NANDHA ENGINEERING
COLLEGE
(Autonomous)

PROJECT

REAL-TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEM.

TEAM ID: PNT2022TMID19722

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CONTENTS

1. INTRODUCTION

a. Project Overview

Project is real-time river water quality monitoring and control system is about we do have so many low laying pits and the big pits are called canals and flow of water is called rivers .now a days most of the rivers are filled with dirty water and in some places we can not able to draw the water and we can not make use of the ground water because in our country or in the worlds there are place where any body can not able to make use of the ground water .there are people who only depend on the stream of water that flowing there near by simply rivers .such that river water plays an crucial role in so many life's.not only human beings but also other animals and living things that are living inside the water ,so there is in need of using the good and efficient water .normally the purity of water is depend up on or the drinking water is safe is determined not only on impurities present in the water but also one thing is ph lever the ph level of the water should be 7 that is neutral state so we are using this project to control the river water ph level with the help of IOT. 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 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. The uniqueness of our proposed paper is to obtain the water monitoring system with high frequency, high mobility, and low powered. Therefore, our proposed system will immensely help Bangladeshi populations to become conscious against contaminated water as well as to stop polluting the water.

b. Purpose

In this project, we depict the design of Wireless Sensor Network (WSN) [4-7] 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 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 network if everywhere starting from smart cities, smart power grids, and smart supply chain to smart wearable [7- 12]. Though IoT is still under applied in the field of environment it has huge potential. It can be applied to detect forest fire and early earthquake, reduce air population, monitor snow level, prevent landslide, and avalanche etc. Moreover, it can be implemented in the field of water quality monitoring and controlling system [4, 13]. Water quality monitoring has gained more interest among researchers in this twenty-first century. Numerous works are either done or ongoing in this topic focusing on various aspects of it. The key theme of all the projects was to develop an efficient, cost-effective, real-time water quality monitoring system which will integrate wireless sensor network and internet of things [14]. In this research, we monitor the physical and chemical parameters of water bodies inside Chittagong city by using an IoT based sensor network.

LITERATURE SURVEY

a. Existing problem

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

b. References

1. Real-Time River Water Quality Monitoring System- International Journal of Engineering Research & Technology (IJERT)
2. Real-Time Water Quality Monitoring System -International Research Journal of Engineering and Technology (IRJET)

c. Problem Statement Definition

Water is the primary need of all living beings and living without water is impossible. With the advancement of technology and industrialization, environmental pollutions have become a major concern. Water pollution is one of the most serious types of this environmental pollution. Our lives depend on the quality of water that we consume in different ways, from juices which are produced by the industries. Any imbalance in the quality of water would severely affect the humans' health and at the same time it would affect the ecological balance among all species. Water quality refers to the chemical, biological, radiological, and biological parameters of the water.

2. IDEATION & PROPOSED SOLUTION

Empathy Map Canvas

Have to provide pure drinking water

causes risky life

Multiple sensors are needed to check water condition

Have to check and maintain the acidity & pH level

Density of water is not measured

Earlier monitoring is needed

water has to purify by collecting waste materials

Added advantage to the workers in water board

spend time for getting updates on water condition

Dust particles are needed to segregate

looking for the data's provided by sensors

updates must be provided regularly

PAIN

Initialization cost is high

Chemical component may cause damage

Maintenance is needed

GAIN

Reduce man power for checking water
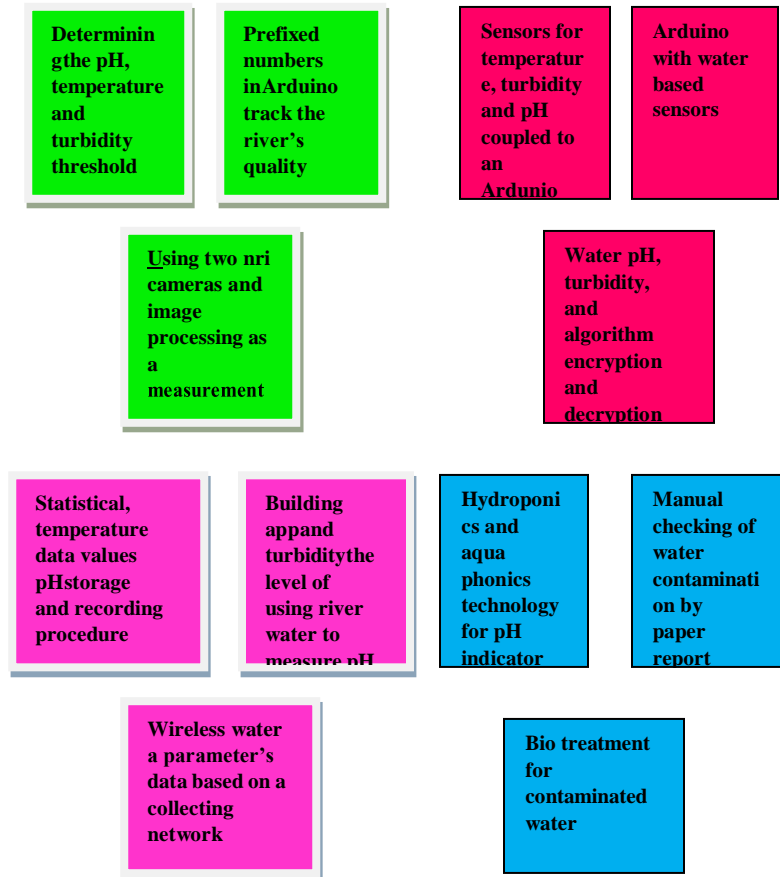
24/7 monitoring
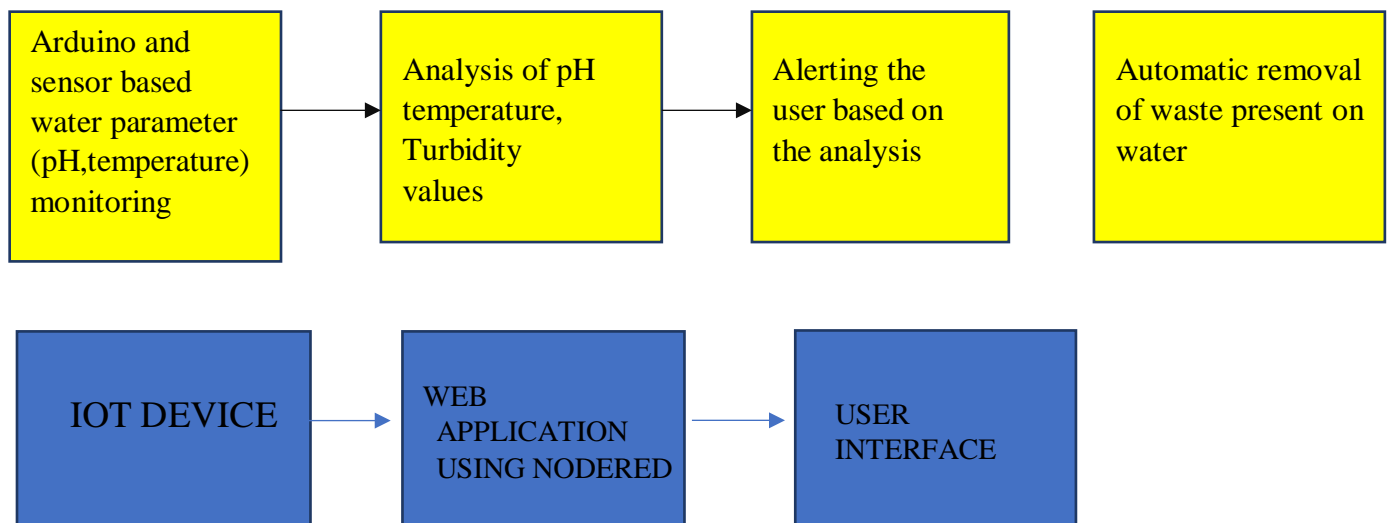
clean water may provided

a. Ideation & Brainstorming

Define your problem statement

Disposal of Solidand chemical wastes into the river water resulting in contamination of water and also disturbing the life existing in water

BRAINSTORMING

Determinin gthe pH, temperature and turbidity threshold	Prefixed numbers inArduino track the river's quality

Using two nri cameras and image processing as a measurement

Statistical, temperature data values pHstorage and recording procedure	Building appand turbiditythe level of using river water to measure pH

Wireless water a parameter's data based on a collecting network

Sensors for temperatur e, turbidity and pH coupled to an Ardunio	Arduino with water based sensors

Water pH, turbidity, and algorithm encryption and decryption

Hydroponi cs and aqua phonics technology for pH indicator	Manual checking of water contaminati on by paper report

Bio treatment for contaminated water

IDEAS

Arduino and sensor based water parameter (pH,temperature) monitoring → Analysis of pH temperature, Turbidity values → Alerting the user based on the analysis → Automatic removal of waste present on water

IOT DEVICE → WEB APPLICATION USING NODERED → USER INTERFACE

b. Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To obtain the PH value and temperature level of a water and to removal of waste from the river water.
2.	Idea / Solution description	Observing the quality of water using sensors.
3.	Novelty / Uniqueness	If the values of the parameter changes (abnormal), warning SMS will sent to the agent.
4.	Social Impact / Customer Satisfaction	Good quality water is furnished for people and animals. It also reduces the risk of water borne diseases.
5.	Business Model (Revenue Model)	Water monitoring and control model.
6.	Scalability of the Solution	The system is easy to use and it also analyse the changes in quality of water

c. Problem Solution fit

Project Title: Real-Time River Water Monitoring and Control System   **Team ID:** PNT2022TMID19722

Define CS, fit into CC	**1. CUSTOMER SEGMENT(S)** CS Who is your customer? i.e. working parents of 0-5 y.o. kids Locality people living near river side and river water users.	**6. CUSTOMER CONSTRAINTS** CC What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices. Lack of awareness, cost, difficulty in implementation and understanding.	**5. AVAILABLE SOLUTIONS** AS Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking Manually collecting the water sample for testing the parameters like pH, turbidity, oxygen content etc and evaluating the results.	**Explore AS, differentiate**

Focus on J&P, tap into BE, understand RC	**2. JOBS-TO-BE-DONE / PROBLEMS** J&P Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides. Monitoring the parameters like pH, temperature of water and alerting the users at the time of abnormal change in parameter's value.	**9. PROBLEM ROOT CAUSE** RC What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations. Discharge of chemical and solid wastes into the river water contaminates the water as well as creates threat to the life existing in the water. Consumption of this contaminated water puts the human's health at risk.	**7. BEHAVIOUR** BE What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace) The users either can directly install the system and monitor the river water individually or can get the help from service centre.	**Focus on J&P, tap into BE, understand RC**

Identify strong TR & EM		...... and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour. **4. ......** EM Necessity of clean and healthy water. ...... lost, insecure > confident, in control - use it in your communication strategy & design. The consumer may initially find it difficult to operate, but later the user easily get adopted with the process.	The IoT-based river water quality monitoring device continuously checks the pH, temperature, and oxygen content of the water. It monitors the water for trash and eliminates it by collecting each type of waste separately in a container.	**8.2 OFFLINE** What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development. Online: Tracking the parameters of water Offline: Installation and maintenance of the system by removing the wastes collected.	**Identify strong TR & EM**

3. REQUIREMENT ANALYSIS

a. Functional requirement

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	**User Requirements**	River water Protection Monitors PH, Salinity, Turbidity, Conductivity and dissolve solvents andto analyse the quality of river water
FR-2	**User Registration**	Registration through Form Registration through Gmail Registration through LinkedIN Registration through website
FR-3	**User Confirmation**	Confirmation via Email Confirmation via OTP Confirmation via call
FR-4	**Product Feedback**	Through star rating Through Phone calls Through Google forms
FR-5	**User Authentication**	The credentials is accessible only to the authorized users to access the model.

b. Non-Functional requirements

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Easier to apply Even an illiterate consumer ought to use the product without any difficulties.
NFR-2	**Security**	The model is designed in a secure manner to maintain privacy, and it is protected by two-step authorization. Username and password will be assigned based on the needs of the user.
NFR-3	**Reliability**	Even if there is a failures the last updated Data's are stored in a Default manner.
NFR-4	**Performance**	The software should have good user interface. It must have a minimum power requirement. It has to keep water and power.
NFR-5	**Availability**	The models are created in such a way that they are accessible, usable, and can be modified at any time. Data is available at any time.
NFR-6	**Scalability**	The product has to cover all the space of water body irrespective of the quantity of river water.

4. PROJECT DESIGN

a. Data Flow Diagrams

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.

Data Flow Diagram
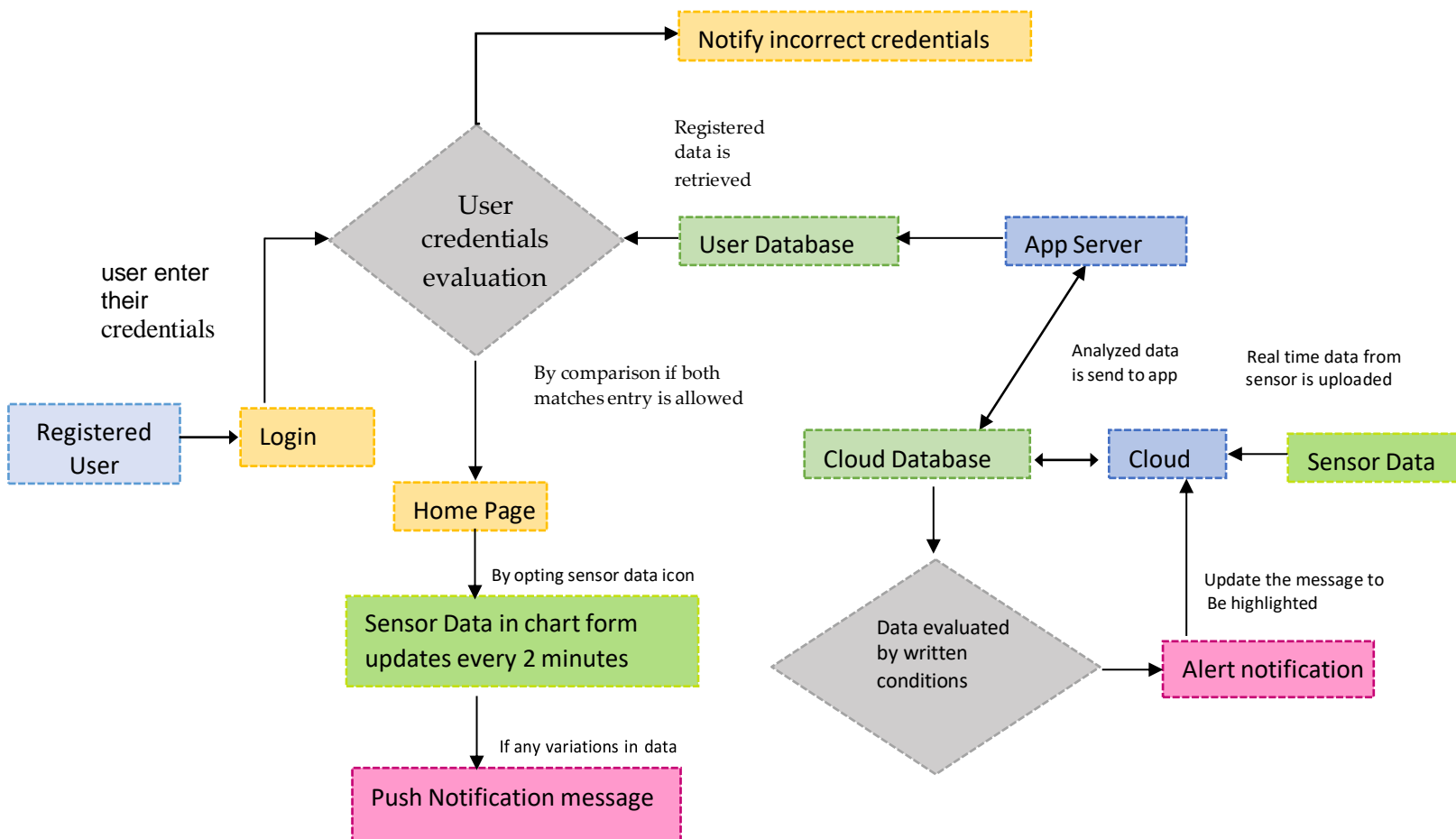
User stories

| 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 byentering my email, password, and confirming my password.	I can access my account /dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation emailonce I have registered for the application	I can receive confirmationemail & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the applicationthrough Facebook	I can register & access the dashboard with FacebookLogin	Low	Sprint-2
		USN-4	As a user, I can register for the applicationthrough Gmail	I can access the app byemail account	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application byentering email & password	I can login to the app	High	Sprint-1
		USN-6	As a user, I can reset the password if i haveforgotten	I can reset the passwordby link sent to mail	High	Sprin-1
	Account	USN-4	As a user, I can logout of the app	I can easily logout by logout option	High	Sprint-1
	Dashboard	USN-1	As a user, I prefer an well organised page thatis ease to access	I can easily view the contents	High	Sprint-1
Customer (Webuser)	Registration	USN-6	As a user, I can register by entering my email,password, and confirming my password.	I can access my account /dashboard	Medium	Sprint-2
Customer Care Executive	Login issue	USN-2	As a user, I want to communicate to customercare service	I can contact through mail	High	Sprint-1
	App freeze	USN-7	As a user, I want to inform about the performance of the app	I can send feedback	Medium	Sprint -2
Administrator	Technical support	USN-8	As a admin, I want to rectify the issues in theapp	I need to provide immediate solutions	High	Sprint-1
	Updates	USN-9	As a user, I want new features or upgradedworkspace for easier interpretation	Admin need to make upgrades	High	Sprint-1
	Security	USN-10	As a admin, I want to secure the app fromvirus attack	I want to establish highlysecure protocol	High	Sprint-1
	Maintenance	USN-11	As a user, I want backup and see history ofdata	I can access the past datafrom cloud storage	High	Sprint-1

b. Solution & Technical Architecture
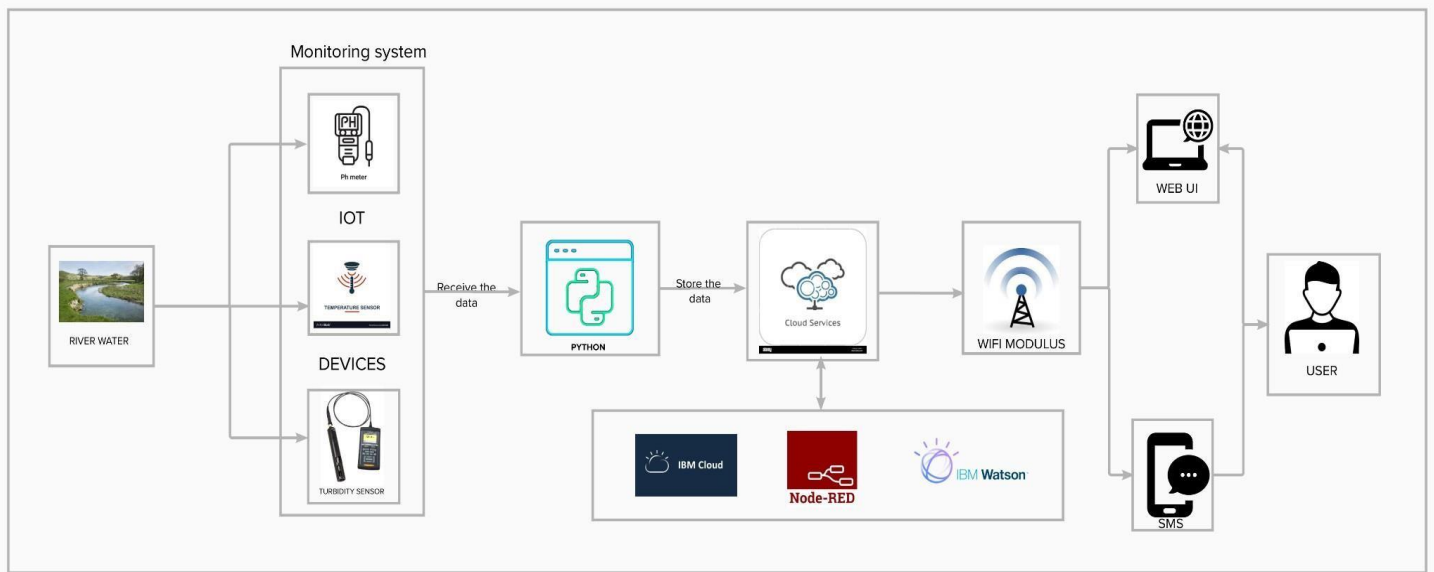
Table-1 : Components & Technologies:
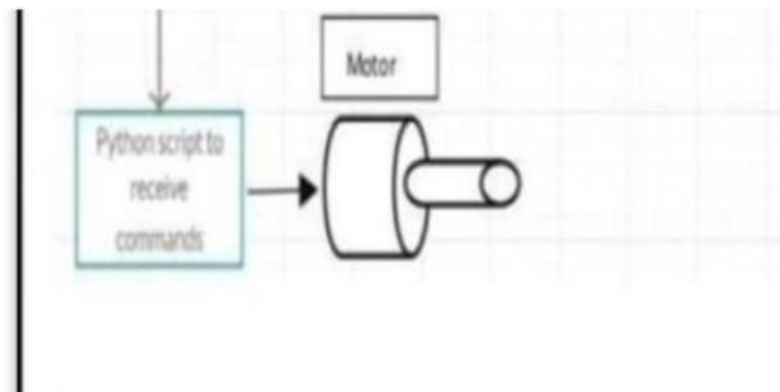
Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Users can interact with applications through Web UI.	Web UI
2.	Application Logic-1	To develop the code to generate the device application.	Python
3.	Application Logic-2	Logic for a process in the application to access the cloud platform.	IBM Watson
4.	Application Logic-3	To build connectivity interfaces between applications and devices.	IBM Watson Assistant ,IOT Devices
5.	Database	Sensor data values are stored.	MySQL, NoSQL
6.	Cloud Database	To store the data in cloud database service.	IBM Cloudant
7.	File Storage	File storage requirements.	IBM Block Storage or Other Storage Service or Local Filesystem
8.	External API-1	Monitoring of water in the external API used in the application.	Web application
9.	Infrastructure (Server / Cloud)	Application Deployment on IBM cloud	Node RED

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Full-stack frameworks and microframeworks are open source frameworksused.	Django, web2py, and the flask framework are used.
2.	Security Implementations	We are using detectors and connectivity devices for monitoring, and firewalls for applications.	e.g. SHA-256, Encryptions of process data, firewalls, antivirus etc.
3.	Scalable Architecture	High scalability	Data storage, web services, wireless networks.
4.	Availability	Hardware devices find out the river water quality level.	Sensors, wifi modules, power supply, LED display, camera
5.	Performance	When a device detects the water quality level change, it will immediately send a message.	Communication network, high durable device battery, high speed process

c. User Stories

REAL-TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEM

TIP
As you add steps to the experience, move each these "Five Es" the left or right depending on the scenario you are documenting.

SCENARIO
Browsing, monitoring, alerting, to control water quality

	Entice How does someone initially become aware of this process?			**Enter** What do people experience as they begin the process?		**Engage** In the core moments in the process, what happens?		**Exit** What do people typically experience as the process finishes?		**Extend** What happens after the experience is over?	
Steps What does the person (or group) typically experience?	Using water resources — Most of the people use the water for drinking, agriculture	Visit website or Notices area — A people can know about the condition of water resource and get aware of it	Alerting authority and neighbours — Most people collected water resource condition and notify to self only to occure the water	Applicable for both chemistry and agriculture — Chemistry discover the medicine and agriculture product feed	Getting Message — An message is all about the water conditions and report	Aware of water — preventing the water pollution and use of fresh water	Environment — The good condition provide good environment and global warming	Gather information — This site gives all the information to locality	Report — The customer writes the review of all to update proper water quality condition	Recommend to friends and neighbour — Recommending the people to know about the water quality	Solution for problems — Any feedback or any problems can be reported it recover as fast as possible
Interactions What interactions do they have at each step along the way? ▪ **People:** Who do they see or talk to? ▪ **Places:** Where are they? ▪ **Things:** What digital touchpoints or physical objects would they use?	Access the website anywhere anytime	Water quality monitoring on browser	See the different in water level in website	process of message about water level	Interaction with people about water quality	Now, people can look into the water quality and understand it	Put the review on condition within the profile of the website	Gain of knowledge of water quality	Recommend the other users the ext with monitoring sensor	Recommend to use the website to access the information of water condition	
Goals & motivations At each step, what is a person's primary goal or motivation? ("Help me..." or "Help me avoid...")	To decrease the borne diseases	To get quality water for consuming.	First we enter into the web application	To check the water quality from the application.	To constrain accurate values	To monitor the water level by levels.		Leave with satisfaction after visiting the websites		Main application can share with other to know the water quality levels	Feedback review can be able to do other updation process
Positive moments What steps does a typical person find enjoyable, productive, fun, motivating, delightful, or exciting?	Get a healthy freshwater	Know the condition of water to applicable for various purpose	Doing the experiment to get medical items	we know the water condition and severs of water in advance balance usage	water consumption rate	Healthy environment with good water supply for natural resources		Information about water helps the people to maintain immunity		Friendly user website easy to use and understand	solve the problems immediately
Negative moments What steps does a typical person find frustrating, confusing, angering, costly, or time-consuming?	It is destruction of whole ecosystem in river water	Dirty water cause borne disease for human	More time to Load the web pages	Connection not secure	If the get reload unexpectedly	If the user get reflect is unsecured websites		Alerts will be delay			Operation and maintenance costs are high.
Areas of opportunity How might we make each step better? What ideas do we have? What have others suggested?	The Speed of updating is increased	Can be more economical	Get the water quality update time to time in the web application	Sensors can able to update the water conditions		To predict the actuate the water quality through sensor		Accuracy rate using proper method			After this process we can use the water for various useful purpose

5. PROJECT PLANNING & SCHEDULING

a. Sprint Planning & Estimation

Product Backlog, Sprint Schedule, and Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint1	Simulation creation	USN-1	Connect Sensors and Arduino with python code	2	High	KAVIN H ABINESH J ABISHEK D
Sprint2	Software	USN-2	Creating device in the IBM Watson IoT platform, workflow for IoT scenarios usingNode-Red	2	High	GUNASEKARAN P KAVIN H ABINESH J
Sprint3	MIT App Inventor	USN-3	Develop an application for the real time river water quality management project using MIT App Inventor	2	High	KAVIN H ABINESH J
Sprint4	Dashboard	USN-4	Design the Modules and test the app	2	High	KAVIN H ABINESH J
Sprint5	Web UI	USN-5	To make the user to interact with software.	2	High	GUNASEKARAN P KAVIN H

Project Tracker, Velocity & Burndown Chart:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint EndDate (Planned)	Story Points Completed (ason Planned End Date)	Sprint Release Date (Actual)
Sprint 1	20	6Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint 2	20	6Days	31 Oct 2022	05 Nov 2022		05 Oct 2022
Sprint 3	20	6Days	07 Nov 2022	12 Nov 2022		12 Oct 2022
Sprint 4	20	6Days	14 Nov 2022	19 Nov 2022		15 Oct 2022

$$AV = \frac{\text{Sprint duration}}{\text{Velocity}} = 20/10 = 2$$

a. **Reports from JIRA**

$$AV = \frac{\text{Sprint duration}}{\text{Velocity}} = 20/10 = 2$$

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'saverage 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.

a. CODING & SOLUTIONING

a. Feature 1
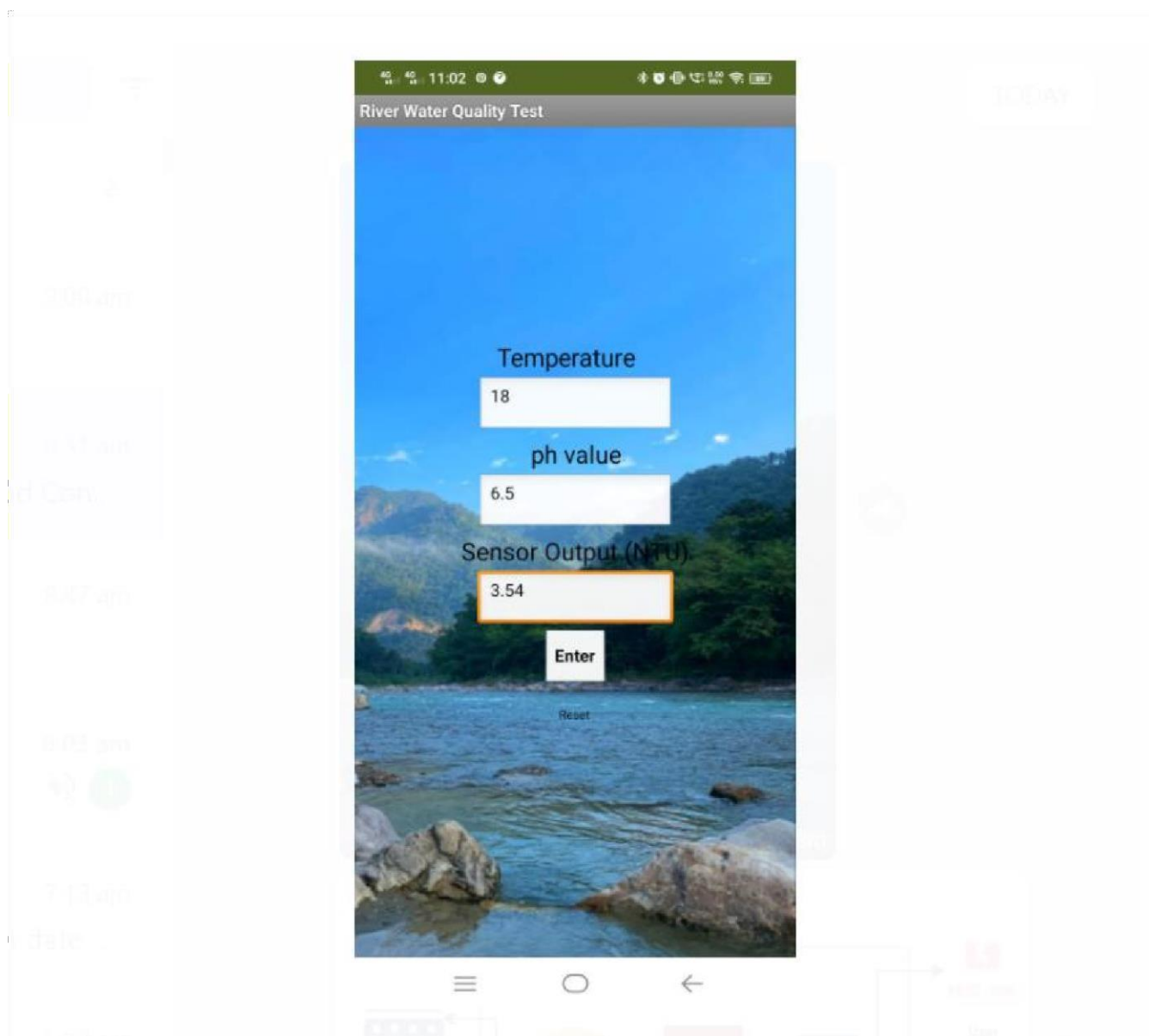
❼First feature is our project is about the IOT based so the IOT word refers to that we can control and monitor directly from the mobile phone .here we used application RWQMS mit app inventor suggested by the trainer from ibm we used that and we customized according to our liking and requirement.

❼From this we can all monitor the required parameters.

RWQMS(River Water Quality Monitoring System):-

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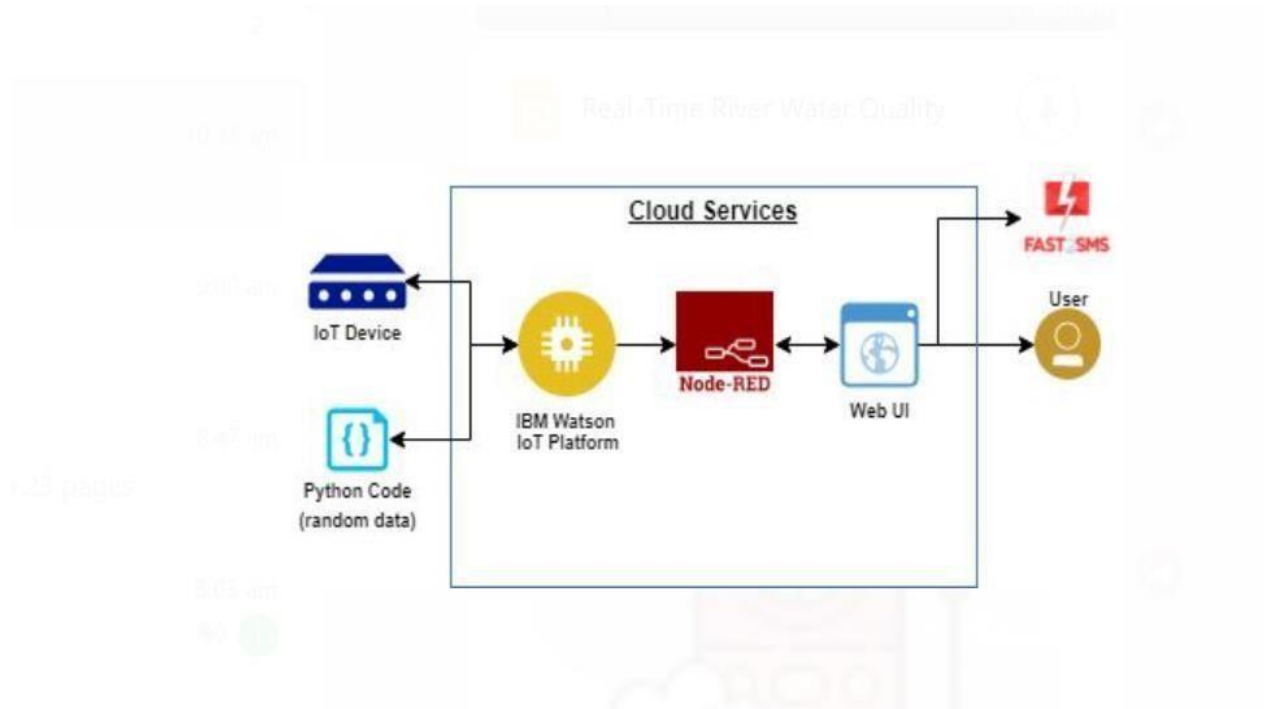
❼This is an feature 2 about the data flow from using the Watson iot platform and node red the data is passed to the front end so that we can handle and we can control from phone.

b. TESTING

❼Testing is more important in every project because we need to know the performance such that the value of product is depend up on the performance

a. Test Cases

      i. Controlling of app from the phone2.Time complexity of data flow.

3. Peformance
4. Data from node to UI and to user.

b. User Acceptance Testing

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

COM3

Sensor Output (NTU):
2.66

Sensor Output (NTU):
2.59

Sensor Output (NTU):
2.64

c. RESULTS

a. Performance Metrics

The accuracy score of model using Random forest classifier and some softwares is 0.77(77%) (f1score).

d. ADVANTAGES & DISADVANTAGES

ADVANTAGES:-

1.We can see the results from the hand set.

2.We can monitor the ph level.

3.We can deliver the good quality water through our app.

DISADVANTAGES:-

The drawback of the system is to the sensors and the maintain is somewhat hard its not like that fully on electronic device but there are sensors are present and we need to maintain.

10. 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.

11. FUTURE SCOPE

We are seeing most of the natural resources are destroyed and being destroyed such that we neet to preserve the remaining for the feature generations.

So we can use this and ewe can save the river water from the harmful chemicals and we can preserve that water for the feature generations.

These days everything is becoming artificial so many diplomats are said that the worlwar-3 should be on water. And so many rivers re-flowing from other neighboring countries there is chance that they can poisonous the flow such that the water become harmful and dangerous so that we can use this.

12. APPENDIX

Source Code:-

Ui code: Code

1.

```html
<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>
         <br>
        <br>
        <br>
        <label>
    Gender :
        </label><br>
        <input type="radio" name="male"/> Male <br>
        <input type="radio" name="female"/> Female <br>
        <input type="radio" name="other"/> Other
        <br>
        <br>
         <br>
        <label>
        Phone :
        </label>
         <input type="text" name="country code" value="+91"
    size="2"/>
        <input type="text" name="phone" size="10"/> <br> <br>
```

```
        Address
        <br>

        <textarea cols="80" rows="5" value="address">
        </textarea>
<br> <br>          Email:
        <input type="email" id="email" name="email"/> <br>
        <br> <br>
Password:
        <input type="Password" id="pass" name="pass"> <br>
        <br> <br>
        Re-type password:
        <input type="Password" id="repass" name="repass"> <br> <br>
        <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"/> <br> <br>
alternate email id
        <input type="altrernate email id" name="alternate email"/>
 <br>
        <br> <br>
        <body>
 <html>
```

Code 2.
```
<style> body {font-family: Arial,Impact, 'Arial Narrow Bold',
      sans-
      serif, 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;
      }
```

```css
/* 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;
```

```css
    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: animatezoom 0.6s;
animation: animatezoom 0.6s
 }
 @-webkit-keyframes animatezoom {
from {-webkit-transform: scale(0)}
to {-webkit-transform: scale(1)}
 }

 @keyframes animatezoom {
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;     }    .cancelbtn {
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">
```

```html
      <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" requried>
          <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="cancelbtn">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>
```

3.Python Script:

```python
#importing
```

```python
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"
         )
```

4. Aurdino:

```c
#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(Celcius);
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);
 }
```

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-32114-1660208108