**Interactive Fresh Water Aquarium using IOT**

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**Software Requirements Specification - Document**

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# Introduction

Everyone loves to own a pet, feed them and play with them. After cats and dogs, the most popular pet till date is the freshwater fishes which can easily be kept in any corner of the room. It is a pretty lovely decoration of home. But behind every attractive thing there lies a lot of care and maintenance, which we assume is the sole challenge for most Aquarium buyers. The maintenance requires proper cleaning, feeding and serving the fishes the care and support they feel while they are at home. So they live long, stay healthy and won’t feel suffocating. Its maintenance is one of the crucial task. The basic job of any aquarium owner is to feed the fishes, clean the water based on the quality of water, temperate and frequently process the required medication. The purpose of this project is to build an Interactive Aquarium with the target customers as hotel, restaurant, office employee or any individual owning a Fresh Water Aquarium and wants to automate the task of maintenance. The system is supposed to monitor the physical changes in the water. The product will provide reading of temperature control, pH level etc. both in textual and audio form (for blind people).

## 1.1 Purpose

The purpose of the project is to monitor the water quality of an aquarium based on PH level, chlorine, alkaline, temperature, etc. Tracking the observatory change obtained from the sensors and informing the user for any unusual activity in the form of text through LCD screen and audio.

## 1.2 Scope

The project is to be implemented with the purpose of reducing the maintenance cost of an aquarium given that the Aquarium interacts with the user. Even blind user can experience the status of an aquarium through audio.

## References

[1] https://components101.com/microcontrollers/arduino-uno

[2] https://www.petsmart.com/learning-center/fish-care/healthy-aquarium- water/A0083.html

[3] https://www.ptglobal.com/?gclid=Cj0KCQiArdLvBRCrARIsAGhB\_szA406e9H\_W1KUkYqDJJQFdz7AHXX3vLA8S-H9COQH9mdYUibQJLjgaAhc3EALw\_wcB

[4] https://www.arduino.cc/en/Main/Software

[5] https://maker.pro/arduino/projects/arduino-speaker

## 1.4 Overview

The project requirements are gathered from the survey done on fresh water fish aquarium. The major challenge for any customer having an aquarium is the maintenance cost. This project will help in monitoring the status of water quality required for fresh water fish and accordingly it will notify the user.

The system is developed to understand well when to change water. The data will be given in the form of text in the mobile app and LCD with an addition of interactive audio output.

The software requirement specification document helps to document the demands and needs of the aquarium required, the document specifies the summary of the entire system that is to be developed.

# 2. The Overall Description

This project will monitor and analyze the water quality needed for fresh water fishes. Water get contaminated due to food oil, waste produce by fish. This factor is supposed to be monitored consistently to keep the environment of the aquarium healthy.

## 2.1 Product Perspective

The overall system is depicted in figure 2.1, shows the overall system. the main system collects data obtained with the help of different sensors. The live data reading is displayed in LCD in textual from and also gives an audio output. The live data obtained is also sent in to a cloud sever. The data is then obtained and processed to get textual information in the user mobile device.

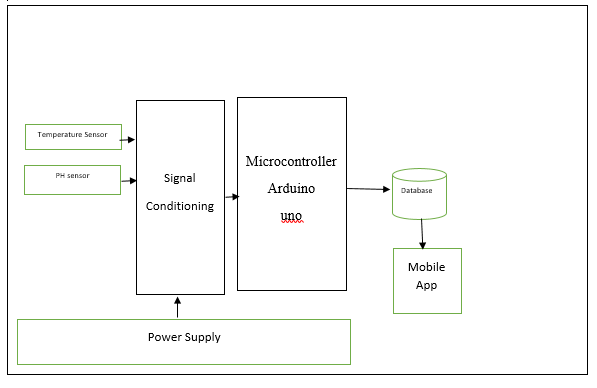


Figure 2.1 Overall system representation

### 2.1.1 System Interfaces

The system is expected to obtain the temperature of aquarium environment and water with its quality parameters like ph, alkaline, nitrate being monitored and display with minimal efforts through a small mobile application and 16x2 LCD Screen. The obtained data is stored in Google Firebase for its other Database operations.

### 2.1.3 Hardware Interfaces

The system requires different hardware components. The description of some of the major components to be used in the above system is as follows: -

* **Arduino uno: -**

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins of which 6 can be used as PWM outputs, 6 analog inputs, a 16 MHz quartz crystal that acts as a clock, a USB connection, a power jack, an ICSP header and a reset button. The Arduino board is used to interface with the sensors.

* **Node MCU: -**

The ESP8266 Integrates **802.11b/g/n HT40 Wi-Fi transceiver**, so it can not only connect to a WiFi network and interact with the Internet, but it can also set up a network of its own, allowing other devices to connect directly to it. **Power to the ESP8266 NodeMCU**is supplied via the **on-board Micro B USB connector.**

* **PH sensor: -**

A pH meter is a scientific instrument that measures the hydrogen-ion activity in water-based solutions, indicating its acidity or alkalinity.

* **Temperature sensor: -**

A temperature sensor is a device, usually an RTD (resistance temperature detector) or a thermocouple, that collects the data about temperature from a particular source and converts the data into understandable form for a device to observe.

* **I2C module for 16 \* 2 serial interface (pcf8574t): -**

I2C Interface Adapter Module is used for 16×2 LCD Display. It uses the PCF8574T IC chip which converts I2C serial data to parallel data for the LCD display.

* **Zinc Carbon 9V Hi – Watt Battery: -**

The nine-volt battery, or 9-volt battery, is a common size of battery that was introduced for the early transistor radios.

### 2.1.4 Software Interfaces

The system requires different Software Interfaces. The description of some of the major Interfaces to be used in the above system is as follows: -

* **Arduino IDE: -**

Arduino IDE is an editor that facilitates the coding and uploading of the same in the Arduino board. The program that is to be run is been saved in the Arduino memory.

* **Android IDE: -**

Android Studio is the official Integrated Development Environment (IDE) for Android app development. this IDE is used for creating the android application that helps to showcase the visualization of the data that are been collected with different sensors.

* **Firebase: -**

Firebase is a database that is part of google. It gives you functionality like analytics, databases, messaging and crash reporting so you can move quickly and focus on your users. we store our information supplied with the different sensors in the firebase.

* **Open C: -**

OpenCV is used for image processing, we use OpenCV for detecting the data embedded in the QR code that has been added in the footwear box.

### 2.1.5 Communications Interfaces

Multiple communication forms have been implemented in the project. The IOT device can send the data to the database server with the help of Ethernet shield and WIFI module. The communication with the server and mobile device could be established by both mobile hotspot and WIFI. The communication technique depends on the customer home environment where the project is supposed to be implemented.

### 2.1.6 Memory Constraints

The data needs to be send to the cloud storage, and only textual information can be stored in the cloud storage. The speaker just converts the textual data into audio. Hence the only role of storage is not transmitting the data from Arduino to cloud and cloud to mobile application. The code that helps the modules to work on is stored in the Arduino boards.

### 2.1.7 Operations

The system comforts the user to monitor the aquarium. Historical data is stored in the system frequently. Hence the live status and earlier reports of the Aquarium can easily be monitored. Frequency between the periodic change in water can be observed smoothly.

### 2.1.8 Site Adaptation Requirements

The system should be able to work for the same in performing the task of recording the details in the database and give the live status of the water level parameter and temperature.

## 2.2 Product Functions

The product is designed for analyzing and comparing the frequency at which rate water has been changed. This will help a user to understand about the health of the fishes and be able to interact with its owner via speakers.

## 2.3 Constraints

The main constraints that comes across is that it won’t be able to monitor the health of each individual fish.

# 3. Specific Requirements

The main requirement of the system is to monitor the temperature and water quality of an aquarium with the help of sensors, that can help to create meaningful observations and comparison on the environment of an aquarium for fishes and give the output in textual as well as audio form. The project will help a user to make efficient management decisions about the maintenance of an aquarium.

## 3.1 External Interfaces

The system interacts with the internal environment of an aquarium to collect the necessary data for the analysis.

## 3.2 Functions

The main function of the project is to automate environment of an aquarium for fresh water fishes.

## 3.3 Logical Database Requirements

The database will have data of PH level, alkalinity, nitrate, temperature, date, time and all logs.

## 3.6 Software System Attributes

The system is supposed to follow and meet standards and the information provided should be reliable and correct.

### 3.6.1 Reliability

The data and the visualizations obtained should be reliable and informative. the data should be able to process for any kind of other analysis.

### 3.6.2 Availability

The data will be easily and quickly available in the application for the visualization.

### 3.6.3 Security

Necessary security guidelines will be employed in the project and the applications associated with it.

### 3.6.4 Maintainability

The application will be easily maintained and used with limited technical knowledge.

### 3.6.5 Portability

The system will satisfy necessary portability features.

# 4. Change Management Process

The project has been developed for the hobbyist who are willing to install an aquarium at home and cut off maintenance cost and effort. The proposal is aimed to give an insight about the environment of an aquarium in term of textual as well as audio. The project will alert normal as well as blind user whenever the environment for fish is in danger.

# 5. Future Scope

In the future, this project will focus on keeping track of fish movement and provide live video streaming from anywhere. An unusual movement inside an aquarium will send a notification in the user mobile device.