

**IOT ENABLED SELF MAINTANANCE & AUTOMATION OF AQUATIC
ENVIRONMENT AT DOMESTIC PLACE POST COVID-19**

Project Reference No.: 46S_BE_5188

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
SYNOPSIS**

SI. NO	USN	STUDENT NAME
1.	1SB19EE011	SAKET RAJ
2.	1SB19EE010	SAKET BHUSHAN
3.	1SB19EE011	LAKSHMI NANDAN
4.	1SB19EE021	ZUHRA MUKHTAR

GUIDES

1. **Dr. Ramya K.**
Assoct Prof,
EEE
Ramya.eee@sairamce.edu.i
n
2. **Prof. Malini K**
VHOD, EEE
Hod.eee@sairamce.edu.i
n

IOT ENABLED SMART MONITORING AQUARIUM(AIESMA)

ABSTRACT

Smart Aquarium is the concept to provide an artificial environment for aquatic animals, for their survival. With the present manually operated aquariums, we face many issues like feeding food on time, changing water, maintaining oxygen level, maintaining PH level, monitoring temperature level etc. To overcome all these disadvantages a technology enabled self – sustaining aquarium to replicate nature in our fish tanks is proposed with an IOT technology, enabled to remotely monitor the biological life under water. The IOT technology implemented in Smart Aquarium enable us to monitor the nitrogen cycle that happens inside the aquarium, monitor the release ammonia into the water that was caused due to fish waste and other decomposing organic matters like decaying plants or uneaten fish food and monitoring the aquatic plants. Most of the aquatic plants used inside the fish tank prefer warmer condition, whose temperature has to be maintained about 78F /

≈25.5°C. The IOT enabled Smart monitoring aquarium uses sensors to monitor the turbidity level in water. If the turbidity exceeds the reference level, where the bio chemical process cannot takes place appropriately, the water will be reused for plantation purpose. A sensor controlled by servo motor is used to develop automatic fish feeding system. The proposed project “IOT enabled Smart monitoring aquarium” monitors the nitrogen cycle, CO₂ level, good source of light and enough nutrients to replicate nature in our Smart Aquarium.

Keywords: *Internet of things (IOT), Smart Aquarium, Carbon dioxide (CO₂), nitrogen cycle , reuse of water.*

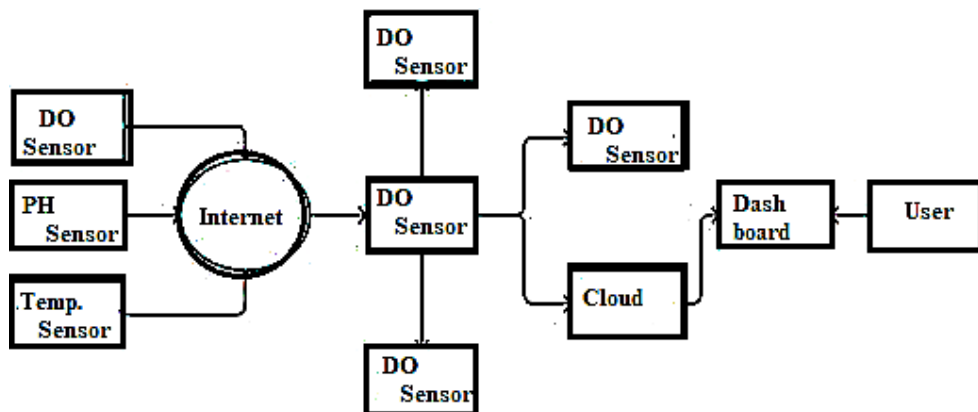
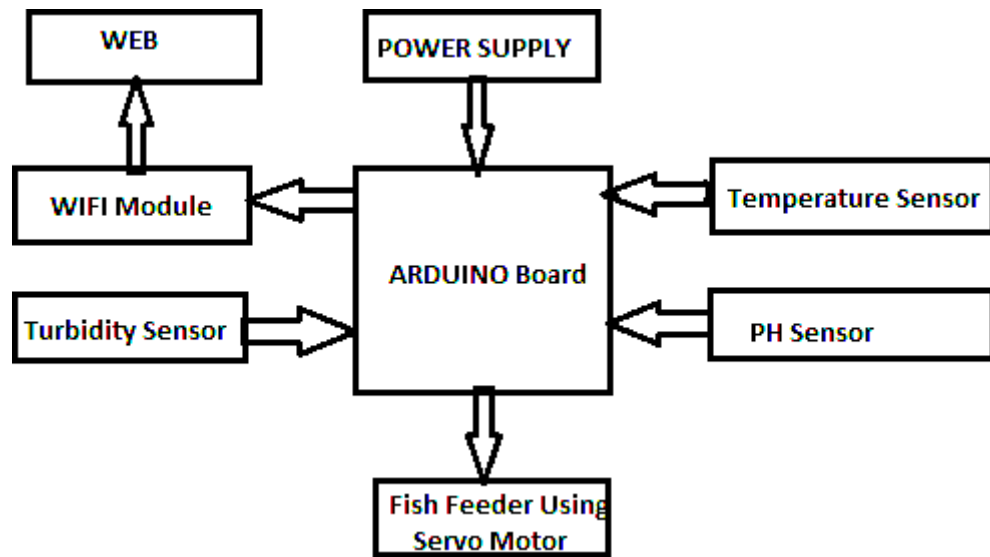
PROBLEM STATEMENT

In the present scenario product development happens based on the issues faced in day to day life. One such issue that happens with fish aquarium is considered as an example to develop our prototype automated smart aquarium. In manually operated fish aquarium we find hard to feed food to fish, changing water in fish tank, maintaining turbidity level, maintain good light source etc. A survey is done to identify the problems faced by the fish pet owners. In this case of scenario, fish pet owner are finding it hard to breed their fish as it is a hassle to know the state of their aquarium, find it difficult to feed their fishes when they are away from home and when they move to abroad. Moreover, it is stated by beginner fish owners don't know the right time to change the aquarium's water as they were not able to detect the pH level of the water. In case of power cut and the owners are away from home, the owners won't be able to know the state of the oxygen pump and may lead the fishes to die.

OBJECTIVE

- To monitor the nitrogen cycle, CO₂ level, good source of light and enough nutrients
- To remove wastes & keep water clean.
- To control motor activity, lighting and heat system.
- To design an aquarium controller with an automated fish feed system.
- To monitor fish movement, temperature, water pH level and aeration system.
- To alert the user in case of undesired variation in physical aspects of the aquarium.
- To feed the user with data regarding the conditions in the aquarium via mobile application.

METHODOLOGY



- **TEMPERATURE SENSOR:** It continuously monitors the aquarium water temperature and depending on temperature reading the heater is turned on. The aquarium should be maintained at a temperature of about 78F / $\approx 25.5^{\circ}\text{C}$. High Temperature NTC 100K Thermistor or DS18B20 temperature sensor is planned to use in this concept as it measures the temperature with the range $-30^{\circ}\text{C} \sim +350^{\circ}\text{C}$. The specification used is Dissipation power factor: 5 mW/C (static in the air), Max power rating: 45 mW, Temperature coefficient of resistance: $-2 \sim 5\%/^{\circ}\text{C}$.

- **SERVO MOTOR:** The smart aquarium concept includes aqua Feeder that uses smart Arduino controlled robot that automatically feeds the fish as on when required. It uses two servo motor with a part number "Tower Pro MG995 Metal Gear Servo Motor (180 Degree Rotation)". One motor is to open the lid and the other one is to feed. The feeder is powered by servo motor and controlled using signals. On receiving signal the servo motor spins and drops the fish feed on the time set by the user. The aqua feeder is programmed in such a way that lid gets opens and food is fed as on required. The use of servo motor in this project is to develop automatic fish feeding system.

- **pH Sensor:** A pH sensor is used to measure hydrogen ion concentration in a solution. Glass pH electrodes are widely used in pH sensors. The electrode is the main part of measuring the pH in a solution. The one important concept that has the major focus is maintaining oxygen level in aquarium. The water inside the aquarium is a part of oxygen which is bonded with hydrogen. The oxygen combined with hydrogen in aqua culture system creates suffocation for the fish to breath. Home or office aquariums, however, require an artificial process to induce oxygen in the water. One solution is to perform ongoing water changes in the fish tank, which are time-consuming and wastes resources. Another solution is aeration, which circulates the water to ensure oxygen absorption. pH sensor is used as a scientific measure of the acidity in water and can be used to test the quality of aquarium water. The pH levels range from 0 to 14 in aquarium, where 7 is the neutral point.

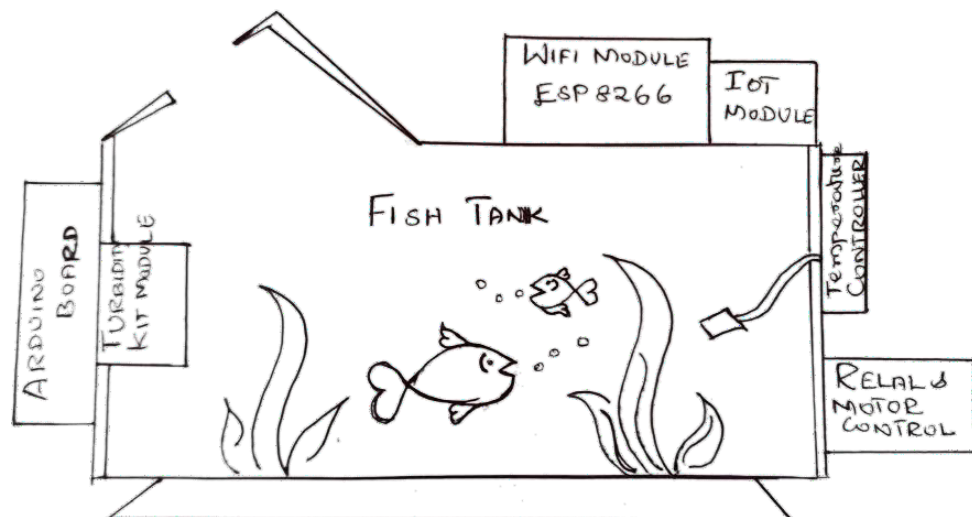
- **WiFi – Module:** The Wi-Fi Module is an independent SOC (system on chip) that can help any microcontroller to connect to the Internet. The ESP8266 is able to do either facilitate an application or offloading all Wi-Fi organizing capacities from one application processor to another application processor. The ESP8266 WiFi Module remotely control the complete process by collecting the data with reference to temperature, level of water in fish tank and its turbidity level. When the water level is less than the default value, the system will be adjusted by adding water into the tank. At the same time, people could also get the data and control the tank whenever they want. The Arduino controller is connected to the

Internet through the WiFi module to collect the data and to have control towards the parameter temperature, PH level, and turbidity level.

- **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.
- **RELAYS:** Relays act as switches to control light, filter feeder, pump and heater.

EXPECTED OUTCOME

- The aquarium will perform all the operations automatically including temperature control, pH control, turbidity control, feeding, and water level control.
- The aquarium's status was continuously transferred to the database via the IoT monitoring system, which users may check over the internet.
- The pH sensor module and the temperature module were used to collect data for the freshwater fish monitoring system.
- The IOT platform used for this project is to when sensors detected any problem, they sent a notification to the IOT platform, which was marked as an alert and monitored automatically.



SOCIAL RELEVANCE

- This system overcomes the disadvantages of the existing system.
- Smart Aquarium Management System has been successfully proposed and it can be easily implemented for making the life of aquarists more comfortable.
- The aquarium parameters like water temperature, fish feeding, lighting control, oxygen flow, etc. can be controlled remotely from mobile phone through internet.
- Having fish tank at home aid in emotional management and memory enhancement.
- Aquarium water noises create a relaxing environment that might aid in relaxation, reduce stress in human, lower blood pressure and heart rate and sleep for some people.

CONCLUSION

We started off the project with aim to accomplish the simple looking task of designing an automatic aquarium (SMART Aquarium). But with time and experiences it was learnt that this was not at all an easy task, specially interfacing the sensors and GSM Mobile with the controller.

Though we are able to achieve all the goals of our project but still we think that lots of advancement can be done on this project. We have provided the platform and the platform is ready for everyone to work on it. For advancements, we need more time, money and hard work. Money would remain the critical issue cause in order to upgrade the project many of the stuff would need an up gradation.

Nevertheless this project has been a success as far as learning and practical implementation of Electronics Engineering concepts is concerned. The basic idea proposed in this project works well and can be implemented on large scale industries like agriculture etc. 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.

FUTURE SCOPE

After implementing and detailing the project, still it has many future advancement possibilities of which are stated as below:

12.1-Air Cooler:

Sometime the temperature of inside the aquarium or we can say the temperature of water increases in summers that's why fish die because of the sudden increase in the temperature. As there is nothing in the aquarium that could reduce the temperature when it has increased so a small air cooler or a fan can be used to decrease the temperature in case the temperature increases up.

12.2-Solar Cell:

As the aquarium needs 24/7 constant power in order to work so lots of power is consumed, GSM mobile also needs a separate constant power. Lots of power is utilized and it can be a burden on your pocket so in order to reduce this, solar cells or panels can be used to get the constant power. So that there will be no issue of over billing and burden on your pocket. If in case of power failure, the aquarium would not stop its work.

12.3-Heater:

In winter, most of the time, the temperature of the water goes down like if it is in snowfall area then its temperature would go suddenly down and the sudden variation in the temperature can kill the fish inside the water. In our project we have used a bulb because we live in a region where temperature does not change suddenly. Heater can also be used in order to increase the temperature if it has fallen down.

12.4-GSM Module:

A GSM modem is a wireless modem that works with GSM networks. A wireless modem behaves like a Hayes compatible dial-up modem. The main difference between a standard Hayes modem and a GSM modem is that a Hayes modem sends and receives data through a fixed telephone line while a GSM modem sends and receives data through radio waves.