Real-Time River Water Quality Monitoring and Control System

A NAALAIYA THIRAN PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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ABSTRACT

This project deals with the system that is developed to measure the parameters of water such as turbidity, dissolved solvents, pH and temperature. Current water quality monitoring system is a manual system with a monotonous process and is very time-consuming. This project proposes a sensor-based water quality monitoring system. The main components of Wireless Sensor Network (WSN) include a microcontroller for processing the system, communication system for inter and intra node communication and several sensors.

Real-time data access can be done by using remote monitoring and Internet of Things (IoT) technology. Data collected at the apart site can be displayed in a visual format on a server PC with the help of Spark streaming analysis through Spark MLlib, Deep learning neural network models, Belief Rule Based (BRB) system and is also compared with standard values. If the acquired value is above the threshold value automated warning SMS alert will be sent to the agent. Agricultural chemicals include fertilizers (nitrogen and phosphorus) and biocides (herbicides, fungicides and insecticides).

The uniqueness of our project is to obtain the water monitoring system with high frequency, high mobility, and low powered. It detects water temperature, dissolved oxygen, pH, and electrical conductivity in real-time and disseminates the information in graphical and tabular formats to relevant stakeholders through a web-based portal and mobile phone platforms. Since water is one of the fundamental requirements of human survival and life underwater, some mechanism is necessary to occasionally control water quality.

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1. INTRODUCTION

1.1 PROJECT OVERVIEW

The project title is real-time river quality monitoring and control system. Nowadays most of the rivers are filled with dirty water so we are not able to draw the water and people who only depend on the stream of water near their houses are not able to make use of it. River water plays a crucial role in so many lives. The purity of water mainly depends upon the pH level. In this project, we control the river water pH level with the help of IoT. The current water quality monitoring system is a manual system with a monotonous process and is very time-consuming. This paper proposes a sensor-based water quality monitoring system. The main components of a Wireless Sensor Network (WSN) include a microcontroller for processing the system, a communication system for inter and intra-node communication, and several sensors. Real-time data access can be done by using remote monitoring and Internet of Things (IoT) technology.

1.2 PURPOSE

In this project, we depict the design of a Wireless Sensor Network (WSN) that assists to monitor the quality of water with the support of information sensed by the sensors dipped in water. Using different sensors, this system can collect various parameters from water, such as pH, dissolved oxygen, turbidity, conductivity, temperature, and so on. The rapid development of WSN technology provides a novel approach to real-time data acquisition, transmission, and processing. The clients can get ongoing water quality information from far away. Now a day's The Internet of things (IoT) is an innovative technological phenomenon. It is shaping today's world and is used in different fields for collecting, monitoring, and analysis of data from remote locations. IoT-integrated networks are everywhere starting from smart cities, smart power grids, and smart supply chains to smart wearables.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

Water is the most valuable for all human beings drinking water utilities face challenges in real-time operation. These challenges occurred because of a growing population, limited water resources, aging infrastructure, etc. Hence there is a need for better methodologies for monitoring water quality. To reduce water-related diseases and prevent the water population World Health Organization (WHO) has also stated This crisis is "the largest mass poisoning of a population in history." The main goal of this paper is to build a Sensor-based Water Quality Monitoring System.

2.2 REFERENCES

LITERATURE PAPER TITLE	**AUTHOR**	**OBJECTIVE**
Real-time water quality monitoring through Internet of Things and ANOVA-based analysis: a case study on river Krishna (3,December 2019)	Prasad M . Pujar Harish H Raviraj . M Uma kant . P	In this paper it has emphasized on the IOT based water qualitymonitoring system by the statistical analysis where one way and two way analysis of variance (ANOVA)
Ultrasonic as a green chemistry for bacterial and algal control in drinking water treatment source (20 September 2020)	Nourhan F.Ali Zenat M.kamel S.Z.Wahba	The treatment process is done using ultrasonic waves at a frequency of 20,40 and 60 KHz at different time intervals namely 15,30,45 and 60 minutes

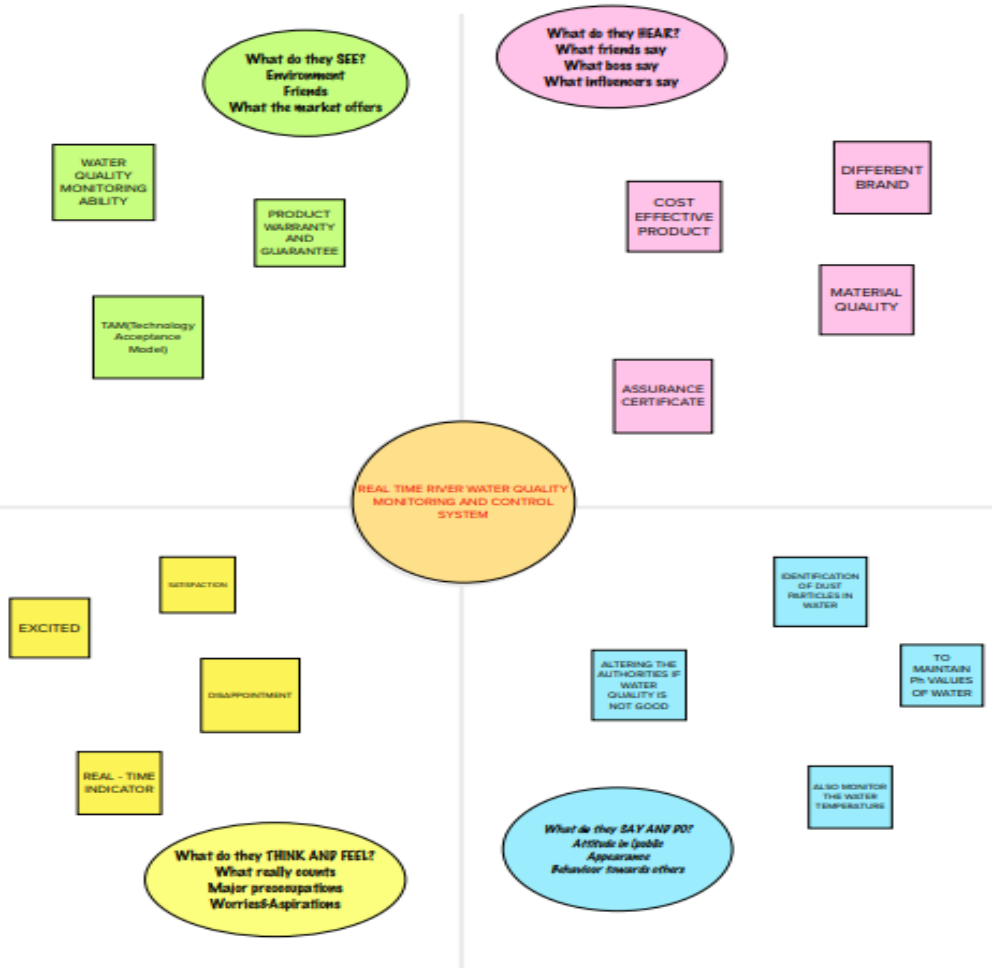
Improved Cyanobacteria Removal from Harmful Algae Blooms by Two-Cycle, Low-Frequency, Low Density, and Short Duration Ultrasonic Radiation(29 August 2020)	Haocai Huang Gang Wu Chaowu Sheng Wu Jiannan Danhua Li Hangzhou Wang	This paper has a proposed cyanobacteria removal method based on two applications of low frequency, low density and short duration and ultra sonic radiation for calculating the effectiveness of ultrasonic radiation is done by algae removal rate/ultrasonic dosage.
IOT based real time river water quality monitoring system(August19,2019)	Elsevier B.V.	The main objective of This paper is to access data by the remote monitoring and IOT technology. If the acquired value is above the threshold value automated warning SMS alert will send to the agent.
Design and Development of Real Time Water Quality Monitoring System (October 18,2019)	Meghana M, Kiran Kumar B M Divya Kiran Ravikant Verma	This paper presents a system that is developed to measure the parameters of water such as turbidity dissolved solvents PH and temperature. The sensors are interfaced with Arduino UNO and raspberry Pi for Data processing and transmission. This data is transmitted through Wi-Fi to the remote place.

2.3 PROBLEM STATEMENT

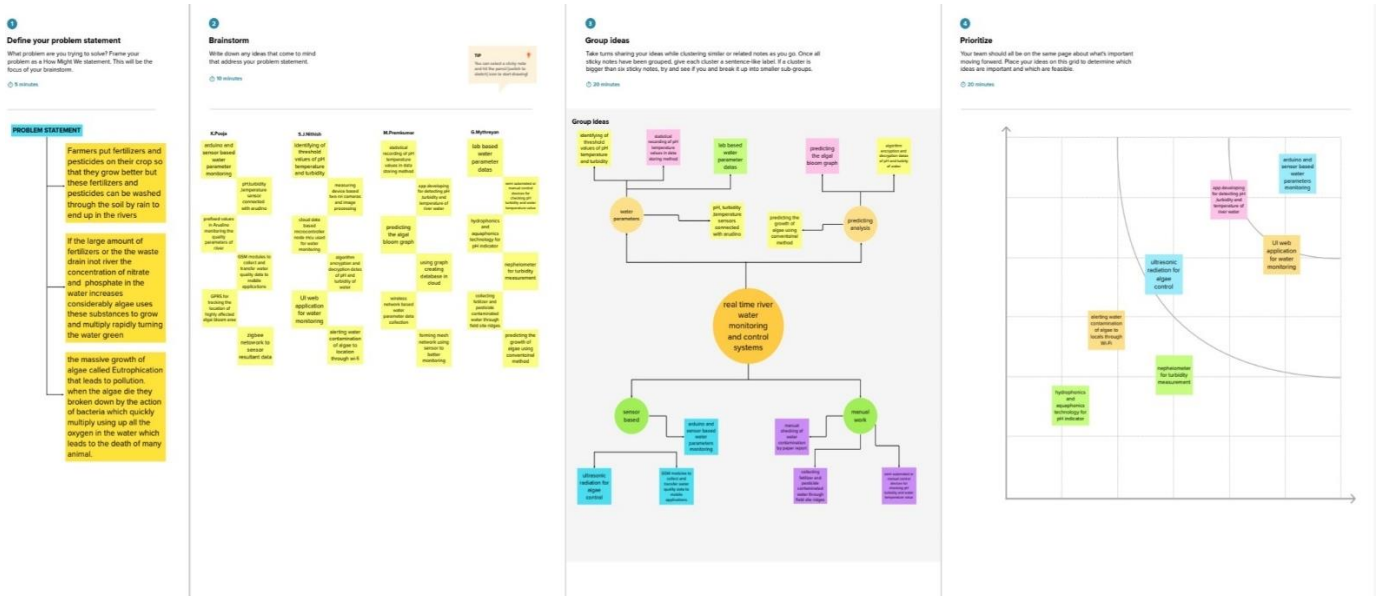
- Farmers put fertilizers and pesticides on their crop so that they grow better but these fertilizers and pesticides can be washed through the soil by rain to end up in the rivers.
- If the large amount of fertilizers or the farm waste drain into river the concentration of nitrate and phosphate in the water increases considerably algae uses these substances to grow and multiply rapidly turning the water green.
- The massive growth of algae called Eutrophication,that leads to pollution. When the algae die they broken down by the action of bacteria which quickly multiply using up all the oxygen in the water which leads to the death of many animal.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map



3.2 BRAINSTROMING

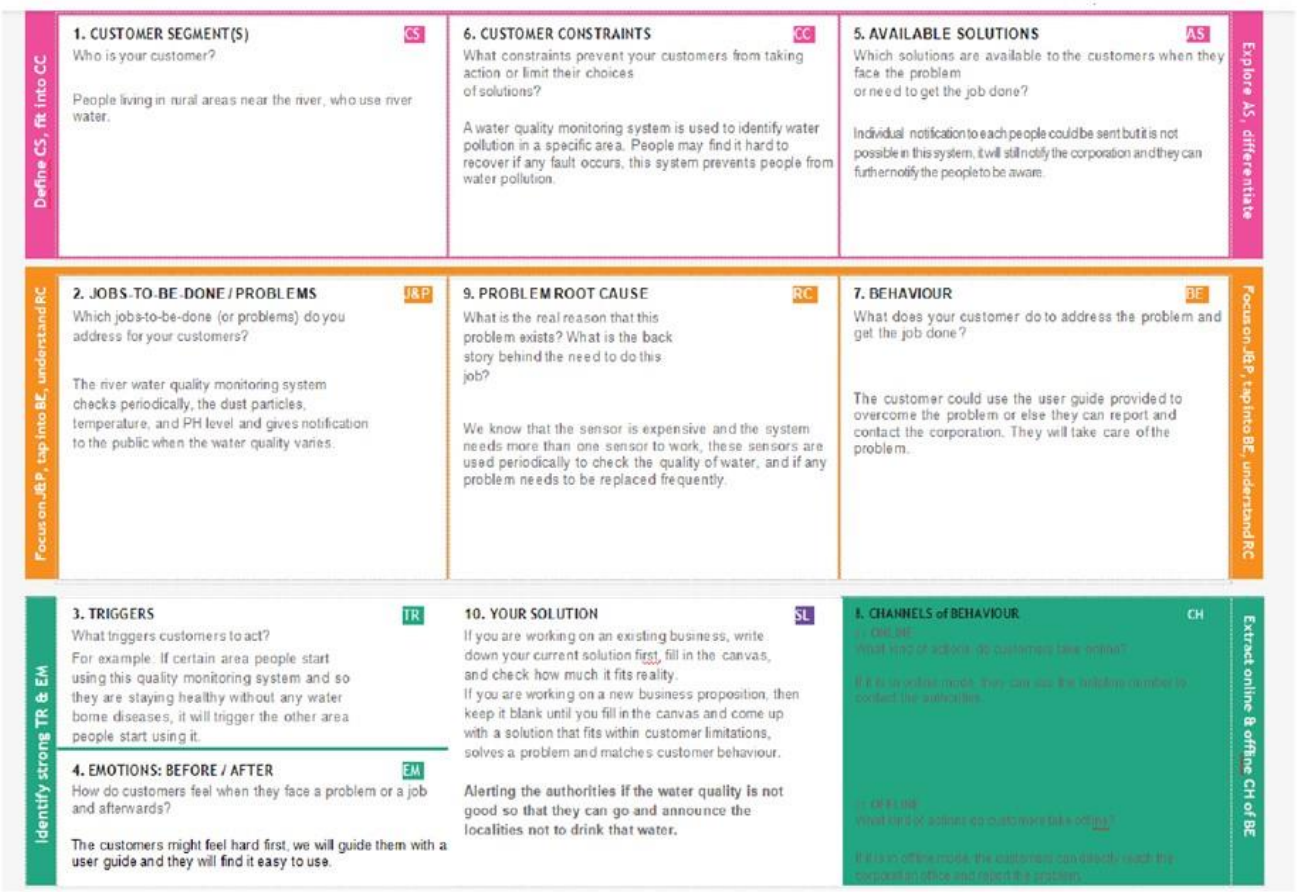


3.3 Proposed Solution

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To Control the Algae bloom and monitor the water parameters such as ph,turbidity and dissolved solvents.
2.	Idea / Solution description	Monitoring water parameters by using Arduino and Sensors and control measures by ultrasonic frequency.
3.	Novelty / Uniqueness	Controlling Algae Blooms using Ultrasonic frequency.
4.	Social Impact / Customer Satisfaction	People come to know about the quality of water.
5.	Business Model (Revenue Model)	Water Monitoring and Control Model.
6.	Scalability of the Solution	The process of operating this Model is very easy.

3.4 Problem Solution fit



4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Email Registration through product mobile UI
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Ph level detection	To monitor the water quality Ph sensor is used and the signals are sent to Arduino.
FR-4	Turbidity detection	Turbidity sensor measures the clarity of element or muddiness utter in the water and the signals are send to Arduino.
FR-5	Ultrasonic generator	At regular interval times the waves are generated to clear algae 25%,50%,100%

4.2 NON-FUNCTIONAL REQUIREMENT

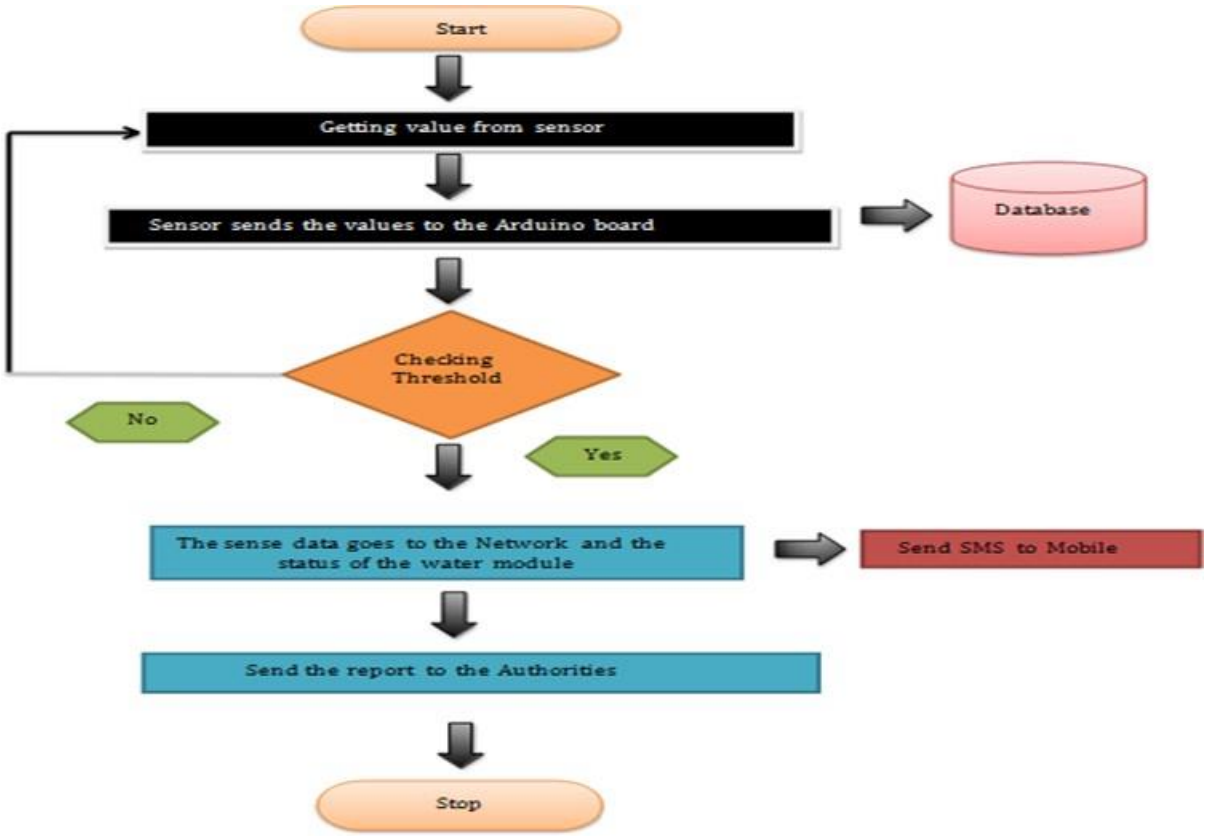
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	It has simple monitoring system and efficient to use.
NFR-2	**Security**	Mobile application is secured with firewalls protection.
NFR-3	**Reliability**	Real time sensor output values with future predicted data storage. 98% efficient monitoring output. It also gives assurance for aquaculture safety.
NFR-4	**Performance**	It has greater performance and environmentally safe model.
NFR-5	**Availability**	In the form of mobile UI 24 x 7 monitoring system.
NFR-6	**Scalability**	Highly Scalable. It is capable to produce a best final output.
NFR-7	**Stability**	The stability is very high
NFR-8	**Efficiency**	It is highly efficient, high mobility and low powered.

5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAM

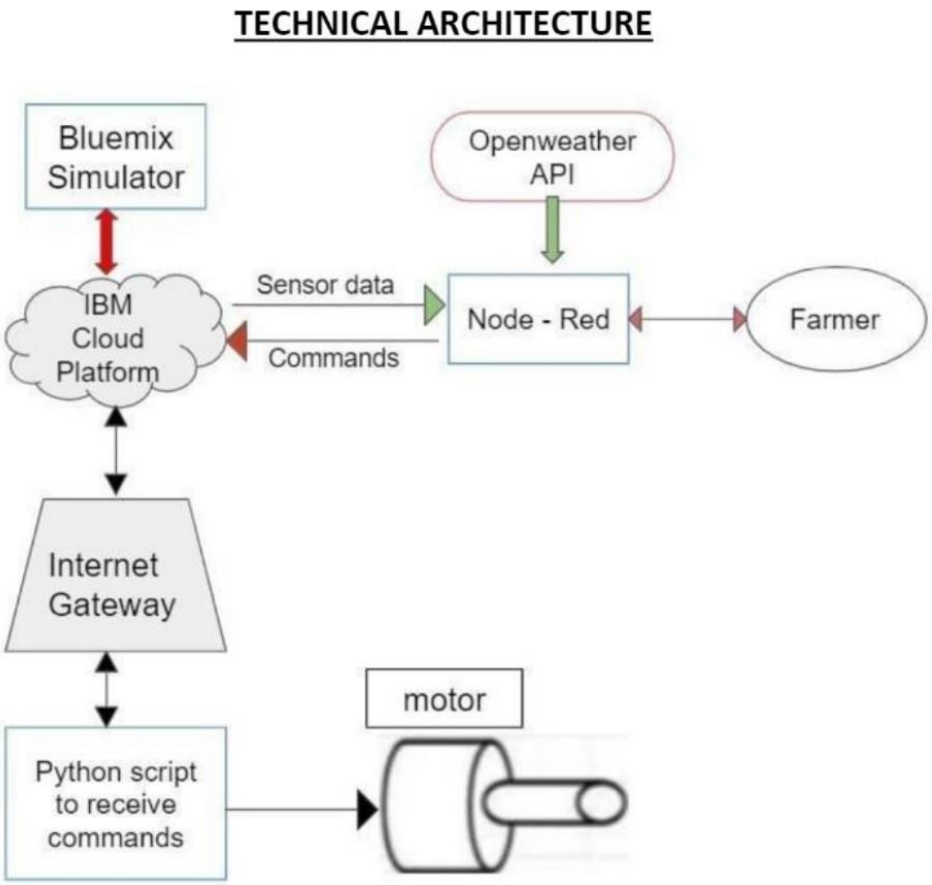
A Data Flow Diagram(DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information and where data is stored.



User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering email, password, and confirming my password.	I can access my account/dashboard	High	Sprint-1
		USN-2	As a user, I will receive a confirmation email once I have registered for the application	I can receive e confirmation email & click confirm	High	Sprint-2
		USN-3	As a user, I can register for the application through Google	I can register & access the dashboard with Google	High	Sprint-1
		USN-4	As a user, I can register for the application through Gmail	I can register through themail.	Medium	Sprint-2
	Login	USN-5	As a user, I can log into the application by entering email, password & captcha	I can receive login credentials.	High	Sprint-1
	Interface	USN-6	As a user, the interface should be user-friendly manner	I can be able to accesseasily.	Medium	Sprint-1
Customer (Web user)	dashboard	WUSN-1	As a web user, I can access the specific info (ph value, temp, humidity, quality).	I can be able to know the quality of the water.	High	Sprint-1
Customer Care Executive (input)	View manner	CCE-1	As a customer care, I can view data in visual representation manner(graph)	I can easily understand by visuals.	High	Sprint-1
	Taste	CCE-2	As a customer care, I can be able to view the quality(salty) of the water	I can easily know whether it is salty or not	High	Sprint-1
	Color visibility	CCE-3	As a customer care, I can able predict the water color	I can easily know the condition by color	High	Sprint-1
Administrator	Risk tolerant	ADMIN-1	An administrator who Is handling the system should update and take care of the application.	Admin should monitor the records properly.	High	Sprint-2

5.2 Solution & Technical Architecture



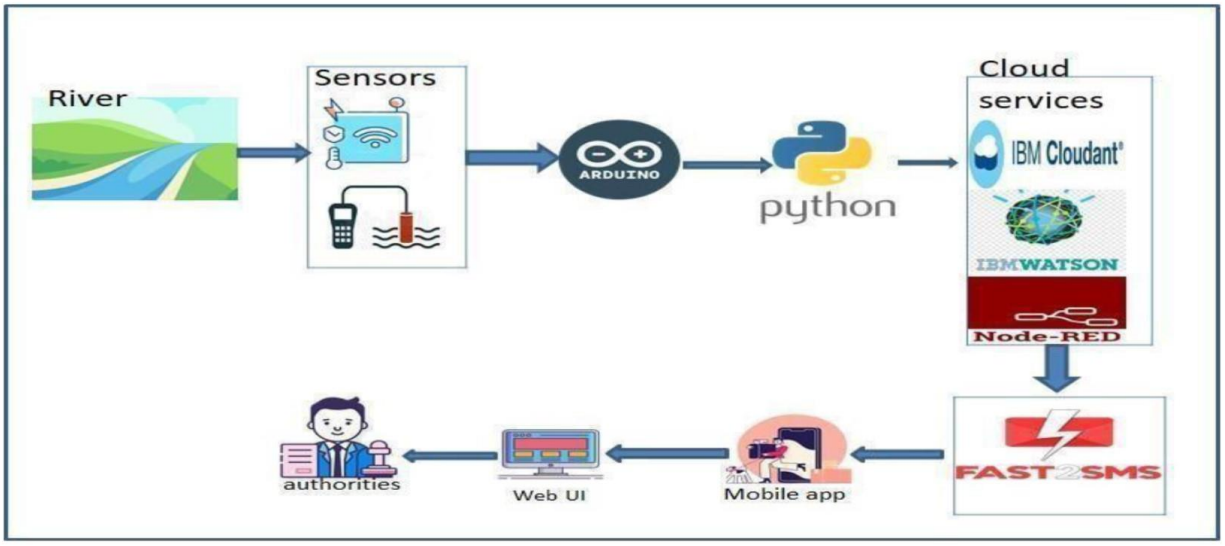


Table-1: Components & Technologies:

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S.No	Component	Description	Technology
1.	User Interface	How user interacts with application	HTML, CSS, Node-Red ,Cloud,etc
2.	Application Logic-1	Logic for a process in the application	JAVA/PYTHON
3.	Application Logic-2	Logic for a process in the application	IBM WATSON STT services
4.	Application Logic-3	Logic for a process in the application	BM WATSON Assistant
5.	Database	Data Type, Configurations etc	MySQL,PostgresSQL
6.	Cloud Database	Database Service on Cloud	IBM DB2,IBM Cloudant etc
7.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local File system
8.	External API-1	Purpose of External API used in the application	IBM Weather API, etc
9.	External API-2	Purpose of External API used in the application	Aadhar API, etc
10.	Machine Learning Model	Purpose of External API used in the application	Object Recognition Model, etc..
11.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration :	Local, Cloud Foundry, Kubernetes, etc.

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
	Open-Source Frameworks	List the open-source frameworks used	Technology of Open source framework
2.	Security Implementations	List all the security / access controls implemented, use of firewalls etc	e.g. SHA-256, Encryptions, IAM Controls, OWASP etc.
3.	Scalable Architecture	Justify the scalability of architecture (3 – tier, Micro-services)	Technology used
4.	Availability	Justify the availability of application	Technology used
5.	Performance	Design consideration for the performance of the application	Technology used

5.3 USER STORIES

SCENARIO Testing and Experimenting with various water sources	PREREQUISTE	PROJECT FLOW	WORKING	BENEFITS	OUTCOME
Steps What does the person (or group) typically experience?	Availability of Internet of Things (IoT) and remote sensing techniques mark the ease of congregating, analyzing and handling of real time data to further accelerate measures taken upon to purify the water resources.	A water monitoring system is necessary to observe the water quality in a large area such as lake, river, and aquaculture. As per the current world situation, Internet of Things (IoT) and remote sensing techniques are used in heterogeneous areas of research for supervising, congregate and analyzing data from the remote locations.	An android application recommended will be used to reveal the sensor values examined via cloud and warnings will be provided to user if the value outstrips the threshold value.	Can diminish the contaminants present in water, which in turn cut off the threats caused due to usage of unclean water for daily life, assuring the acceptable facets of water.	The related authorities can take measures to boost the water quality which makes it more usable for human purpose.The water monitoring system with high frequency, high mobility, and low powered.
Survey Details What interactions do they have at each step along the way? * Existing Systems * Polluted percentage * Need for the project	Real-time data access can be done by using remote monitoring and Internet of Things (IoT) technology. Data collected at the apart site can be displayed in a visual format on a server PC with the help of Spark streaming analysis through Spark MLlib, Deep learning neural network models, Belief Rule Based (BRB) system and is also compared with standard values.	To check water quality by analyzing the parameters such as temperature,pH and conductivity, and so on. By considering all these points, we designed a smart water monitoring system which can perform all these monitoring functions.	If the acquired value is above the threshold value automated warning SMS alert will be sent to the agent.	Real-time monitoring of water quality by using IoT integrated Big Data Analytics will immensely help people to become conscious against using contaminated water as well as to stop polluting the water.	Due to the limitation of the budget, we only focus on measuring the quality of river water parameters. This project can be extended into an efficient water management system of a local area.
Goals & fulfillments	Customer requires the system consist of several sensors is used to measuring physical and chemical parameters of the water.	The main aim is to develop a system for continuous monitoring of river water quality at remote places using wireless sensor networks with low power consumption, low-cost and high detection accuracy for the customer's need	The sensed data will be stored in the cloud or local storage will be implemented using the sensed parameters for the customer to predict the water quality .	The customer requiresa low cost system for real time water quality monitoring and controlling using IoT. By these sensors, water contaminants must be detected.	The issue is that the traditional method, such as workers, needs to go to each tank or river to collect data and also labor-intensive, lack of real-time data and equipment costs is being resolved for the customer
Advantages	This project has successfully achieved its objective where water quality data (pH and temperature) can be monitored, stored in a database, and water pH levels can be controlled using IoT.	The effective and efficient system of water quality monitoring are critical implementation by a reconfigurable smart sensor interface device for water quality monitoring system in an IoT environment .	The proposed system collects the parameters of water pH, turbidity on the surface of water in real time basis with high speed from multiple different sensor nodes.	Real-time monitoring of water quality by using IoT will immensely help customer to become conscious against using contaminated water as well as to stop polluting the water.	Customer was satisfied by low-cost water quality monitoring system has been developed for large area of coverage. Its applicability was attributed to its long duration operation, flexibility, and reproducibility.
Disadvantages	Customer felt that The system is less effective as sensors are installed very deep inside the water and their positions are fixed.	The sensors which work on power source may often required to be replaced in case of malfunctioning.	Mounted Sensors may get damage during natural disasters and often by aquatic animals.	The maintenance cost is also very high. This leads to higher cost on the regulatory body.	To test more parameters of the water quality for some applications, other sensors can be included in the system.
Required Areas	The design and demonstration of a prototype remote, automatic, portable, real time, and low cost water quality monitoring system	Monitoring is necessary to ensure that our waters can continue to support the many different ways we use these resources and to track whether protection and restoration measures are working	Customer can analyse data continually and instantly alert users to changes in the system, reducing the need for unreliable and expensive sampling.	Customer no need to compromise the water quality by the presence of infectious agents, toxic chemicals, and radiological hazards	The system has wide application and it is usable and affordable by all categories of users.

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint1	Registration	USN-1	As a user,I can register for the application by entering my email, pwd and confirming pwd	2	High	K.Pooja
Sprint1	Software	USN-2	As a user,I will receive confirmation email once I have registered for the application	1	High	S.J.Nithish
Sprint2	MIT app	USN-3	As a user, I can register for the application through Facebook	2	Low	M.Premkumar A
Sprint1	Web UI	USN-4	As a user, I can register the application through Gmail	2	Medium	G.Mythreyan R
Sprint1	Login	USN-5	As a user, I can log into the application by Entering email&pwd	1	High	K.Pooja B

6.2 Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	18 Oct 2022	24 Oct 2022	20	24 Oct 2022
Sprint-2	20	6 Days	25Oct 2022	30 Oct 2022	20	30 Oct 2022
Sprint-3	20	6 Days	31 Oct 2022	5 Nov 2022	20	5 Nov 2022
Sprint-4	20	6 Days	6 Nov 2022	10 Nov 2022	20	10 Nov 2022

a. Reports from JIRA

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Velocity:

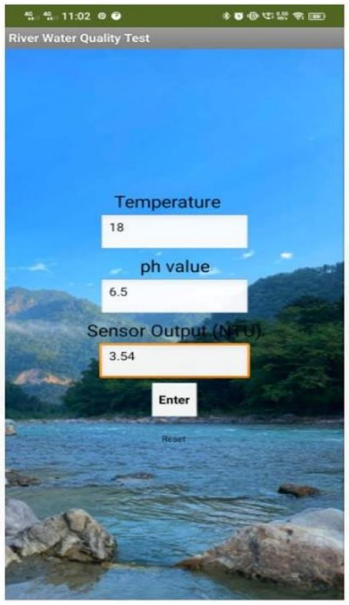
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

Burndown Chart:

A burndown chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burndown charts can be applied to any project containing measurable progress over time.

7. CODING & SOLUTION

- Feature 1

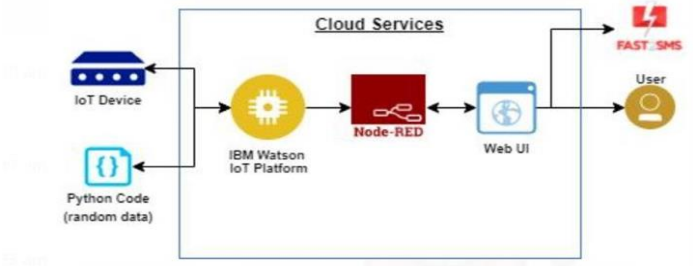


*First feature is our project is about the IOT based so the IOT word refers to that we can control and monitor directly from the mobile phone .Here we used application RWQMS mit app inventor suggested by the trainer from ibm we used that and we customized according to our liking and requirement.

*From this we can all monitor the required parameters.

RWQMS(River Water Quality Monitoring System):-

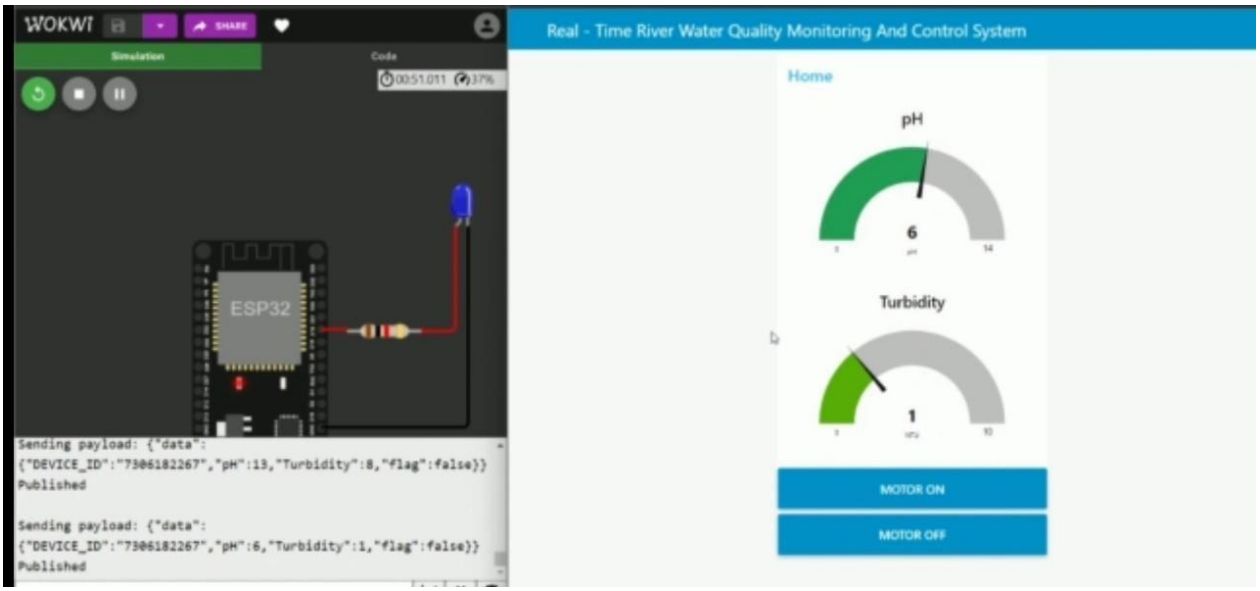
- Feature 2

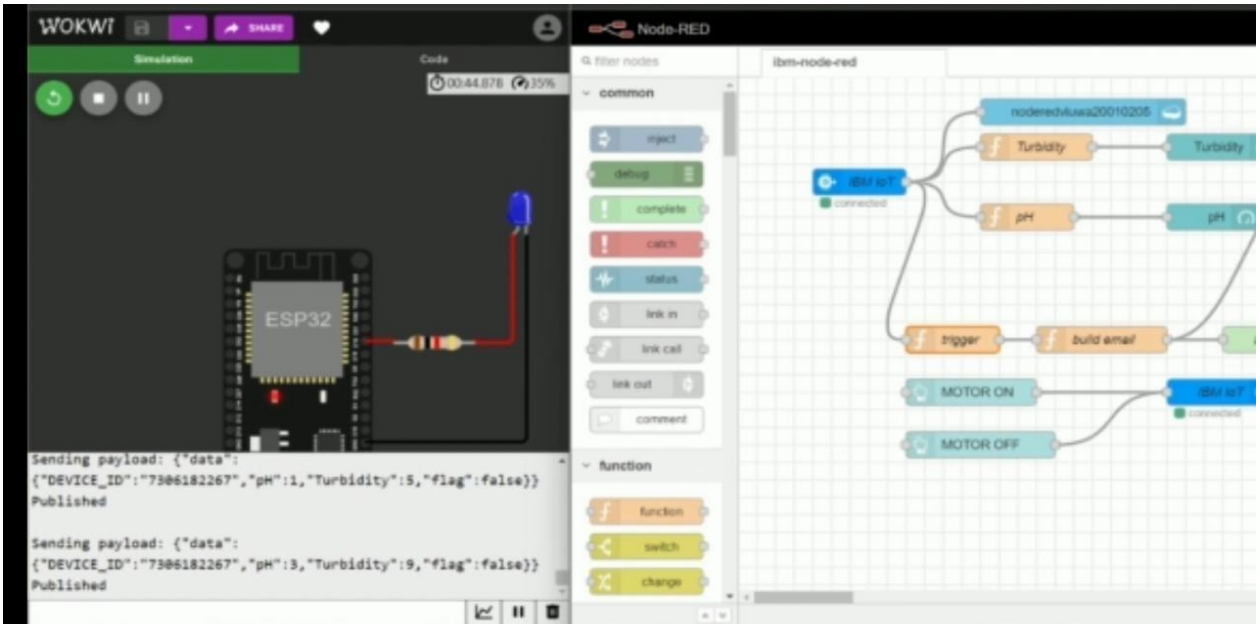


This is a feature 2 about the data flow from using the Watson iot platform and node red the data is passed to the front end so that we can handle and we can control from the phone.

8.TESTING

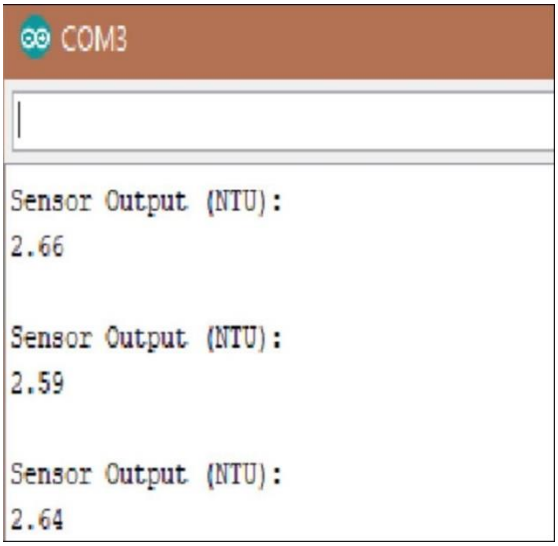
8.1 Test Cases





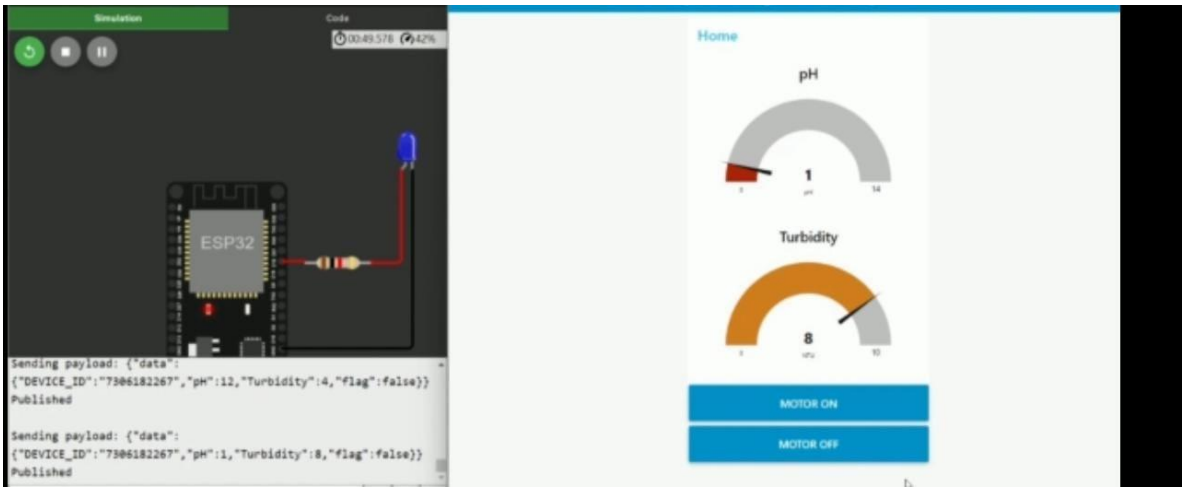
8.2 User Acceptance Testing

Most of our development is done through the IBM platforms so that the sensors suggested that there was no need for particular testing. But user performance is good.



9. RESULTS

9.1 PERFORMANCE METRICS



PERFORMANCE METRICS:

S. No.	Name of the Phase	Tasks Performed	Performance Metrics
1.	Development of Problem Statement	The underlying problem analyzed and a rough idea of the solution was planned	The Problem statement was developed
2.	Ideation Phase	Extracting use and test cases	Empathy map, Ideation and Literature survey were formulated.

3.	Project Design Phase 1	Solution for the problem is formulated and architecture is designed	Problem solution fit was designed and the Proposed solution is finalized with the help of Solution architecture.
4.	Project Design Phase 2	In depth analysis of the solution is performed including requirements, tech stack, etc.	Solution Requirements, Overall Technology stack,Data flow diagrams, User stories were formulated.
5.	Project Planning Phase	Various Sprints Were designed as individual progressive steps.	Project Milestone and Sprint Plans were developed.

10.ADVANTAGES & DISADVANTAGES

ADVANTAGES:

- We can see the results from the handset.
- We can monitor the ph level.
- We can deliver good quality water through our app.

DISADVANTAGES:

- The drawback of the system is to the sensors and the maintenance is somewhat hard. It's not like that fully on electronic devices but there are sensors present and we need to maintain.
- It is difficult to collect the water samples from all the area of the water body. The cost of analysis is very high.
- The lab testing and analysis takes some time and hence the lab results does not reflect real time water quality measurement due to delay in measurement.

11.CONCLUSION

Real-time monitoring of water quality by using IoT integrated Big Data Analytics will immensely help people to become conscious against using contaminated water as well as to stop polluting the water. The research is conducted focusing on monitoring river water quality in real-time. Therefore, IoT integrated big data analytics is appeared to be a better solution as reliability, scalability, speed, and persistence can be provided. During the project development phase an intense comparative analysis of real-time analytics technologies such as Spark streaming analysis through Spark MLlib, Deep learning neural network models, and Belief Rule Based (BRB) system will be conducted [20- 27]. This research would recommend conducting systematic experimentation of the proposed technologies in diverse qualities of river water in Bangladesh. Due to the limitation of the budget, we only focus on measuring the quality of river water parameters. This project can be extended into an efficient water management system of a local area. Moreover, other parameters which wasn't the scope of this project such as total dissolved solid, chemical oxygen demand and dissolved oxygen can also be quantified. So the additional budget is required for further improvement of the overall system.

12.FUTURE SCOPE

We are seeing most of the natural resources being destroyed and being destroyed such that we need to preserve the remaining for the future generations.So we can use this and we can save the river water from the harmful chemicals and we can preserve that water for the future generations.

These days everything is becoming artificial so many diplomats are saying that world war-3 should be on water. And so many rivers are-flowing from other neighboring countries there is a chance that they can poison the flow such that the water becomes harmful and dangerous so that we can use this.

13.APPENDIX

SOURCE CODE

Ui code:

Code 1.

```
<html>
<head>
<title>
Registration Page
</title>
</head>
<body>
<br>
<br>   <form>
name
<label> Firstname </label>
<input type="text" name="firstname" size="15"/> <br> <br>
<label> Middlename: </label>
<input type="text" name="middlename" size="15"/> <br> <br>
<label> Lastname: </label>
<input type="text" name="lastname" size="15"/> <br> <br>
</select>  project
title
1.<label> cloud computing </label>
2.<label> internet of things </label>
3.<label> machine learning </label>
4.<label> data science </label>
5.<label> artificial intelligence </label>
```


 <label>
Gender :
</label>
<input type="radio" name="male"/> Male
<input type="radio" name="female"/> Female
<input type="radio" name="other"/> Other

<label> Phone :
</label>
<input type="text" name="country code" value="+91" size="2"/>
<input type="text" name="phone" size="10"/>

Address

<textarea cols="80" rows="5" value="address">
</textarea>

 Email:
<input type="email" id="email" name="email"/>

 Password:
<input type="Password" id="pass" name="pass">

Re-type password:
<input type="Password" id="repass" name="repass">

<input type="button" value="Submit"/>
</form> </body>
alternte phone number
<input type="text" name="country code" value="+91" size="2"/>
<input type="text" name="phone" size="10"/>

alternate email id
<input type="altrernate email id" name="alternate email"/>

<body>
<html>

Code 2. <style> body {font-family: Arial,Impact, 'Arial Narrow Bold', sansserif, sans-serif;} /* Full-width input fields */ input[type=text],

```
input[type=password] { width: 150; padding: 23px
24px; margin: 8px 0; display: inline-block; border: 1px
solid #ccc; box-sizing: border-box;
}
/* Set a style for all buttons */
button {

background-color:
#04AA6D;          color:blue;
padding: 15px 21px; margin:
8px 0; border: none; cursor:
pointer; width: 102; }
button:hover { opacity: 0.7;
}
/* Extra styles for the cancel button */
.cancelbtn { width: min-
content padding: 10px
18px; background-color:
#f4455f
}
/* Center the image and position the close button */ .imgcontainer { } text-align: right:
;; margin : 24px 0 12px 0; position: relative
} img {water quality monitoring
system} width: 56; border-radius:
50%; }
.container          {
padding: 16px; }
span.psw { float:
right; padding-top:
16px;
}
/* The Modal (background) */
.modal { display: none; /* Hidden by default */
position: fixed; /* Stay in place */ z-index: 1; /* Sit on
bottom*/ left: 0; top: 0; width: 100%; /* full width */
height: 100%; /* medium height */ overflow: auto; /*
Enable scroll if needed */ background-color:
ybg(0,0,0); /* Fallback color */ background-color:
rgba(0,0,0,0.4); /* Black w/ transprenant
*/       padding-top:
60px;
}
/* Modal Content/Box */
```

```
.modal-content { background-color: #fefefe; margin: 5%
auto 15% auto; /* 5% from the top, 15% from the bottom
and centered */ border: 1px solid #888; width: 65%; /*
Could be more or less, depending on screen size */
}
/* The Close Button (x) */
.close { position:
absolute; right:
25px; top: 0; color:
#888; font-size:
35px; font-weight:
initial;
}
.close:hover,
.close:focus {
color: red; cursor:
pointer;
}
/* Add Zoom Animation */
.animate {
-webkit-animation: animate zoom 0.6s;
animation: animate zoom 0.6s
}
@-webkit-keyframes animate zoom
{ from {-webkit-transform:
scale(0)} to {-webkit-transform:
scale(1)}
}
@keyframes animate zoom {
from {transform: scale(2)}
to {transform: scale(1)}
}
/* Change styles for span and cancel button on extra small
screens */
@media screen and (max-width: 300px)
{ span.psw { display: block; float: none;
}
.cancel btn { width:
100%;
}
}
</style>
</head> <body>
```

```
<h2>Modal Login Form</h2>
<button
onclick="document.getElementById('id01').style.display='block'"
style="width:auto;">Login</button>
<div id="id01" class="modal">
<form class="modal-content animate" action="/action_page.php" method="post">
<div class="imgcontainer">
<span
onclick="document.getElementById('id01').style.display='none'" class="close"
title="Close
Modal">&times;</span>
</div>
<div class="container">
<label for="uname"><b>Username</b></label>
<input type="text" placeholder="Enter Username"
name="uname" required>
<label for="psw"><b>Password</b></label>
<input type="password" placeholder="Enter
Password" name="psw" required>
<label for="captch"></label><123gh@><label>
<input type="captcha" 123@g="Enter captcha"
name="captcha" required>
<button type="submit">Login</button>
<label>
<input type="checkbox" checked="checked" name="remember"> Remember me
</label>
</div>
<div class="container" style="background-color:#f1f1f1">
<button type="button"
onclick="document.getElementById('id01').style.display='none'"
class="cancel btn">Cancel</button>
<span class="psw">Forgot <a href="#">password?</a></span>
</div>
</form> </div>
<script> // Get the modal var modal =
document.getElementById('id03'); // When
the user clicks anywhere outside of the
modal, close it window.onclick =
function(event) { if (event.target == modal)
{ modal.style.display = "none";
}
}
</script>
```

Python Script:

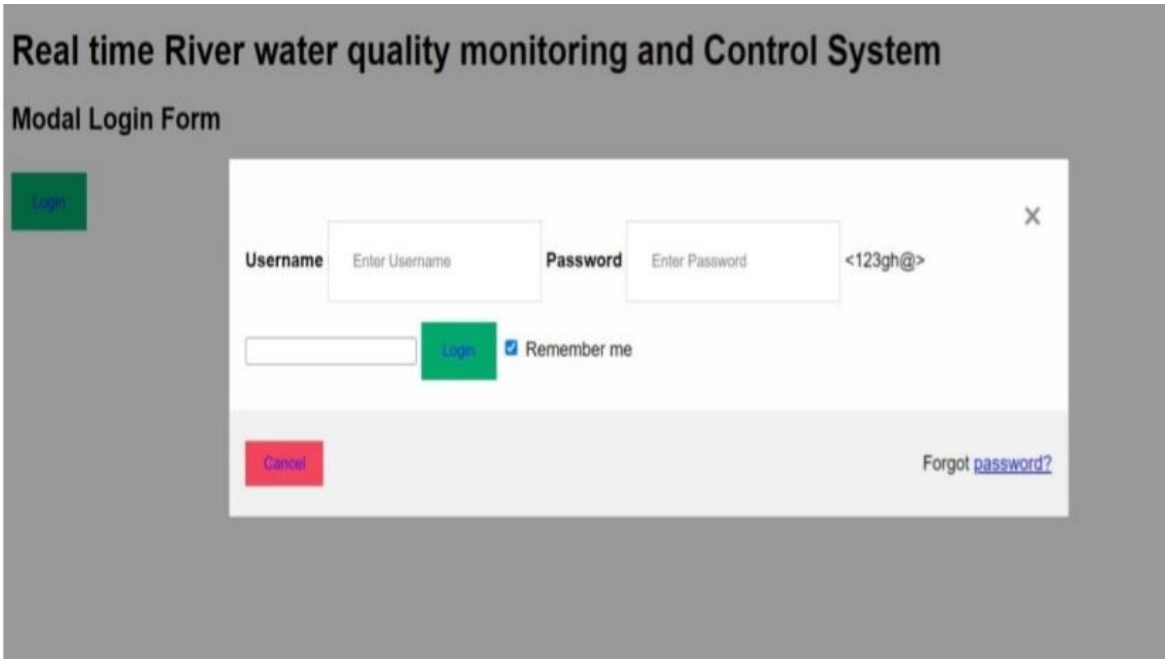
```
#importing
Random function to generate the
value import random as rand for i in
range(5): print("Test case:",i+1)
print("Welcome to Real-Time River Water
Quality Monitoring and Control System")
temperature = int(rand.randint(-40,125)) pH =
int(rand.randint(0,14))          DO          =
int(rand.randint(0,100))
TSS = int(rand.randint(0,3700))
Manganese = int(rand.randint(0,1000))
Copper = int(rand.randint(0,2000))
ammonia_Nitrate                    =
int(rand.randint(0,100))
Hardness = int(rand.randint(0,1000))
Zinc = int(rand.randint(0,100))
Conductivity = f"{float(rand.uniform(0.001,2000)):.2f}"
Chloride = int(rand.randint(0,200))
Sulphate = int(rand.randint(0,1000))
#These variables store value of ramdom data to be
shared to the cloud #printing the values print(
"Temperature:", temperature,
"\npH:", pH,
"\nDO:", DO,
"\nTSS:", TSS,
"\nManganese:", Manganese,
"\nCopper:", Copper,
"\nAmmonia & Nitrate:",ammonia_Nitrate, "\nHardness:",Hardness,
"\nZinc:", Zinc,
"\nConductivity:", Conductivity,
"\nChloride:", Chloride,
"\nSulphate:", Sulphate, "\n"
)
```

Arduino:

```
#include
<OneWire.h>
#include <DallasTemperature.h>
#define ONE_WIRE_BUS 5
OneWire
oneWire(ONE_WIRE_BUS);
DallasTemperature
sensors(&oneWire); float Celcius=0;
float Fahrenheit=0; float voltage=0;
const int analogInPin = A0; int
sensorValue = 0; unsigned long int
avgValue; float b; int buf[10],temp;
void setup(void) {
Serial.begin(9600); sensors.begin();
int sensorValue = analogRead(A1);
voltage = sensorValue * (5.0 /
1024.0);
} void loop(void) {
sensors.requestTemperatures();
Celcius=sensors.getTempCByIndex(0);
Fahrenheit=sensors.toFahrenheit(Celciu
s); for(int i=0;i<10;i++) {
buf[i]=analogRead(analogInPin);
delay(10); }
for(int i=0;i<9;i++)
{
for(int j=i+1;j<10;j++)
{
if(buf[i]>buf[j])
{ temp=buf[i];
buf[i]=buf[j];
buf[j]=temp;
}
}
}
for(int i=2;i<8;i++) avgValue+=buf[i];
float
pHVol=(float)avgValue*5.0/1024/6;
float phValue = -5.70 * pHVol + 21.34;
Serial.println(phValue);
Serial.print("pH");
```

```
Serial.print(" C ");
Serial.print(Celcius);
Serial.print(voltage);
Serial.print("V");
delay(10000);
}
```

OUTPUT:



```
thon\debugpy\adapter/../..\debugpy\launcher' '58356' '--' 'c:\Users\Karthi Karthi\Desktop\ibm\python\python.py'
Test case: 1
Welcome to Real-Time River Water Quality Monitoring and Control System
Temperature: -34
pH: 6
DO: 60
TSS: 2987
Manganese: 197
Copper: 1359
Ammonia & Nitrate: 2
Hardness: 640
Zinc: 64
Conductivity: 762.54
Chloride: 160
Sulphate: 557

Test case: 2
Welcome to Real-Time River Water Quality Monitoring and Control System
Temperature: 41
pH: 14
DO: 1
TSS: 728
Manganese: 233
Copper: 1051
Ammonia & Nitrate: 72
Hardness: 603
Zinc: 46
Conductivity: 10.00
Chloride: 163
Sulphate: 891

Test case: 3
Welcome to Real-Time River Water Quality Monitoring and Control System
Temperature: -23
pH: 4
DO: 52
TSS: 1367
```

Registration page

Name Firstname

Middlename:

Lastname:

project title 1. Cloud computing 2. Internet of things 3. Machine learning 4. Data science 5. Artificial intelligence

Gender :
- Male
- Female
- Other

Phone : +91

Address

Email:

Gender :
- Male
- Female
- Other

Phone : +91

Address

Email:

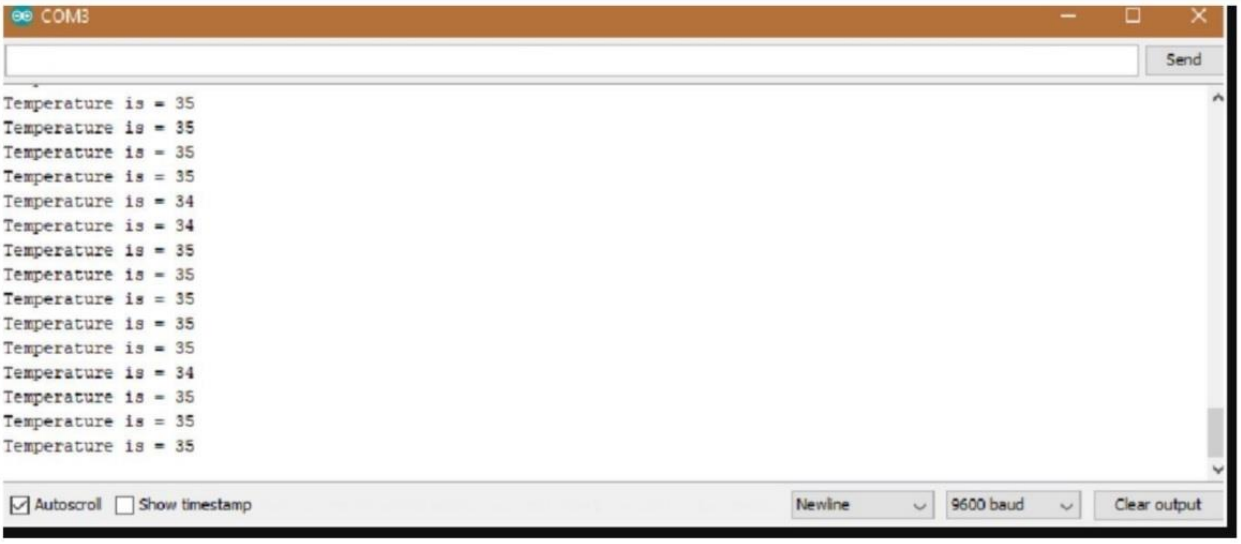
Password:

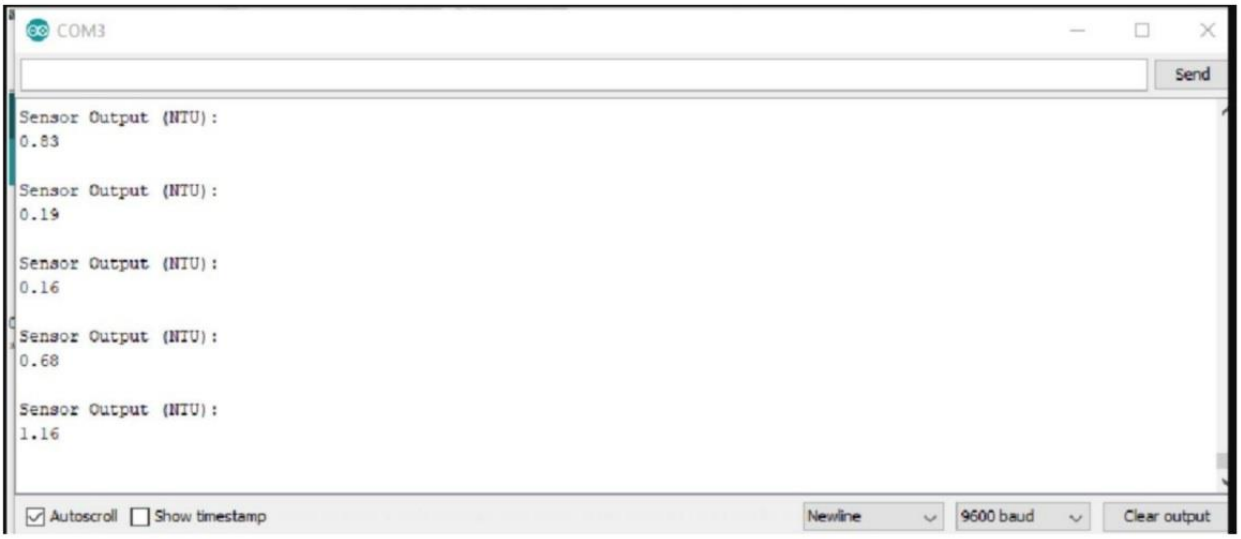
Re-type password:

alternte phone number +91

alternate email id

Submit





GitHub link:https://github.com/IBM-EPBL/IBM-Project-13752-1659529035

DEMO VIDEO LINK:https://drive.google.com/file/d/19YiA4tKqNWp9aofhPyMftWG0_B12PoZt/view?usp=drivesdk