state of profound sleepiness and perish away if the alkali fixation becomes high enough[1]. Smelling salts only sometimes accumulates to lethal fixations in carefully supervised fish pools. In any case, alkali can have supposed "sub-lethal" effects, such as reduced growth, impotent feed change, and reduced illness resistance—at concentrations lower than lethal levels. Impacts of pH and temperature on alkali harmfulness [2]. Ammonia in water is either unionized smelling salts (NH3) or the ammonium particle (NH4 +). The methods for quantifying smelling salts provide an advantage in terms of the two structures' quantities. "All out alkali," or "smelling salts," is used to account for the value. (In this distribution, "alkali" refers to the combined weight of the two buildings; the specific constructions will be mentioned as appropriate.) pH has a big impact on the general spread of the two structures in water. When the pH is high, the deadly structure of un-ionized smelling salts takes over. The ammonium particle is typically harmless and thrives in low pH environments. When the pH is below 8.0, the toxic structure contains less than 10% alkali. Regardless, the magnitude of this increase increases dramatically as pH rises. As a function of pH and temperature, the amount of toxic, non-ionized alkali increases. Draw a line from the pH of the water straight up to the line that is closest to the water temperature to determine the amount of un-ionized smelling salts in a water test. Begin by attracting a line to one side until it converges with the vertical hub of the figure. The level of un-ionized smelling salts in the water test is measured at this stage. To assess the un-ionized smelling salts fixation, simply multiply that value (partitioned by 100) by the total alkali focus. The misfortune or change of smelling salts is brought about by two main cycles. The use of smelling salts by green growth and various plants is the most significant. Plants use nitrogen as a growth supplement and "bundle" it in a natural structure. Algal photosynthesis functions as a "wash" for smelling salts, therefore anything that promotes algal growth in general will increase alkali absorption. Adequate light, a warm environment, a plentiful supply of supplements, and (to an extent) algal thickness are all aspects to consider[3].

III. METHODOLOGY

We have used ammonia sensor, Node MCU and LCD display for monitoring ammonia in a tank. The sensor is dipped in the water. This senses and Node MCU checks the value which is read out at LCD. Same can also be sent to cloud and thus multiple devices can be placed in various places and can be centrally monitored. The basic idea is shown in fig 1.

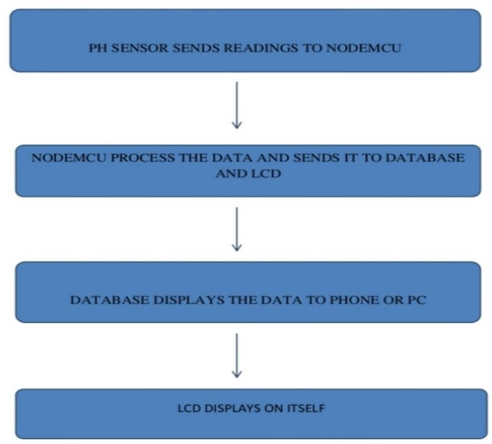


FIG 1 : BASIC IDEA

IV. IMPLEMENTATION

The flow chart of the implementation process is shown in fig 2.

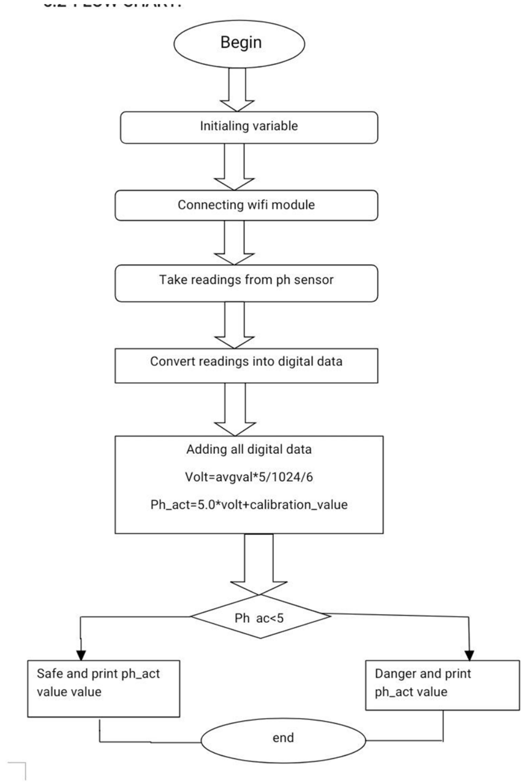


FIG 2: FLOW CHART

Block diagram is shown in Fig 3.

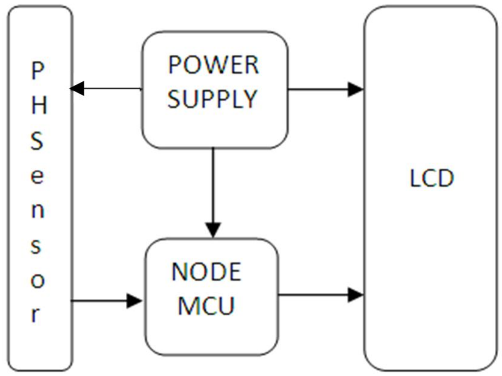


FIG 3: BLOCK DIAGRAM

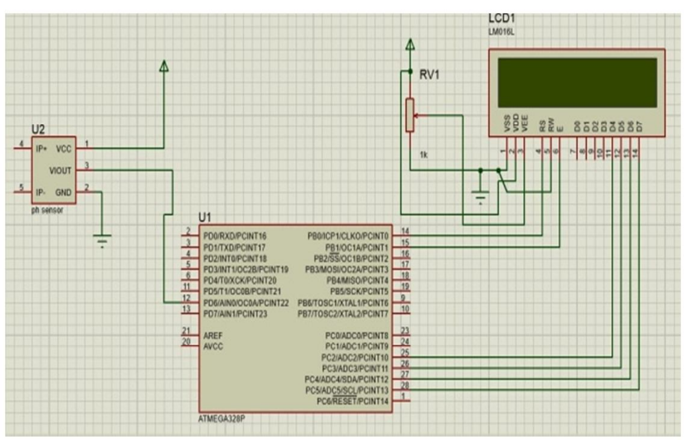
The pH sensor is placed in the water to be tested and measures the ph of the water. The amount of H+ ions is used to compute the ammonia concentration in water, which is the pH value of the water.

pH=-log[H+]

In a 1.0M aqueous solution, ammonia is somewhat basic, with a pH of 11.6.The data from the pH sensor is processed by NodeMCU and delivered to a database, and we take analogue values and sample them in NODEMCU. After that, figure out what the average value of those samples is. Calculate it on a scale of one to ten. If the output is less than 5, the water in the aquarium is safe for the fish and has no negative impact on the fish's survival. However, if the output exceeds 5, the water in the aquarium is unsafe for fish to survive in. We take this information and enter it into the database. The blynk app and the wifi module link to the data base, which shows data on the phone. The pH number is also displayed on the LCD screen, along with whether or not the water is safe.

V.CIRCUIT DIAGRAM

Hardware Schematic is shown below fig 4.



- Connect the power supply to pH sensor and also to the nodeMCU.
- Power supply is connected to the switch and then to the transistor. From transistor, it is connected to node MCU to protect it from the direct high power supply which can damage it.
- Here pH sensor also not connected directly with the power supply. It is connected through the switch.
- The pH sensor tube is dipped into the fish aquarium. It checks the amount of ammonia in water and the output of the pH sensor is sent to the NodeMCU.
- LCD is connected to the output of the NodeMCU.
- The rheostait s connected to the LCD to control the contract of the display.

A. Hardware Components

1) PH Sensor:

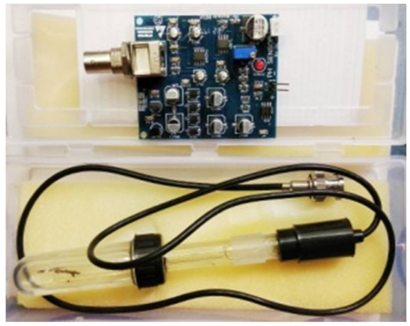


Fig 5: pH sensor

Analog pH sensor is used to measure pH value of the water. It has glass tube which is placed inside the water to find the pH of any solution. The reference solution neutralizes the probe.

2) Node MCU:

Fig 5: Node MCU

NodeMCU is an open source IOT platform. It has 17 GPIO pins which we can use for variety of tasks. It is a microcontroller with wifi capability.

Specifications:

- Operating voltage is 3.3v
- 16 digital pins
- 1 analog pin
- Flash memory 4MB
- SRAM 64MB
- Clock speed is 80MHz

3) LCD:

Fig 6: LCD

LCD modules are used regularly because of its low cost, uses less power. LCDs are broadly used as they are software friendly. 16x2 LCD consists of 16 columns and 2 rows. So that it can display upto 32 characters.

Specifications:

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- Operating voltage is 4.7 to 5.3V
- It has 2 rows with 16 columns and each character is built with 5X8 – pixel box.
- It will display any custom generated characters.

B. Software Components

1) Arduino IDE:

Arduino is a open source platform used to program the Arduino. C and C++ programming languages are used for programming. IDE consists of editor and compiler for developing the code compiling and upload the program into Arduino module.

2) Blynk:

Blynk is for controlling and monitoring the hardware projects**.** We can monitor the aquarium even from a distance by creating a project in blynk app.

- Blynk app is used for developing projects.
- Blynk server is used for connecting smart phone with hardware.
- Blynk libraries is used for allows communication with the server.

VI. RESULT AND ANALYSIS

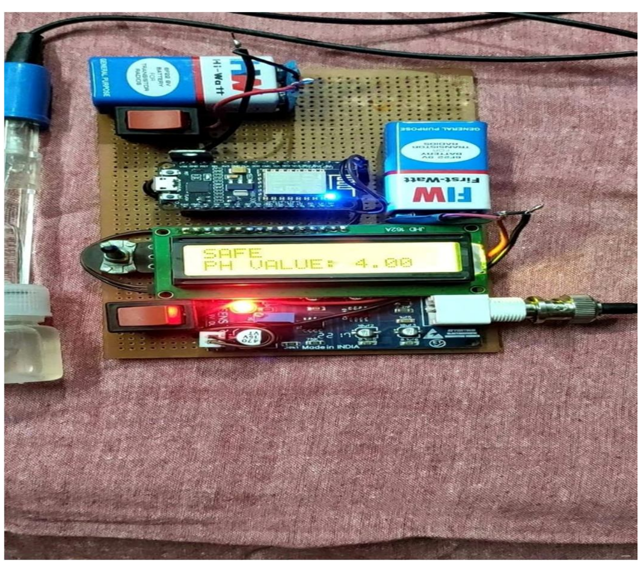

FIG 7: PROJECT OUTLOOK

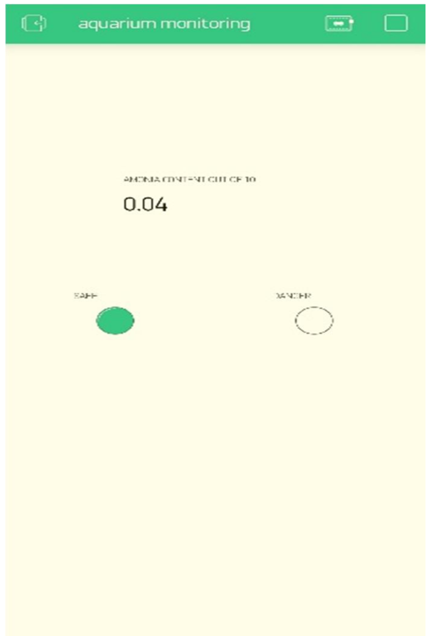

FIG 8 : Result when ammonia less in water
Output when ammonia is less in water

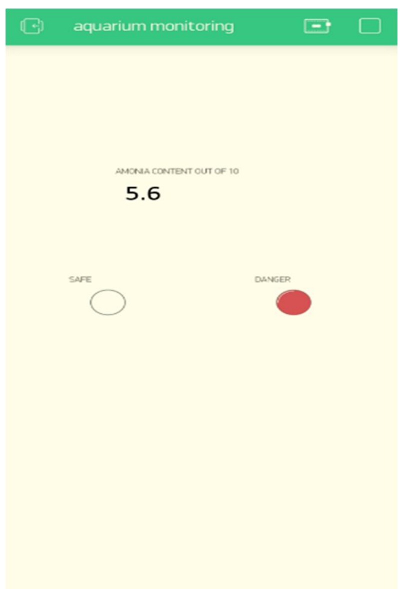

FIG: Result when ammonia more in water

Output when ammonia is more in water.

VII. CONCLUSION

We here conclude that this device is easy for monitoring aquarium and it is simple for people to understand about the status of their aquarium. It convey the information to the user about the status by updating it in the server.

VIII. FUTURE SCOPE

Here pH sensor is used for detecting ammonia concentration similarly we can use sensors like this for detecting waste in water. So that we can improve the water quality, environment monitoring, and waste water cleaning etc.

IX. ACKNOWLEDGEMENT

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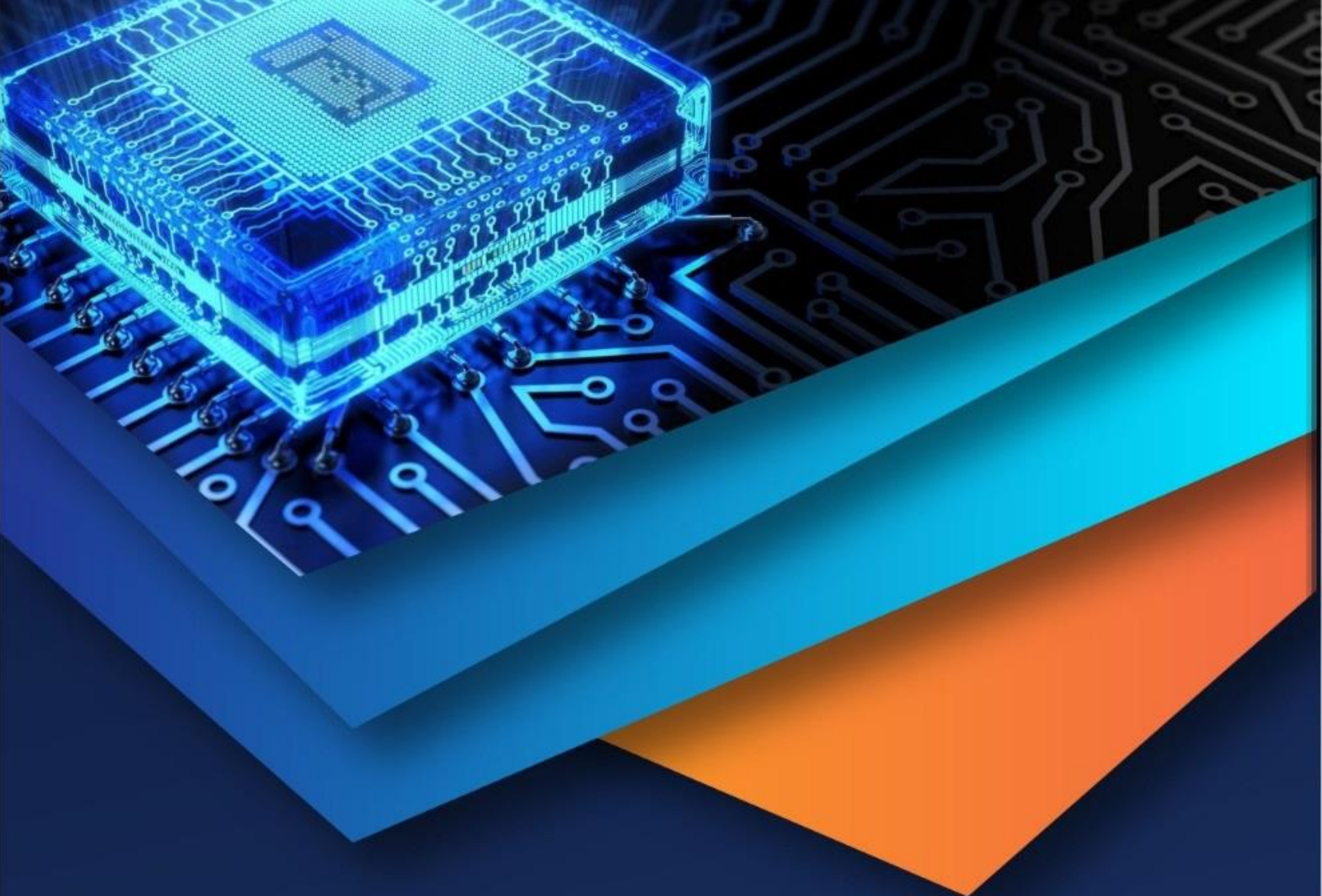

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