NAALAIYA THIRAN PROJECT

TEAM MEMBERS:

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REAL TIME RIVER WATER QUALITY TEST AND CONTROL

IBM

11/11/22

INTRODUCTION

1.1 PROJECT OVERVIEW:

Freshwater is a world resource that is a gift of nature and important to farming, manufacturing, and the life of human beings on earth. Currently, drinking water facilities face new real-world problems (Shafiq et al., 2018) (Seagar et al., 2017). Due to the limited drinking water resources, intensive money requirements, growing population, urban change in rural areas, and the excessive use of sea resources for salt extraction has significantly worsened the water quality available to people (Chen & Han, 2018) (Meng et al., 2017). The high use of chemicals in manufacturing, construction and other industries, fertilizers in farms and also directly leaving the polluted water from industries into nearby water bodies have made a huge contribution to the global water quality reduction, which has become an important problem (Cloete et al., 2014). Even due to containment water various water born are increasing day by day, due to which many human beings are losing their lives.

Traditionally, detection of water quality was manually performed where water samples were obtained and sent for examination to the laboratories which is time taking process, cost and human resources (Das & Jain, 2017) (He & Zhang., 2012). Such techniques do not provide data in real-time. The proposed water quality monitoring system is consisting of a microcontroller and basic sensors, is compact and is very useful for pH, turbidity, water level detection, temperature and humidity of the atmosphere, continuous and real-time data sending via wireless technology to the monitoring station (Sugapriyaa et al., 2018) (Barbed & Dane., 2015).

1.2 PURPOSE:

Wireless communication developments are creating new sensor capabilities. The current developments in the field of sensor networks are critical for environmental applications. Internet of Things (IoT) allows connections among various devices with the ability to exchange and gather data. IoT also extends its capability to environmental issues in addition to automation industry by using industry 4.0. As water is one of the basic needs of human survival, it is required to incorporate some mechanism to monitor water quality time to time. Around 40% of deaths are caused due to contaminated water in the world. Hence, there is a necessity to ensure supply of purified drinking water for the people both in cities and villages. Water Quality Monitoring (WQM) is a cost-effective and efficient system designed to monitor drinking water quality which makes use of Internet of Things (IoT) technology. In this paper, the proposed system consists of several sensors to measure various parameters such as pH value, the turbidity in the water, level of water in the tank, temperature and humidity of the surrounding atmosphere. And also, the Microcontroller Unit (MCU) interfaced with these sensors and further processing is performed at Personal Computer (PC). The obtained data is sent to the cloud by using IoT based Think Speak application to monitor the quality of the water.

LITERATURE SURVEY

2.1 EXISTING PROBLEM:

Now a day's water is polluted due to many reasons. In this existing system the equipment cost is high and it takes a lot of time to process. Traditional methods have the disadvantages like complicated methodology, long waiting time for results low measurement precision and high cost. So, with the implementation in the technology, we use different methods and techniques to check quality of water. There is a disadvantage in the existing system that the system has high complexity and low performance.

2.2 REFERENCES:

Lambrou et al. (2014) discussed the development and implementation of a portable, mobile, cost-efficient and reliable water level control system. Here the authors used two transceivers of radio frequency (RF) and a transmitter mounted on the tank and sump at the place where they wanted to check the quality of water. The RF transceivers used for wireless communication to the internet server. With the help of a microcontroller, the system is fully programmed of the user unless the water the bottle is drained or overflowed. The sensor array is used to measure various parameters such as dissolved Oxygen, Tumble, pH, Temperature, etc. Sensor array. Costs of installation are reduced because of the wireless system.

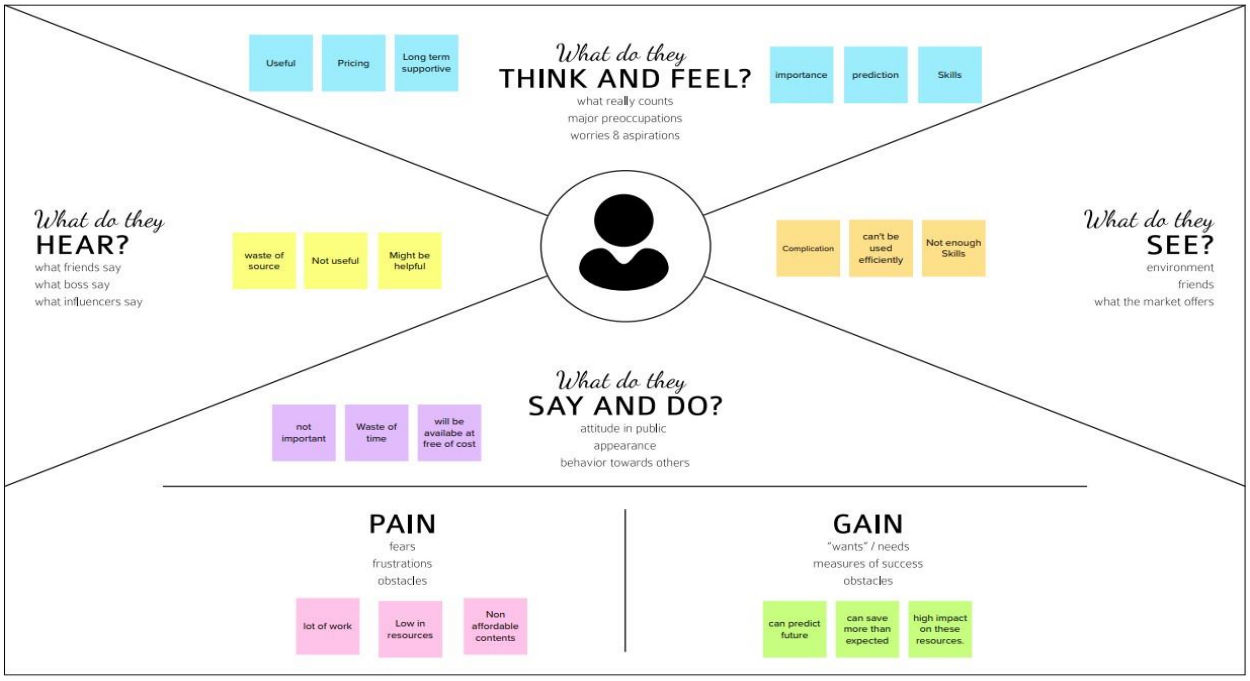
Prasad et al. (2015) the smart Water Quality Monitoring (WQM) device for Fiji using IoT and remote sensing technologies is shown in this article. The Pacific Islands of Fiji require regular collection and analysis of collected data for the water quality monitoring and uploading this data into the server. In order to monitor water quality, the authors have used IoT and remote sensing technologies. The current measurements can be enhanced by remote sensing. During the entire test period, the system has been proved worth by delivering accurate and consistent data using IoT for water monitoring in real-time. The system proposed by these authors also used a GSM module to forward the data to the mobile user via SMS.

Omar Faruq et al. (2017) A water quality monitoring system based on microcontrollers for people living in Bangladesh's outskirts, where safe drinking water is not available, is provided in this paper. The device has been designed with a high degree of accuracy and is sensitive to several water parameters such as temperature, turbidity and hydrogen potential. (pH) displayed on the LCD monitor. Finally, in this paper, each of the parameter values is compared with the predefined equipment, and sensor values and error are calculated.

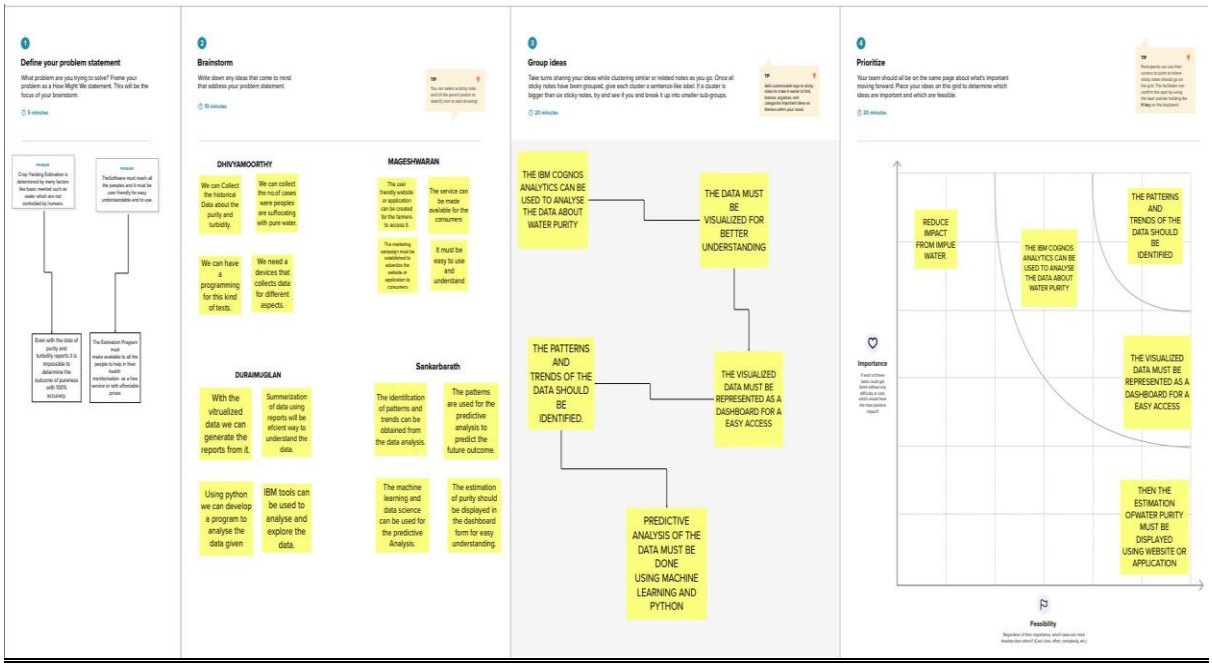
2.3 PROBLEM STATEMENT DEFINITION:

IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS:



3.2 IDEATION AND BRAINSTROMING:



3.3 PROPOSED SOLUTION:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To Control the Algal 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 Algal Blooms using Ultrasonic frequencies.
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:

REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT:

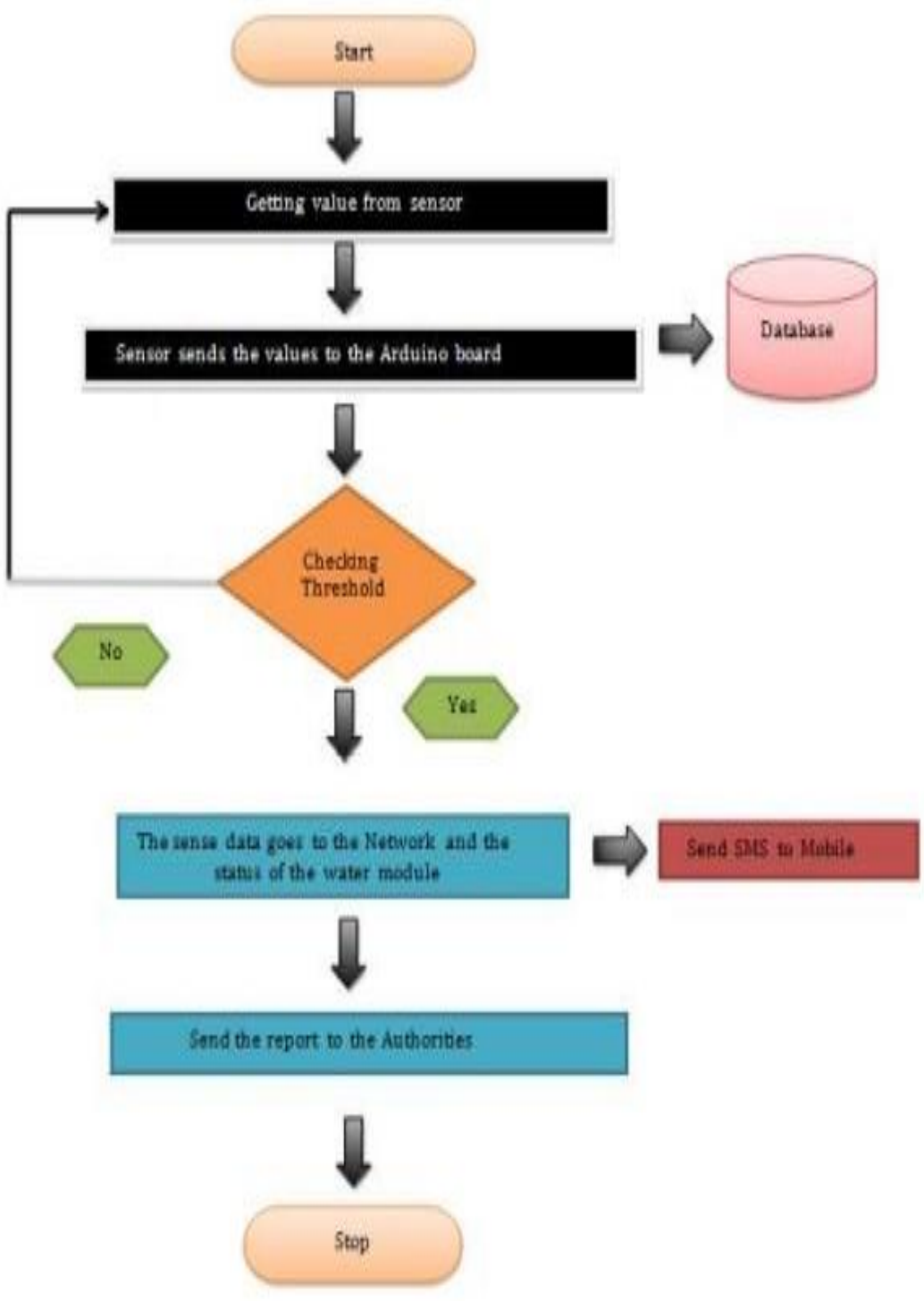
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Email Registration through product mobile UI
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Ph level detection	To monitor the water quality 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:

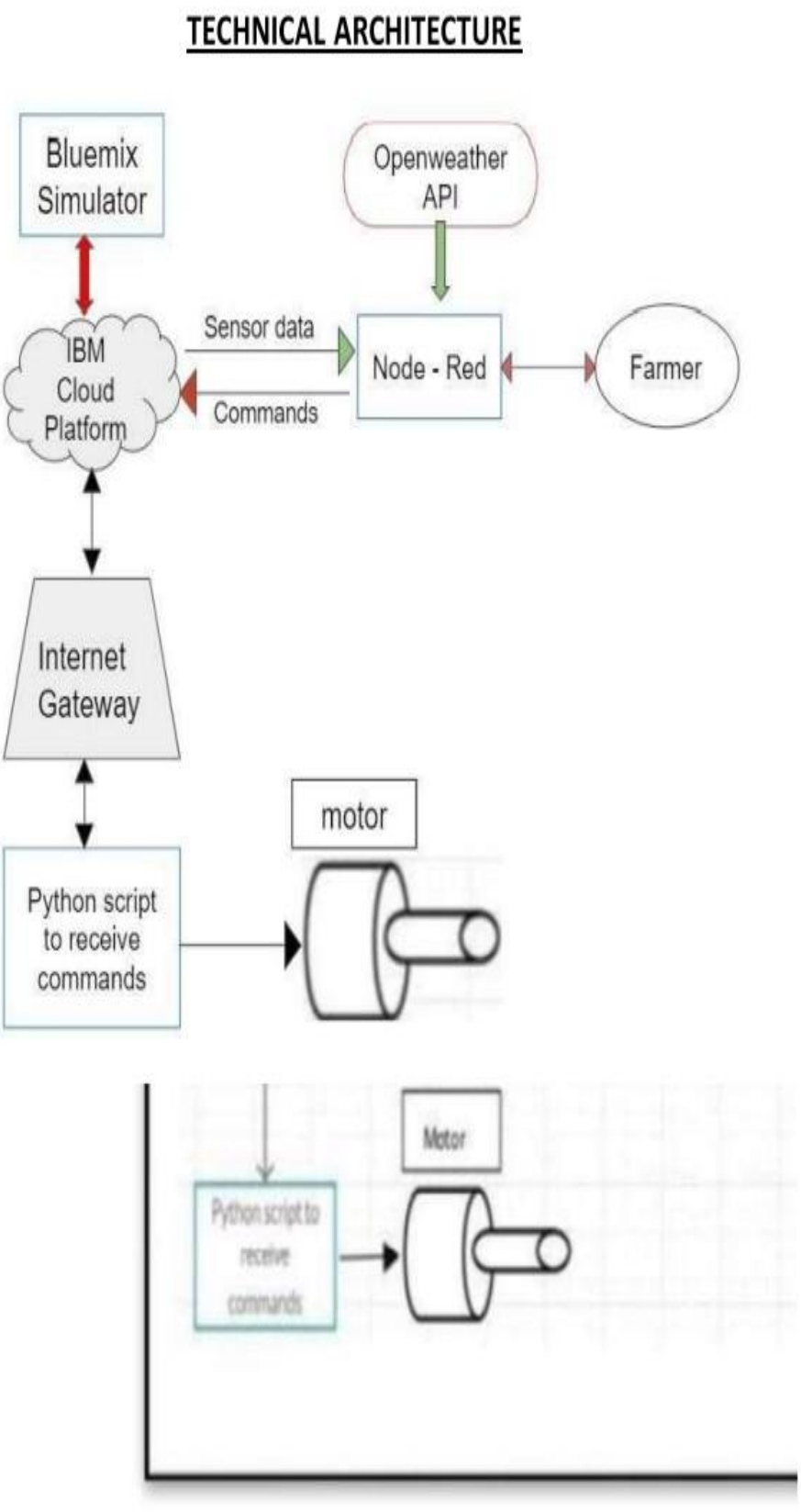
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	It has simple monitoring system and efficient to use.
NFR-2	**Security**	Mobile application is secured with firewalls protection.
NFR-3	**Reliability**	Real time sensor output values with future predicted data storage. 98% efficient monitoring 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.

PROJECT DESIGN

5.1 DATA FLOW DIAGRAM:



5.2 SOLUTION AND TECHNICAL ARCHITECTURE:



5.3 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 the mail.	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 able to access easily.	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 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 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

PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION:

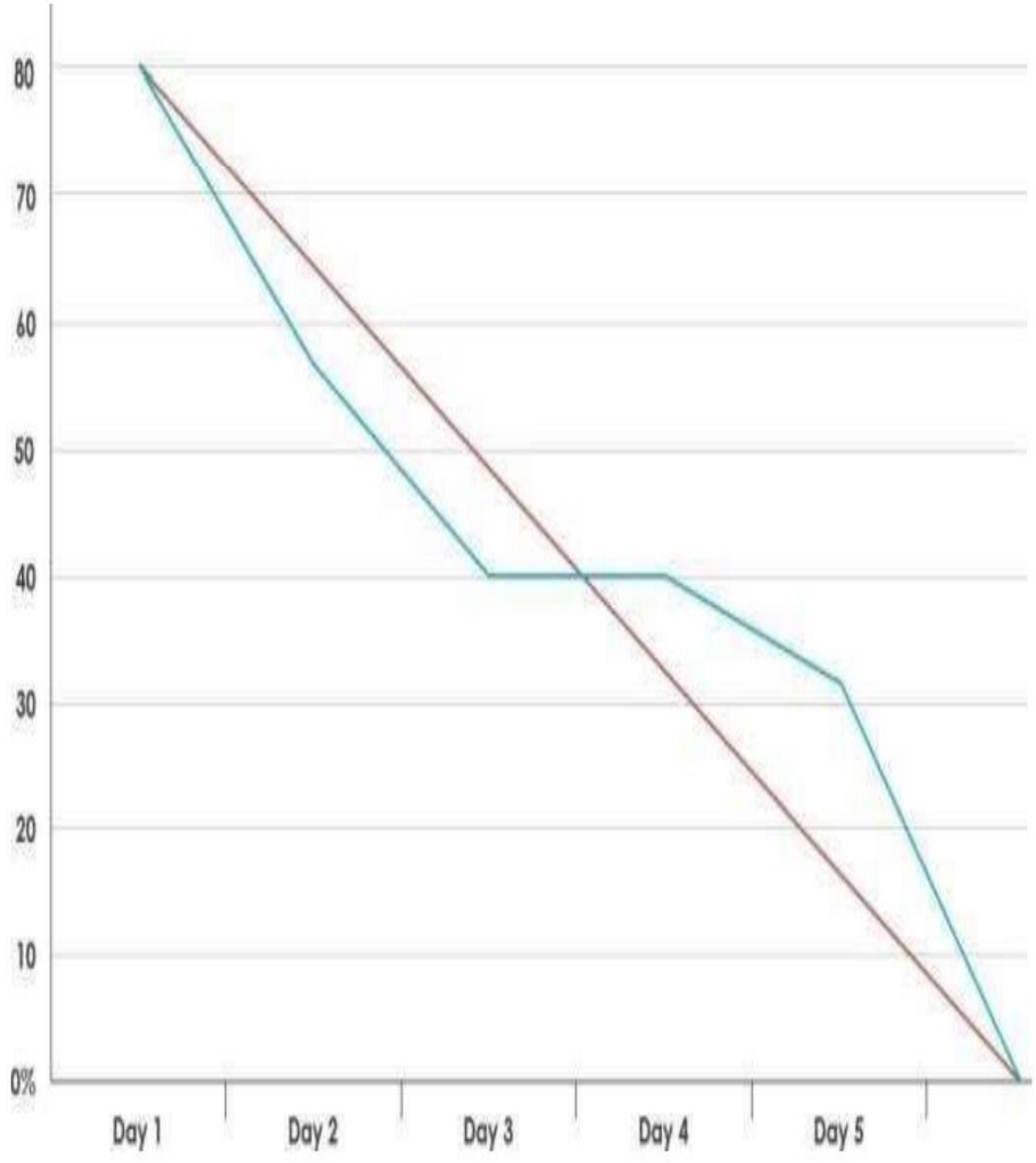
S.NO	ACTIVITY	ACTIVITY DESCRIPTION	DURATIO N
1	Understanding the project requirement	The Aim is team members are assigned with tasks for each to be executed as a responsible team lead.Also create repository in theGithub, Assign members andteach how to use and open the Github and IBM career education portals .	1 WEEK
2	Starting of project	Advisory of team lead to his team members based on regularly attending training sessions for installing and use of prerequiste . Also necessarily attending the training sessions based on python code,development ofandroid app in mobile app invtr.com and working alongNodeRed is ensured by the team lead and acknowledged by team members simultaneously.	1 WEEK
3	Attend class	Team members and team lead must watch and learn from classes provided by IBM and NALAYATHIRAN and must gain access of MIT license for their project.	4 WEEK
4	Budget and scope of project	Budgetary planning process taken up on whole as a team to detect the user compatible price to the buythe product based onbudgetary on IOT and component level.	1 WEEK

6.2 SPRINT DELIVERYSCHEDULE:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Dhivyamoorthy
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Duraimugilan
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	Sankarbarath
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	Duraimugilan
Sprint-1	Login	USN-5	As a user, I can log into the applicationby Entering email & password	1	High	Dhivyamoorthy

Sprint	Total Story Points	Duration	Sprint StartDate	Sprint End Date(Planned)	Story Points Completed (as on Planned End Date)	Sprint ReleaseDate (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	30	30 Oct 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	49	06 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	50	07 Nov 2022

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



CODING AND SOLUTION

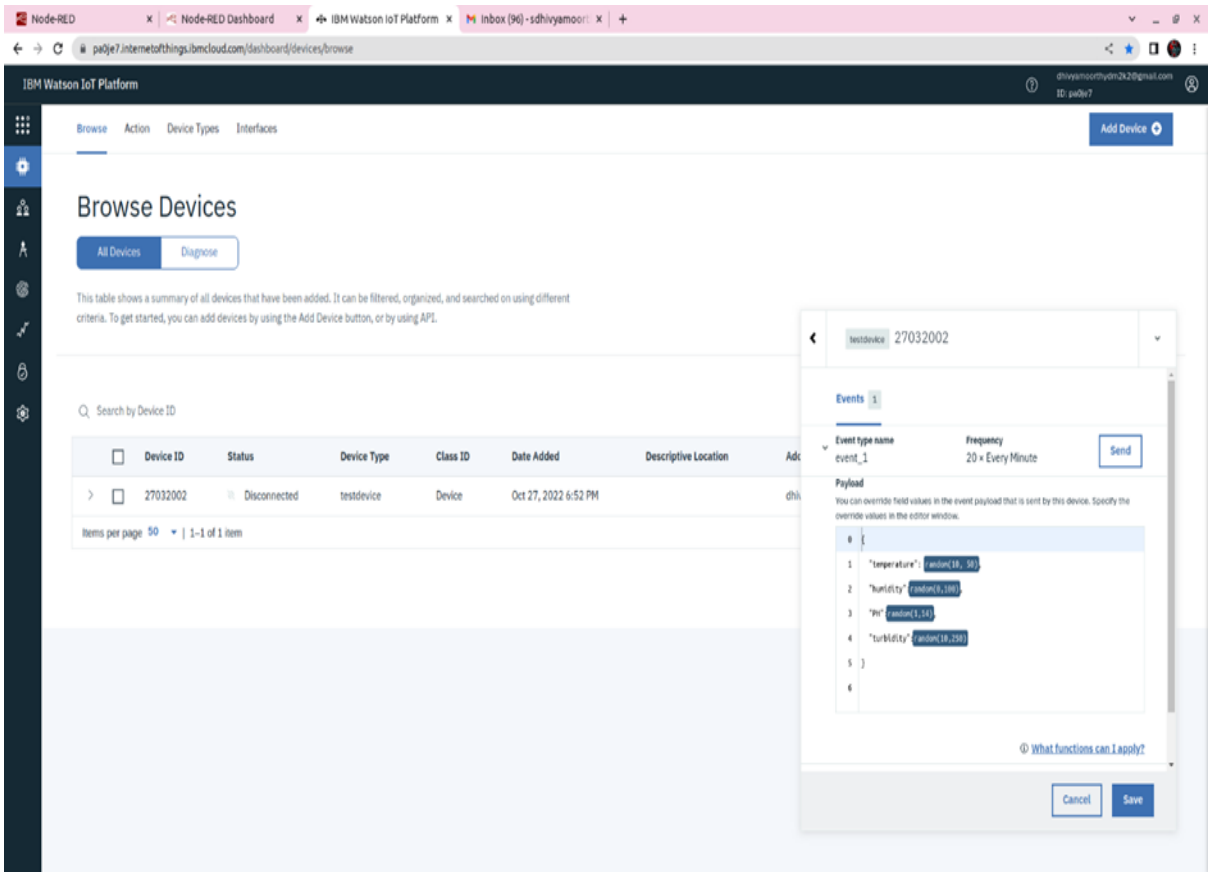
7.1 FEATURE 1:

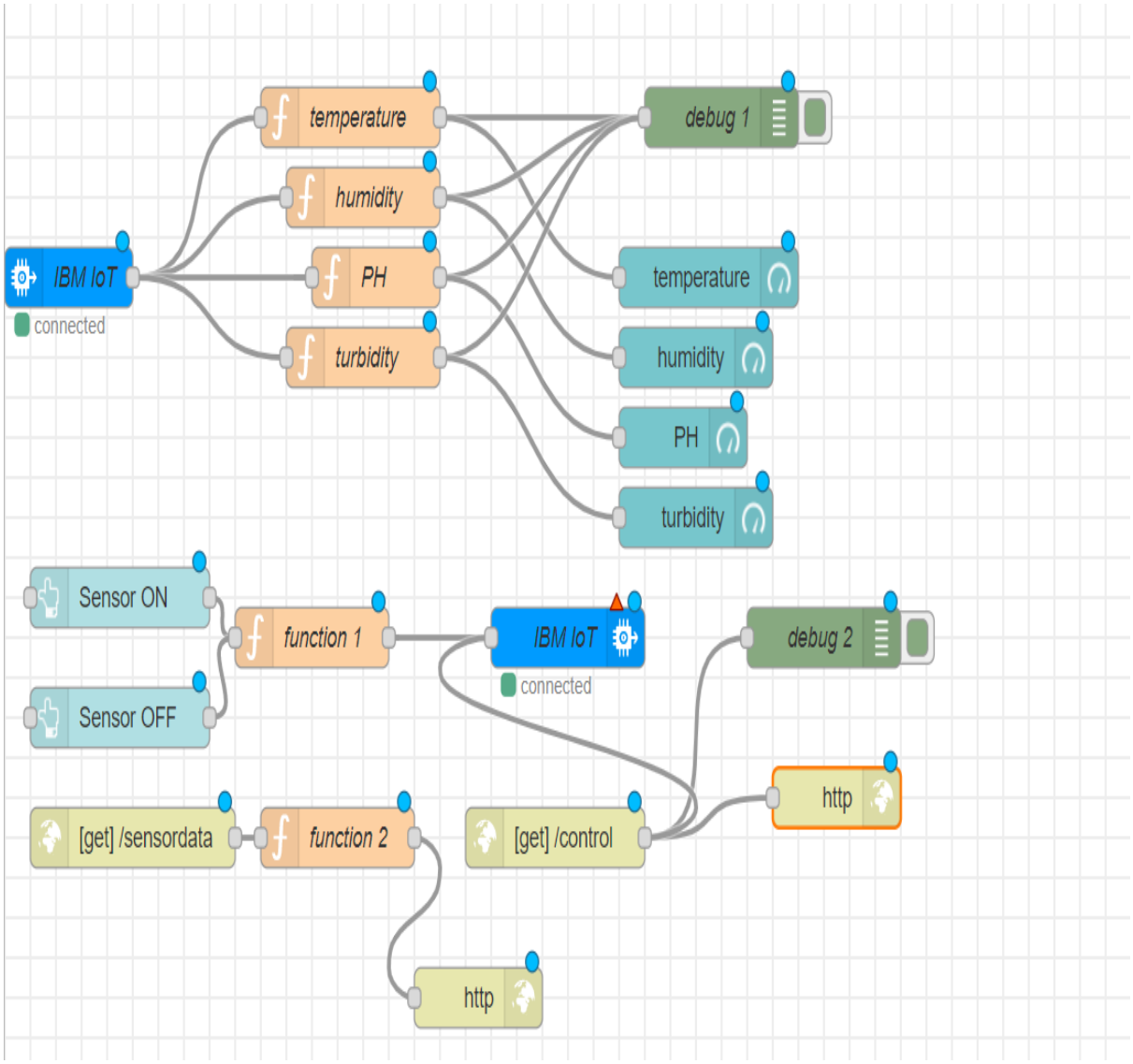
For this technology function, we used python script that helps to manipulate data as per the datasets, i.e.; the temperature value ranges between 10 to 50 degrees Celsius, humidity value ranges between 0 to 100 percentage, PH value ranges between 1 to 14 class, turbidity value ranges between 10 to 250 NPM.

Thus, it helps to manipulate the data exactly.

Then for the function of the code we need a database, as we priorly defined the values range and category, in IBM Watson cloud IOT platform, where this code syncs with my database which I already stored by evaluating the org ID, authentication token, device ID, type ID.

Then this cloud data needs to be initiated or functionable, for this we used Node-red service, this connects with my IBM IOT cloud service database, and fulfill the functions.





1.The IBM IOT input and output nodes helps the service to get data from my cloud, which was priorly implemented in cloud.

2.Then the functions of temperature, humidity, PH, turbidity, gets data and manipulates the value as per the database in cloud, by using “msg. payload” function and get function for each function nodes as: “t-temperature”, “h-humidity”, “p-PH”, “t-turbidity”.

3.To display the values which was manipulated by the function nodes we use dashboard nodes for the output.

4.Then executing and deploying the nodes with “debug” node.

5.Then giving button access it the node which will activate and deactivate the sensor when required, whenever the buttons were pressed the sensors will activate according to the command.

6.Then another function node for the buttons that accepts the command from the cloud and previous function nodes.

7.Then we use “http in” and “http response” node for the web-based display output, that will get the input from the function node and displays output.

8.Then the final function node that gets command from the function nodes that was connected with the IBM IOT input node, then controls the flow of the data.

Note:

We used simulation for processing of data and output. Which also shows value as we use the IOT devices.

9.For mobile app we used MIT app inventor for UI for mobile based application, the node-red service will connect with the MIT app inventor and my database and code, for that we need to create a block for the mobile app which will have a direct access with cloud for sending and receiving data.

10.For the fulfilled function of this technology, we have to initiate for an application, where the application will interact with my cloud and node-red service output, which will be changed to integers as whenever the output shows in the node-red service output.

7.2 FEATURE 2:

The first block represents clock with respect to the data generation per second.

Then the web service whenever the web local server displays output the values will be generated in each box with respect to the node-red service.

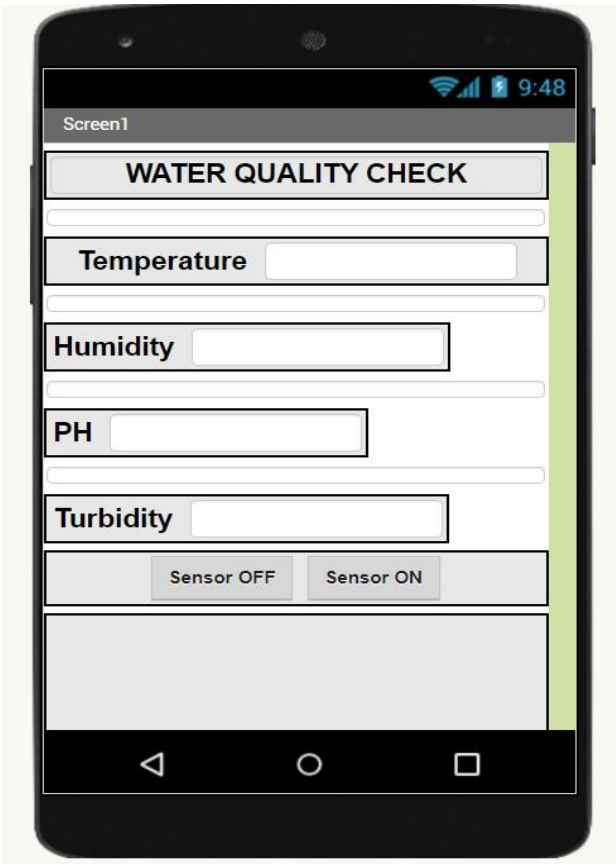
We used localhost server that connect with my data, and displays value with respective text box.

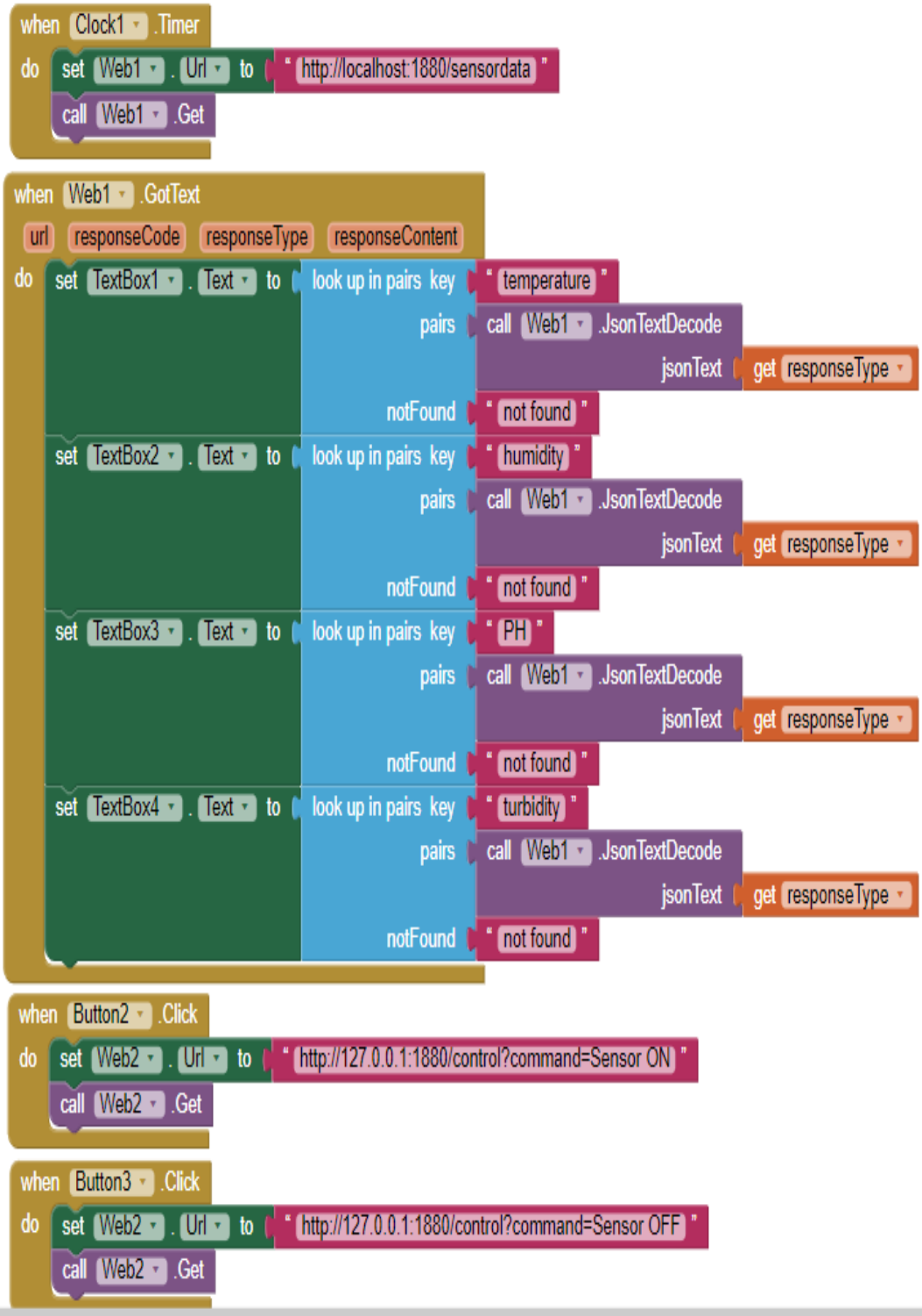
Whenever the button is clicked the localhost will be activated.

TESTING

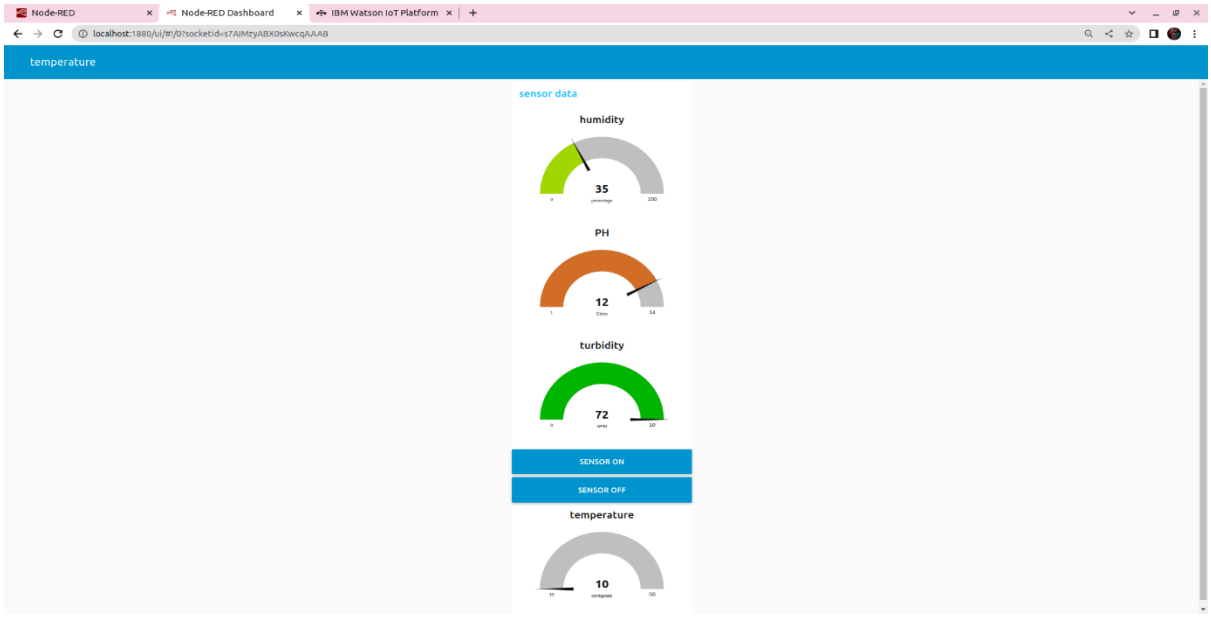
8.1 TEST CASES:

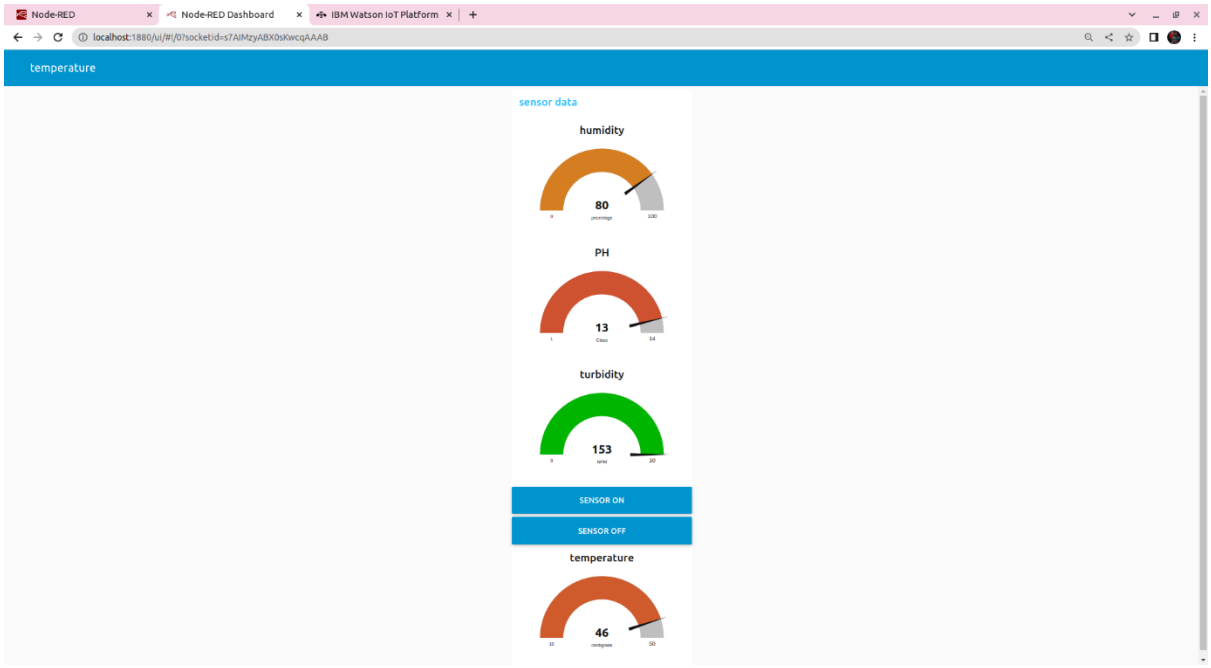
SCENARIO	PREREQUISTE	PROJECT FLOW	WORKING	BENEFITS	OUTCOME
Testing and Experimenting with various water sources					
Steps What does the person (or group) typically experience?	Techniques purpose	sites Process	Info Transfer An android application will be used to determine the sensor values and examined via cloud and warnings will be provided to user The values are then compared with the threshold value	It Can diminish the contaminants present in water It changes to a drinking water	The related authorities can take measures to boost the water quality which makes it more usable for human purpose It has high frequency, high mobility, and low powered.
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?	Real-time data access can be done by using remote monitoring and Internet of Things (IoT) technology. Can be displayed in visual format on a server PC	To check water quality by analyzing the parameters such as Temperature ,pH and conductivity, and so on It supervising, congregate and analyzing data from the remote locations	If the acquired value is above the SMS alert will be sent to the user	Using IoT integrated Big Data Analytics will immensely help people to become conscious against using contaminated water	It can be extended into an efficient water management system of a local area.
Goals & motivations At each step, what is a person's primary goal or motivation? ("Help me..." or "Help me avoid...")	Customer requires the system consist of several Sensors It is used to measuring physical and chemical parameters of the water.	The aim is to develop a system for continuous monitoring of river water quality at remote places using wireless sensor networks With low power consumption, need	The data will be stored in the cloud or local storage will be implemented Using the sensed parameters, the customer predicts the water quality	The customer requires a low cost system By the 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
Positive moments What steps does a typical person find enjoyable, productive, fun, motivating, delightful, or exciting?	This project has successfully achieved its objective where water quality data (pH and temperature) can be monitored	Implementation by a reconfigurable smart sensor interface device for water quality monitoring system in an IoT environment	It proposed the system collects parameters of water pH, turbidity on the surface of water With high speed from multiple different sensor nodes.	It will immensely help customer to become conscious against using contaminated water as well as to stop polluting the water.	It was satisfied by low-cost water quality monitoring system has been developed for large area of coverage It was attributed to its long duration operation, flexibility, and reproducibility
Negative moments What steps does a typical person find frustrating, confusing, angering, costly, or time-consuming?	Customer felt that the 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.	To test other Parameters ,the new sensors can be included.
Areas of opportunity How might we make each step better? What ideas do we have? What have others suggested?	The design of a real time, and low cost water quality monitoring system	Track whether protection and restoration measures are working	Customer can analyse data continually and instantly alert users to changes in the system. It reduces the need for unreliable and expensive sampling.	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

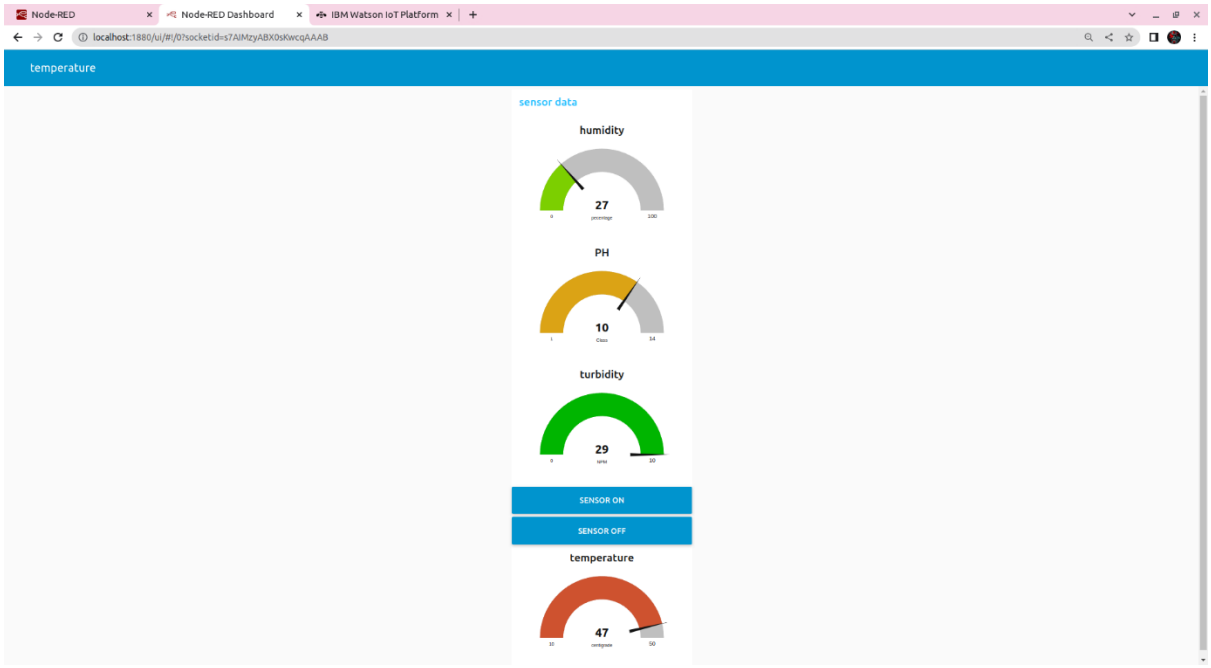



when Clock1 .Timer
do set Web1 . Url to " http://localhost:1880/sensordata "
call Web1 .Get
when Web1 .GotText
url responseCode responseType responseContent
do set TextBox1 . Text to look up in pairs key " temperature "
pairs call Web1 .JsonTextDecode
jsonText get responseType
notFound " not found "
set TextBox2 . Text to look up in pairs key " humidity "
pairs call Web1 .JsonTextDecode
jsonText get responseType
notFound " not found "
set TextBox3 . Text to look up in pairs key " PH "
pairs call Web1 .JsonTextDecode
jsonText get responseType
notFound " not found "
set TextBox4 . Text to look up in pairs key " turbidity "
pairs call Web1 .JsonTextDecode
jsonText get responseType
notFound " not found "
when Button2 .Click
do set Web2 . Url to " http://127.0.0.1:1880/control?command=Sensor ON "
call Web2 .Get
when Button3 .Click
do set Web2 . Url to " http://127.0.0.1:1880/control?command=Sensor OFF "
call Web2 .Get

8.2 USER ACCEPTANCE TESTING:



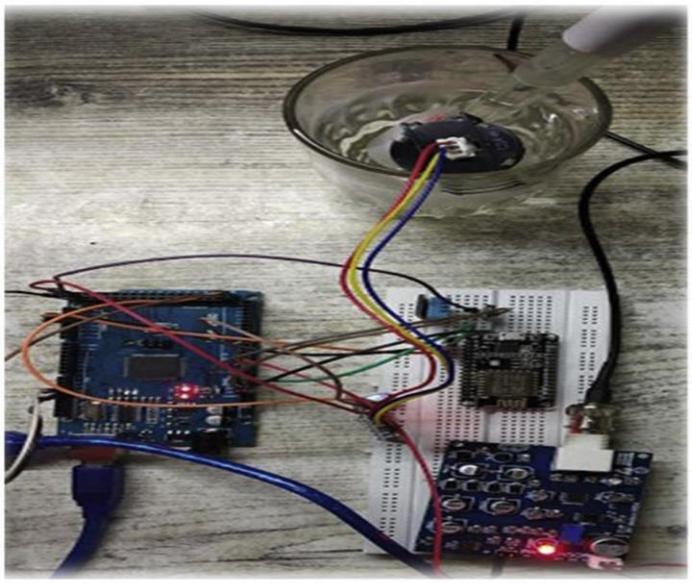




RESULTS

9.1 Performance Metrics:

The experimental setup consists of an MCU with a sensor network that takes samples for every 10s from the water storage tank and the parameters are displayed on the Arduino IDE serial display. For the real-time monitoring, a Wi-Fi module used which will be updating the server forever 20s with different parameters. The water sample from river water and sewerage board and groundwater tested. The entire hardware setup of the WQM system is shown,



pH sensor results

The two fields in Server are updated with their corresponding values. The server is getting updated every 20 s. Infield 1 the voltage of water is being calculated from the sensor and being updated. Whereas in field 2 the pH value of water is being updated. According to the Nernst equation, as shown, the pH of water is directly proportional to the voltage water.

(2)E = EO + (RT/zF) pH.

Turbidity sensor results

The turbidity values in NTU, as well as the voltage of water, are being calculated and updated in the Server, as shown in Figure 8. It is observed that the value of field 3 at time 21:08h is 4.0V and its corresponding value of turbidity is 676 NTU as shown. The server data is updated with the voltage of water and turbidity value of water in field 3 and field 4 respectively. The Turbidity of water is inversely proportional to the voltage water.

(3)y = -1120.4 x2 + 5742.3x – 4352.9.

Temperature and humidity sensor results

Finally, the surrounding environment temperature and humidity calculated from the DHT-11 sensor module and updating it into the Server. Temperature measured in degree C, and humidity measured in percentage. The temperature of the surrounding calculated because the pH sensor and turbidity sensor will give accurate value in a specific atmospheric condition.


8:26 PM
36.3KB/s
WATER QUALITY MONITORING
21:08 21:08 21:09 21:10 21:11 21:12
2.9 2.8 2.7 2.6 2.5 2.4 2.3
2.88574
pH Voltage
Min 2.27214 on 02 May 21:10 Max 2.92318 on 02 May 21:12
Last 2.88574 on 02 May 21:12
6.9 6.6 6.3 6.0 5.7 5.4
6.92578
pH of Water
Min 5.45313 on 02 May 21:10 Max 7.01563 on 02 May 21:12
Last 6.92578 on 02 May 21:12
4.1 4.0 3.9 3.8 3.7 3.6 3.5 3.4 3.3
3.36914
Turbidity Voltage
Min 3.36914 on 02 May 21:12 Max 4.07715 on 02 May 21
Last 3.36914 on 02 May 21:12
8:26 PM
16.4KB/s
WATER QUALITY MONITORING
21:08 21:08 21:09 21:10 21:11 21:12
2,400 2,000 1,600 1,200 800 400
2275.0332
Turbidity of Water
Min 433.84473 on 02 May 21:08 Max 2275.0332 on 02 May 21:12
Last 2275.0332 on 02 May 21:12
200 160 120 80 40 0
46.0
Level of Water
Min 2.0 on 02 May 21:10 Max 189.0 on 02 May 21:09
Last 46.0 on 02 May 21:12
33.9 33.8 33.7 33.6 33.5 33.4 33.3 33.2
33.6
Temperature
Min 33.2 on 02 May 21:09 Max 33.9 on 02 May 21:11
Last 33.6 on 02 May 21:12

ADVANTAGES & DISADVANTAGES

ADVANTAGES:

1. Informative Insights

Installing IoT technology with your existing SCADA provides sensor-based monitoring of assets, where the sensors fetch water-level data and transmit the same on the user's dashboard. This enables prompt decision-making, allowing managers to take necessary actions on time. It thus reduces the chances of water spillage; detects unnecessary consumption patterns, thefts, and leakages; and increases the overall efficiency of the plant processing.

2. Illustrative Historical Reports

An IoT-based solution to monitor water levels provides a well-structured and systematic approach to deal with the plant's functioning. Managers get a simplified dashboard to optimize their everyday tasks, and can even operate them remotely if needed. It then presents the details through illustrative reports, while also keeping a historical record of each process and piece of equipment. This makes it a lot easier for managers to make decisions at a single glance and share them with the appropriate person when required.

3. Preventive Maintenance Checks

The data-driven approach of IoT technology provides scheduled preventive maintenance checks for the respective equipment and assets. It also provides a set threshold value for rising water levels to avoid unnecessary water spills, thus protecting the premises against water damage. The water-level monitoring solution is well-structured and equipped with advanced-level sensors to keep a real-time watch on water levels, eliminating the chances of asset degradation through any means. It also enables automated maintenance checks of the entire system as per the business requirements.

4. Instant Alerts

The sensor-based system retrieves data from water containers and supplies the information through advanced communication channels. All notifications are sent to the managers through an instant alarming system that triggers another alarm on the connected smart devices. This helps the industrial operators make informed decisions in case of leakages so that they can manage adequate supplies across particular regions. Industries can use this data to ensure better business productivity, improved brand recognition, and quality services.

5. Seamless Communication

One can easily simplify the data management process by installing an IoT setup with water storage containers. IoT technology provides great opportunities for businesses to scale up their progress in effective ways. A smart water-level monitoring solution helps water authorities buckle up at times of risks like floods, rising river water levels, etc. It further offers seamless integration and communication within the authorities through interconnected devices, ensuring productive inputs and informed decision-making.

6. Cost Reduction

IoT technology is currently being used in abundance across industries. Integrating it at water authorities gives a new edge to the entire processing of the water supply network. This counts for significant cost savings as the technology prompts the use of sensor devices and gateway connectivity to run maintenance schedules on time and reduce process downtime.

7. Effective ROI

IoT is the future, with many societal benefits, but it is best suited for industrial environments. It amps up the effectiveness of the plant process, resulting in better services and ROI. For instance, installing a real-time river monitoring solution will provide managers with accurate details and the status of river water levels, enabling them to make quick and informed decisions that result in effective ROI.

8. Scalable Solution

An IoT-based water-level monitoring solution is an advanced and well-equipped system highly scalable to monitor the realtime volume of water-filled tanks. It is a full-fledged solution, comprising customizable and flexible features for ease of use. The rapid acceptance of technology in the water industry is a bold step toward progress, which makes a great impact on overall productivity.

9. Multiple Alerts

Installing a scalable IoT-based system further provides real-time alerts of water-related issues like logging, diseases, etc. It allows sufficient space for managers to make informed decisions and take necessary actions. Therefore, to never miss any alert, the solution consists of multiple alarm systems, including SMS alerts, email alerts, platform alerts, etc. These alerts are presented as real-time notifications on the users' smart devices that immediately prompt the appropriate authorities to make effective decisions regarding the river/reservoir levels.

DISADVANTAGES:

1.High demand parts

Due to the fragile parts the IOT equipment's will no longer be used as a reliable one.

2.Small components

Devices such as IOT technology uses small micro processors and controllers, if anyone of the component gets damaged, their spare cost is much expensive, and also this can't be tested in rivers as a real time method.

3.Device trust issues

In this technology world, everything is become an automated one. But although we face trust issues in this kind of technologies, there might be some random errors, that leads to a huge issue, it's safer to test also manually.

CONCLUSION

By using a WI-FI module the interfacing is done between transducers and the sensor network on a single chip solution wirelessly. For the monitoring process the system is achieved with reliability and feasibility by verifying the four parameters of water. The time interval of monitoring can be changed depending upon the need. Ecological environment of water resources is protected in this research. The time is reduced and the cost is low in this environmental management.

FUTURE SCOPE

This proposed system gives information to every user whodepend on that plant. We can use more sensors to detect more parameters for the water quality analysis purposes. The supply of water can be controlled by interfacing relay for easy detection. This system can be used to monitor other water quality parameters. The operation is user-friendly. The system can be expanded to monitor hydrologic, air

pollution, industrial and agricultural production and so on. It has wide spread application and extension value.

Applications:

- This system can be used for both commercial and domestic purposes.
- Different water supply agencies.
- In health department for identification and cause of water diseases.

APPENDIX

SOURCECODE:

https://drive.google.com/drive/folders/1ed0aAf3swuMlsVmHN5j58FO2xaXYyFvL?usp=sharing

GITHUB:

https://github.com/IBM-EPBL/IBM-Project-30776-1660189397