REAL TIME RIVER WATER MONITORING AND CONTROL SYSTEM

NALAIYA THIRAN PROJECT BASED LEARNING

IN

COMPUTER SCIENCE AND ENGINEERING

SRM VALLIAMMAI ENGINEERING COLLEGE

(AN AUTONOMOUS INSTITUTION)

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TABLE OF CONTENT

CHAPTER 1

INTRODUCTION

1.1 Project Overview

There are five main components of the environment: soil, water, climate, native plants, and landforms. The most important of these for human life is water. Additionally, it is essential for the survival of other living ecosystems. Water that is safe and easily accessible is essential for maintaining the general public's health, whether it is utilised for drinking, home use, food production, or recreational activities. Therefore, it is crucial for us to keep the balance of water quality. Otherwise, it would seriously harm human health while also disrupting the natural balance among other species.

Water pollution is a major global issue that necessitates continual assessment and adaption of the guiding principles for managing water resources from the global level down to individual wells. According to studies, water contamination is the main global cause of deaths and diseases. Records indicate that water contamination causes more than 14,000 deaths each day worldwide. Untreated water that is contaminated or unclean is frequently used for drinking in impoverished nations. One of the causes of this is the public and administrative illiteracy, as well as the absence of a system to check the quality of the water, which poses major health risks.

In this project, we show how to create a Wireless Sensor Network (WSN) that helps to monitor water quality by using data collected by sensors submerged in water and reducing the amount of algae in the water. This system can gather a variety of parameters using different sensors. Real-time data capture, transmission, and processing now have a fresh method thanks to the quick development of WSN technology. Customers can access up-to-date information on water quality from a distance. The Internet of Things (IoT) is a modern technical innovation. It is influencing today's world and is applied in numerous fields to gather, monitor, and analyse data from distant locations. From smart cities, smart power grids, and smart supply chains to smart wearables, the Internet of Things is everywhere. IoT has a lot of potential, even though it is presently underutilised in the environmental field. It can be used to avoid landslides and avalanches, minimise air pollution, monitor snow levels, and identify forest fires and early earthquakes. Additionally, it can be used in the field.

Researchers' interest in water quality monitoring has increased in the twenty-first century. Numerous works on this subject, concentrating on different facets of it, are either completed or in progress. The development of an effective, affordable, real-time system for monitoring water quality that incorporates wireless sensor networks and the internet of things was the overarching goal of all the initiatives.

1.2 Purpose

The main objective is to develop a system with low power consumption, low cost, and high detection accuracy for constantly monitoring river water quality at remote places. In order to improve water quality, measurements are made of pH, conductivity, turbidity level, and other variables. The core of IoT-based water quality monitoring is remote sensing technology. This carries out the strategy by obtaining analogue measurements for water contaminants utilising the pH and turbidity sensors. Additionally, we can add additional sensor elements depending on the application.

CHAPTER 2

LITERATURE SURVEY

2.1 Existing Problem

- The content of nitrate and phosphate in the water increases noticeably when significant quantities of fertilisers or farm waste drain into a river. These elements help algae grow and multiply quickly, turning the water green in the process.
- The enormous amount of algae growth causes pollution. When algae die, bacteria start to break them down by swiftly multiplying and consuming up all the oxygen in the water, which causes a lot of issues.
- Control the algae growth and keep an eye on the water's PH and temperature to prevent these issues.

2.2 References

1. IOT based Think Speak application for monitoring the quality of the water. Pasika and Gandla

The monitoring system which consists of a number of sensors used to measure several quality parameters like turbidity, pH value, water level in the tank, dampness of the adjoining environment and temperature of the water. The sensors are interfaced with the Microcontroller Unit (MCU) and additional processing is executed by the Personal Computer (PC). The acquired data will be directed to the cloud by means of Internet of Things (IoT) based Think Speak application for monitoring the quality of the water under test. As a future directive, work should be extended for analyzing some other parameters such as nitrates, electrical conductivity, dissolved oxygen in the water and free residual chlorine.

2. Solar powered water quality monitoring system using WSN.

M. Kulkarni Amruta and M. Turkane Satish Published on 2013 by IEEE

The idea of ‘Underwater Wireless Sensor Network’ (UWSN) is the basic building block of a water quality monitoring using wireless sensor network (WSN) technology powered by solar panel. To monitor water quality over different sites as a real-time application, an excellent system architecture constituted by distributed sensor nodes and a base station is suggested. The nodes and base station are connected using WSN technology like Zigbee. Design and implementation of a prototype model using one node powered by solar cell and WSN technology is the challenging work. Data collected by various sensors at the node side such as pH, turbidity and oxygen level is sent via WSN to the base station. Data collected from the remote site can be displayed in visual format as well as it can be analyzed using different simulation tools at base station. This novel system has advantages such as no carbon emission, low power consumption, more flexible to deploy at remote site and so on.

3. IOT based Smart Water Quality Monitoring System.

Monjra Mukta, Samia Islam and M.S.H. Khan Published on 1 Feb 2019 (4th ICCCS)

This paper represents an IOT based smart water quality monitoring(SWQM) system aids in continuous measurement of water condition based on four physical parameters i.e., temperature, Ph, electric conductivity and turbidity properties. Four sensors are connected with Arduino-uno in discrete way to detect the water parameters. Extracted data from the sensors are transmitted to a desktop application developed in NET platform and compared with the WHO standard values. Based on the measured result, the proposed SWQM system can successfully analyze the water parameters using fast forest binary classifier to classify whether the test water sample is drinkable or not.

4. Design and Implementation of Real Time Approach for the Monitoring of Water Quality Parameters.

Siti Aishah Binti Makhtar, Norhafizah Binti Burham, Anees Bt Abdul Aziz
Published on June 2022 by IEEE

This presented paperwork is to develop a smart water quality monitoring system using four sensors and an IoT platform to help determine water quality. It is to analyze the parameters of water samples such as tap water, coway water, river water, pond water, and lake water whether these water samples are in the threshold range for drinking or not. The device is initially used to measure pH, turbidity, total dissolved solids (TDS) and temperature, and then sent the information to the microcontroller Arduino Uno. Users can connect the device to a mobile phone via Bluetooth, and then an android-based mobile application called HC-05 Bluetooth Terminal displays real-time test data. These values of each parameter are also displayed on the I2C LCD screen connected to the microcontroller.

5. IoT and Cloud based water conservation and monitoring system Avita Katal, Sharad Singhania and Sakshi Jain Published on 26 Aug 2022 (ASIANCON)

There have been many researches whose major focus has been on water conservation but none of them provides with the plan on how to utilize water in an effective manner and minimize water wastage. The proposed system uses ultrasonic and water-level sensors to detect multiple metrics such as the vessel's water level as well as the individual’s daily water consumption. These sensors are connected to the Node Microcontroller Unit (NodeMCU), which performs additional computations. The real time data collected is uploaded to the database. A selfdesigned web application is used to show the water usage, alerts in case of water wastage and the recommendations to users in order to help them planning better water utilization.

2.3 Project Statement Definition

• Farmers use pesticides and fertilisers on their crops to promote greater growth. But rain can wash these pesticides and fertilisers through the soil, causing them to end up in rivers.

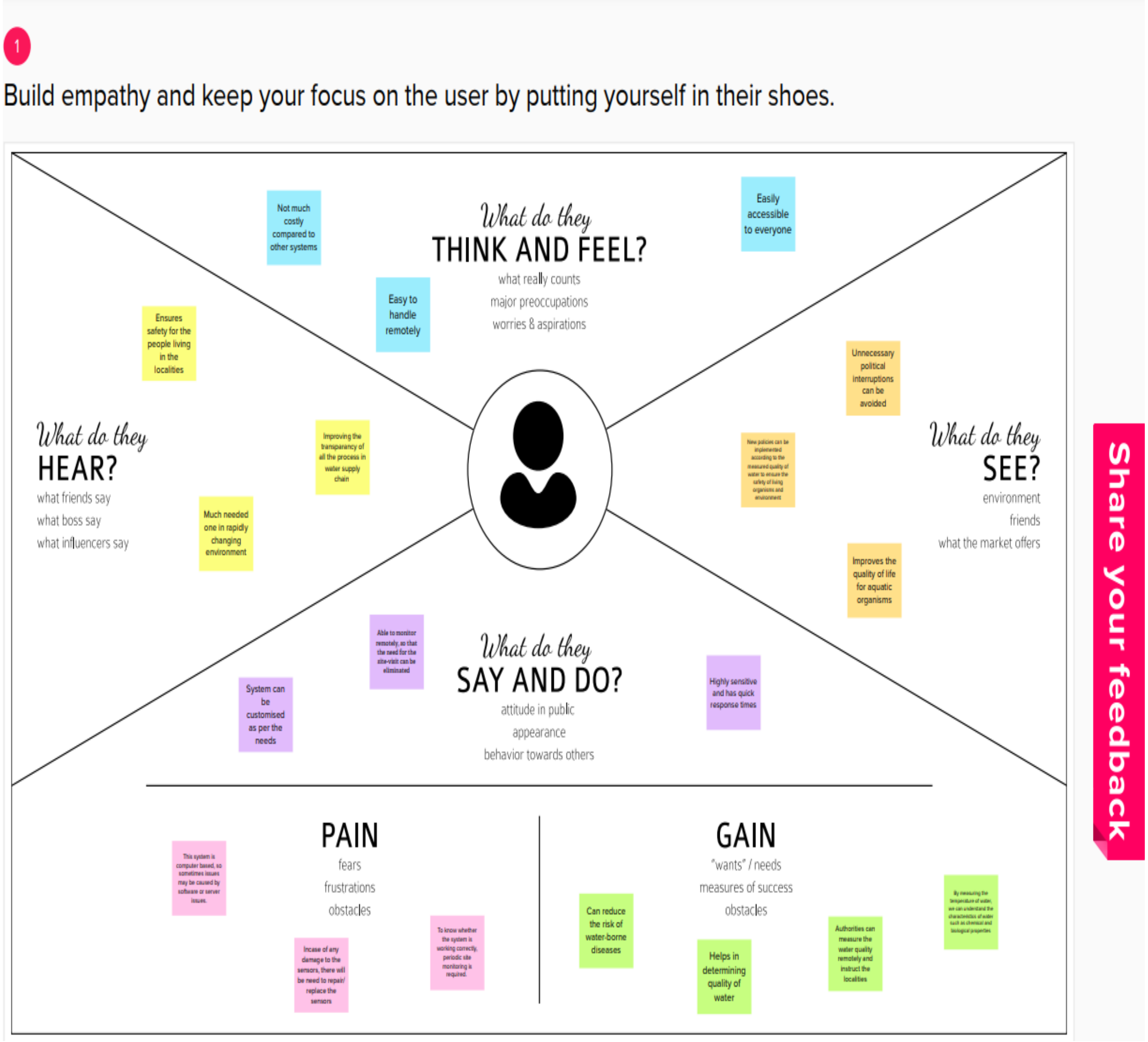
Problem Statement (PS)	I am (Customer)	I'm trying to	But	Becaus e	Which makes me feel
PS-1	People	To use the water for cooking.	It was dirty.	Medical wastages and fertilizers are mixed with the river water.	Fear to use the River water.
PS-2	People	I want to drink the river water.	It was not clean.	Algae present in the river.	Hard to drink

• Nitrate and phosphate concentrations in water rise significantly when huge amounts of farm waste or fertilisers drain into a river. These elements enable algae to quickly reproduce and proliferate, turning the water green. Eutrophication, or the huge development of algae, causes pollution. The bacteria swiftly multiply once the algae die, consuming all the oxygen in the water, which causes a large number of creatures to perish.

CHAPTER 3

IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



1

Build empathy and keep your focus on the user by putting yourself in their shoes.

What do they THINK AND FEEL?

what really counts

major preoccupations

worries & aspirations

Not much costly compared to other systems

Easy to handle remotely

Easily accessible to everyone

What do they HEAR?

what friends say

what boss say

what influencers say

Ensures safety for the people living in the localities

Improving the transparancy of all the process in water supply chain

Much needed one in rapidly changing environment

What do they SEE?

environment

friends

what the market offers

Unnecessary political interruptions can be avoided

New policies can be implemented according to the measured quality of water to ensure the safety of living organisms and environment

Improves the quality of life for aquatic organisms

What do they SAY AND DO?

attitude in public

appearance

behavior towards others

Able to monitor remotely, so that the need for the site-visit can be eliminated

System can be customised as per the needs

Highly sensitive and has quick response times

PAIN

fears

frustrations

obstacles

This system is computer based, so sometimes issues may be caused by software or server issues.

Incase of any damage to the sensors, there will be need to repair/ replace the sensors

To know whether the system is working correctly, periodic site monitoring is required.

GAIN

"wants" / needs

measures of success

obstacles

Can reduce the risk of water-borne diseases

Helps in determining quality of water

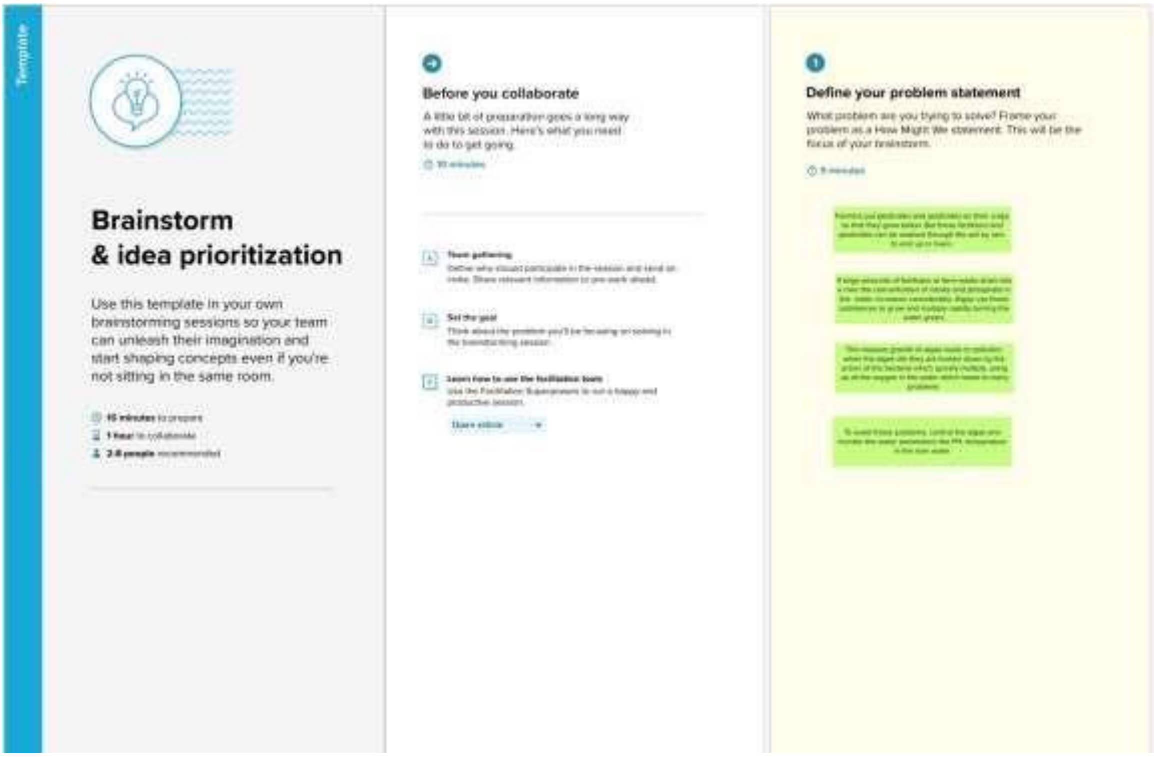
Authorities can measure the water quality remotely and instruct the localities

By measuring the temperature of water, we can understand the characteristics of water such as chemical and biological properties.

Share your feedback

3.2 Ideation & Brainstorming

Step-1: Team Gathering, Collaboration and Select the Problem Statement



Template

Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

10 minutes to prepare

1 hour to collaborate

2-8 people recommended

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A Team gathering
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B Set the goal
Think about the problem you'll be focusing on solving in the brainstorming session.

C Learn how to use the facilitation tools
Use the Facilitation Superpowers to run a happy and productive session.

Open article ▾

1 Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

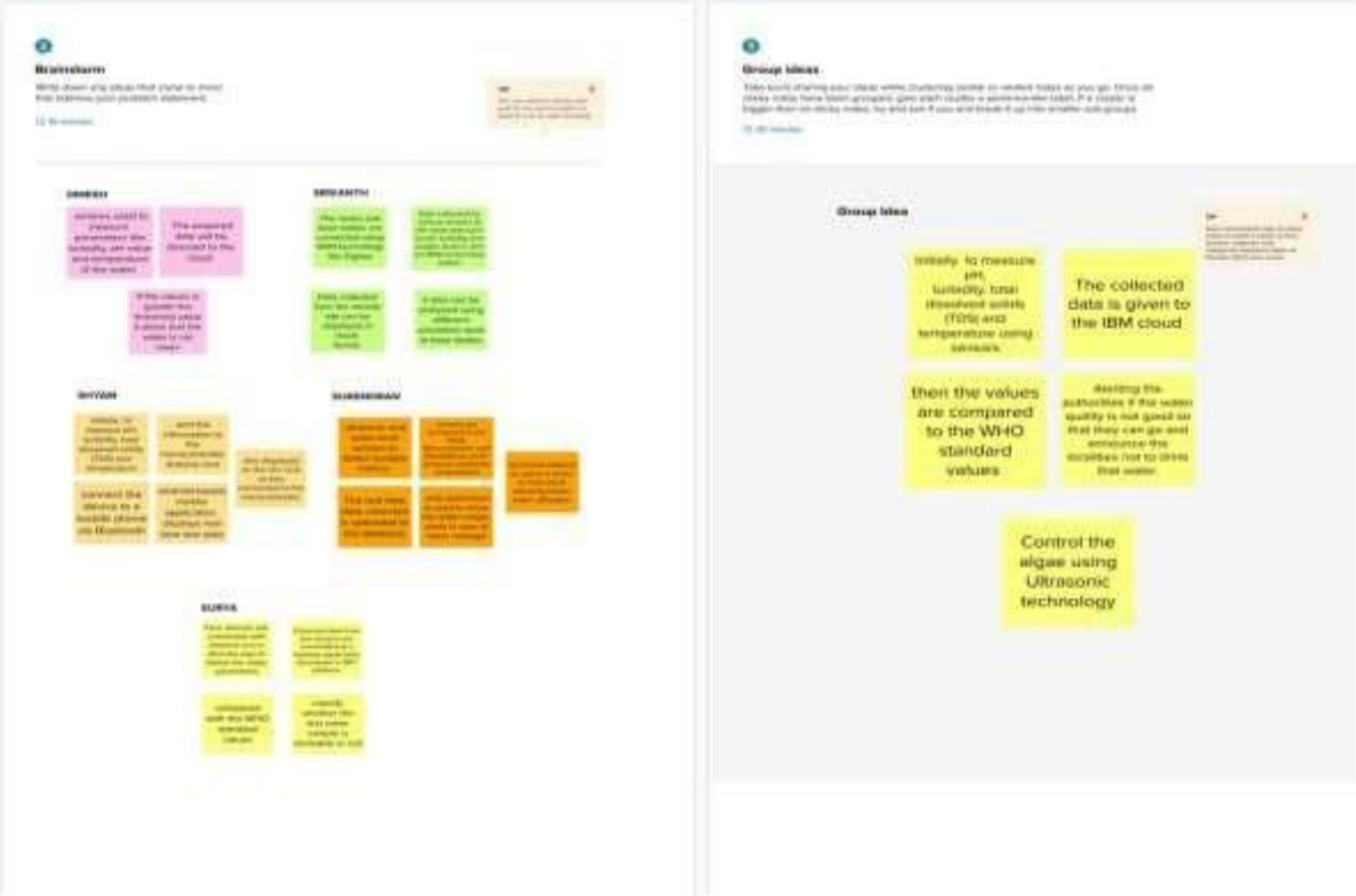
[illegible]

[illegible]

[illegible]

[illegible]

Step-2: Brainstorm, Idea Listing and Grouping



Brainstorm

[illegible]

Group Ideas

[illegible]

Group Idea

Initially to measure pH, turbidity, total dissolved solids (TDS) and temperature using sensors

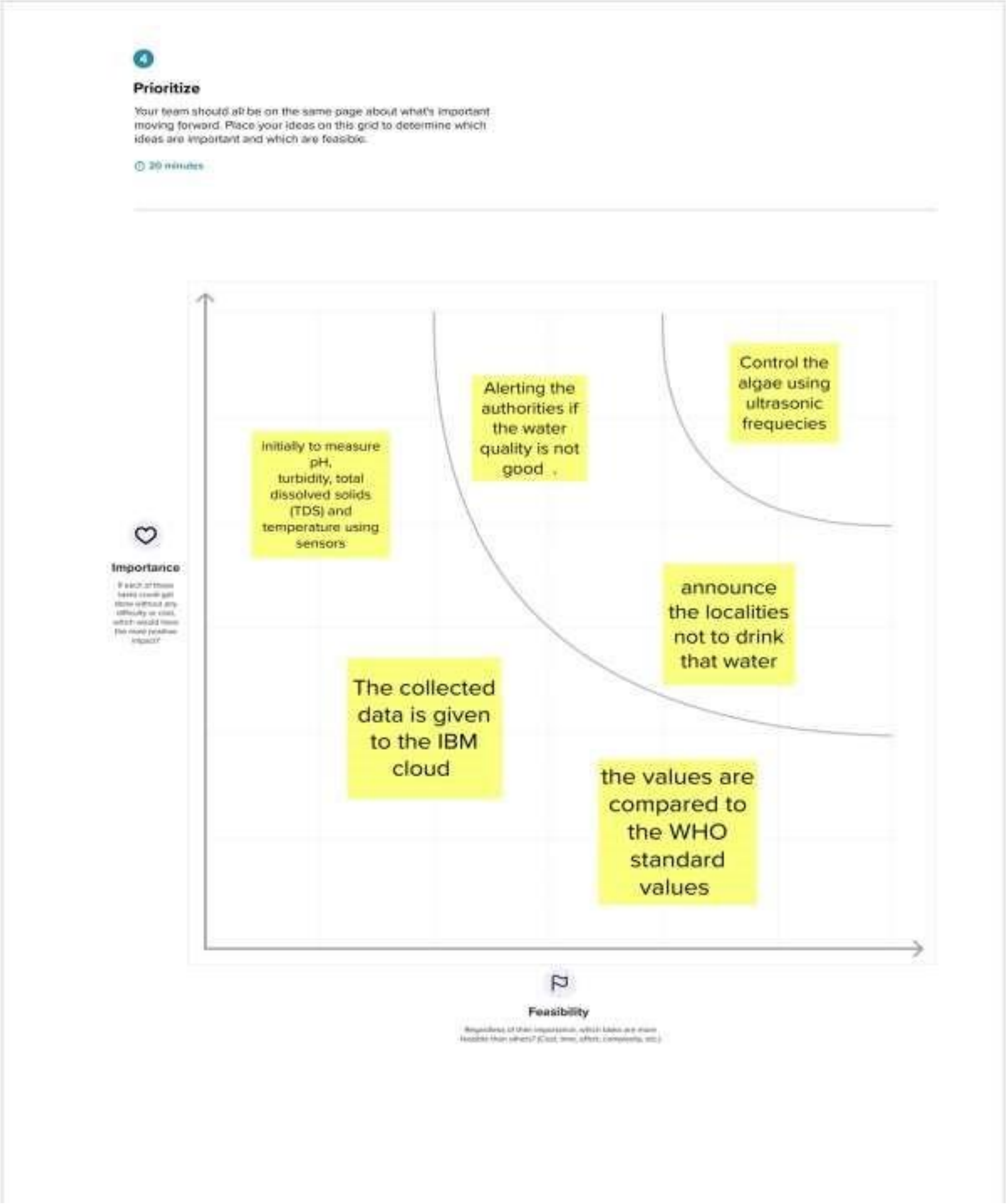
The collected data is given to the IBM cloud

then the values are compared to the WHO standard values

alerting the authorities if the water quality is not good so that they can go and announce the localities not to drink that water

Control the algae using Ultrasonic technology

Step-3: Idea Prioritization



4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes

Initially to measure pH, turbidity, total dissolved solids (TDS) and temperature using sensors

Alerting the authorities if the water quality is not good .

Control the algae using ultrasonic frequecies

announce the localities not to drink that water

The collected data is given to the IBM cloud

the values are compared to the WHO standard values

Importance
If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?
Feasibility
Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

3.3 Proposed Solution

S. No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To **control the algae** and monitor the value of **PH, Turbidity** present in the river water.
2.	Idea / Solution description	The system consists of more **number of sensors to monitor the PH, Turbidity** and etc., and **control the algae by using ultrasonic frequencies**.
3.	Novelty / Uniqueness	Controlling the algae by using the **ultrasonic technology**.
4.	Social Impact / Customer Satisfaction	River pollution can impact all living things. Better controlling and monitoring can impact clean water and healthy.
5.	Business Model (Revenue Model)	River water controlling and monitoring model.
6.	Scalability of the Solution	It is easy to implement.

3.4 Problem Solution fit

1.Customer Segment(CS) Peoples who use the river water	**2.Customer Constraints** Available of devices.	**3. Available Solution** • IOT based think speak application for monitoring the quality of the water. • IOT based smart water quality monitoring system. □ IOT cloud based water conservation and monitoring system.
4.Jobs-to-be-Done The sensor in the system measures the PH and temperature of the river water. Then the values are compared to the standard values. If it is greater than standard values it alerts the consent authorities.	**5. Problem Root Cause** The problem arises naturally.	**6.Behaviour** After the alert, the people can use water from other till the issue solved by the corporation.
7.Triggers If the sensors are damaged, the user will not know how to rectify.	**9. Your Solution** To control the algae and to monitor the water parameters like PH and temperature in the river water and then alert the consent authorities and the local authorities.	**10.Channels of Behaviour** In online service, customer may need to install the mobile application for that. In offline service, customer has need to travel and report the issue.
8.Emotions Before, People using the water with a fear and now they are only using the clean water		

CHAPTER 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 Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	PH sensor	PH sensor are used to detect the PH value of the water
FR-4	Turbidity sensor	Turbidity sensors are used to detect the turbidity value of the water.
FR-5	Thermistors or Thermocouples	Thermistors or Thermocouples are used to detect the temperature of the water.
FR-6	Ultrasonic signal generator	Ultrasonic signal generator generates ultrasonic signal to destroy the algae present in the water.
FR-7	Mobile Application	To give the alerts to the corporation and the local authorities.

4.2 Non-Functional requirements

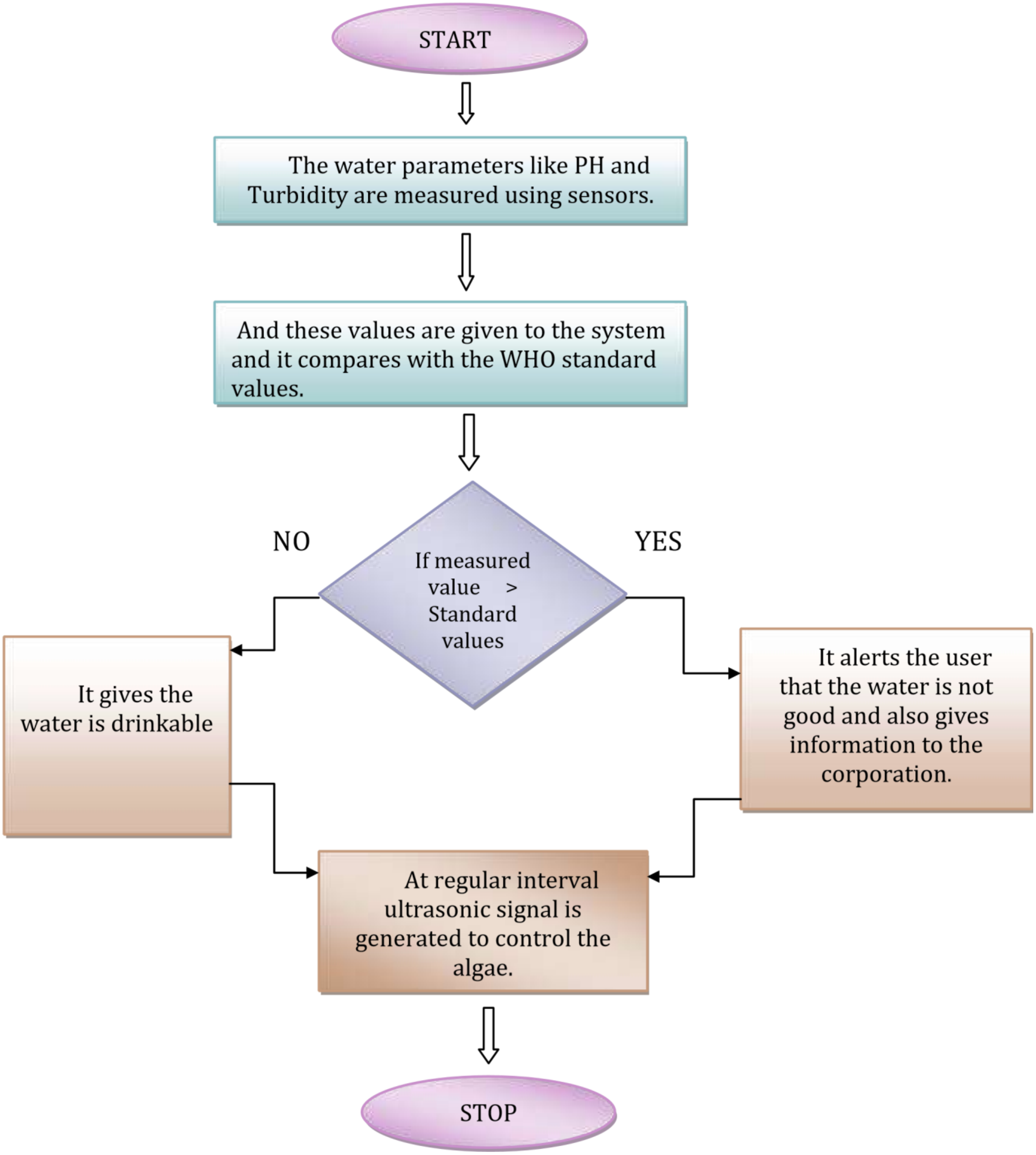
NFR No.	Non-Functional Requirement	Description
NFR-1	Usability	It is good and efficient to use.
NFR-2	Security	It has high security.
NFR-3	Reliability	Quality assurance, quality control and quality assessment procedures have been implemented.

NFR-4	Performance	The performance of the system good and efficient.
NFR-5	Scalability	The ability of the system is highly scalable.

CHAPTER 5

PROJECT DESIGN

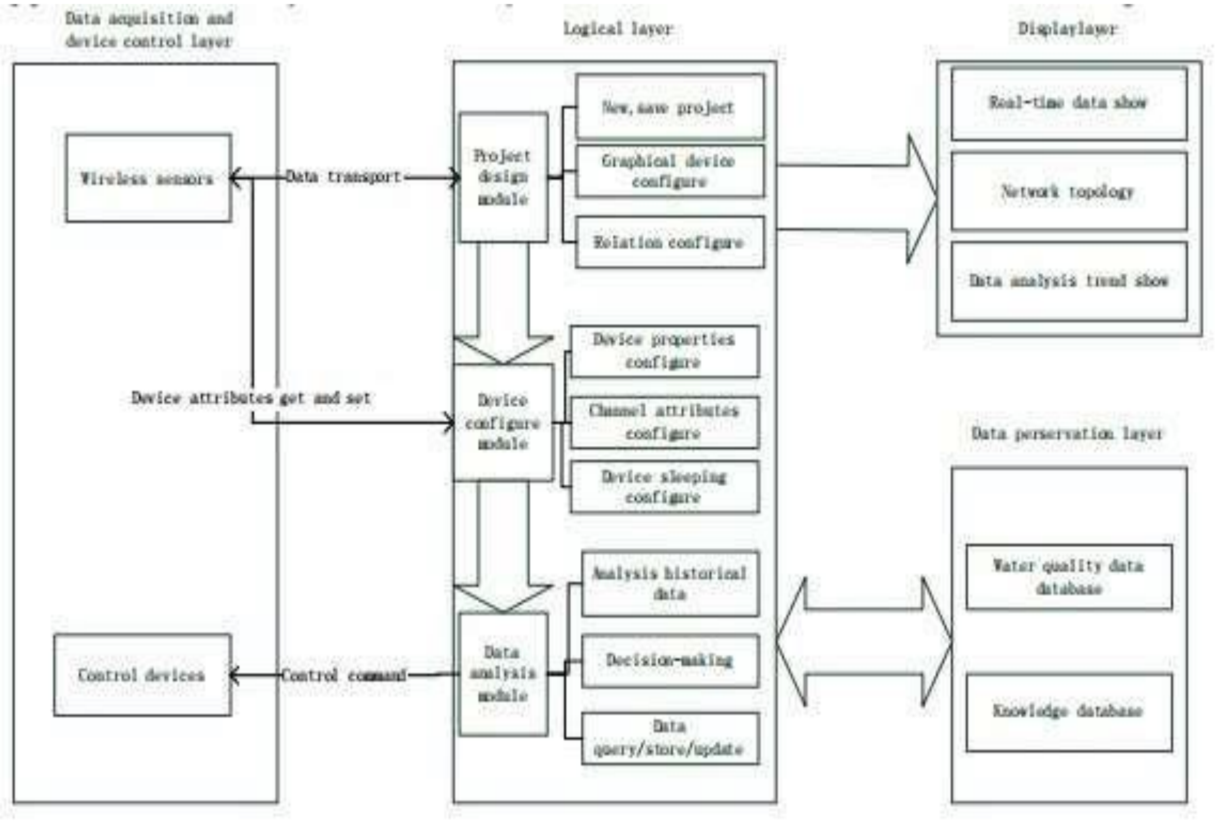
5.1 Data Flow Diagrams


START
The water parameters like PH and Turbidity are measured using sensors.
And these values are given to the system and it compares with the WHO standard values.
NO
If measured value > Standard values
YES
It gives the water is drinkable
It alerts the user that the water is not good and also gives information to the corporation.
At regular interval ultrasonic signal is generated to control the algae.
STOP

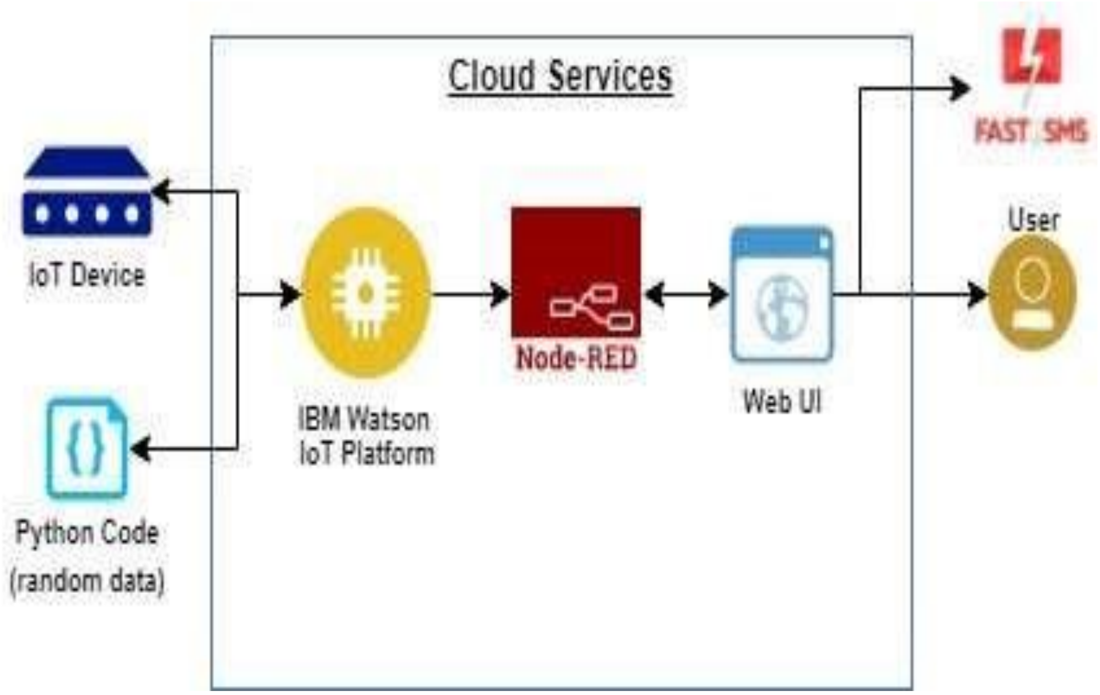
5.2 Solution & Technical Architecture

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.



Solution Architecture Diagram



Technical Architecture

Components and Technology Table:

S. No	Component	Description	Technology
1.	Mobile Application	To give the alerts to the corporation and the local authorities.	SMS service
2.	Web Application	access the data from the cloud	Web UI (using node red service)
3.	PH sensor	detect the PH value of the river water	PH level monitoring
4.	Turbidity sensor	Detect the turbidity level of the water	Turbidity level monitoring
5.	ESP32	To process the sensed data from the sensors	IBM Watson

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 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 email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can register through the mail	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can get login credential	High	Sprint-1

Customer (Web user)	Dashboard	WUSN-1	As a user, I can login to the web application by using user name and password	I can access my account	High	Sprint-1
User Type	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Acceptance criteria**	**Priority**	**Release**
Customer Care Executive	View manner	CCE-1	As a user, I can see the data in visual view. (graphical representation)	I can easily understand	High	Sprint-1
	Quality	CCE-2	As a user, I can easily predict the quality of the water	I can easily identify the quality of the water	High	Sprint-1
Administrator	person	Adm-1	As a admin, I can take all the responsibility about the system	I can monitor the entire system properly	High	Sprint-2

CHAPTER 6

PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

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.	3	High	Prasana Pradeepa
Sprint-1	Confirmation	USN-2	As a user, I will receive confirmation email once I have registered for the application.	2	Medium	Prasanna Pradeepa
Sprint-1	Registration using Gmail	USN-4	As a user, I can register for the application through Gmail.	2	Medium	Prasanna Pradeepa
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password.	3	High	Prasanna Pradeepa
Sprint-2	IBM cloud	USN-6	As a user, I can get access to IBM cloud service.	2	Medium	Nandini Naveen Kumar Iswarya
Sprint-2	IBM Watson and device setting	USN-7	Creating IBM Watson and device setting for integrate the microcontroller to get the sensed data.	3	High	Nandini Naveen Kumar
Sprint-2	Node red	USN-8	To create the Node red service.	3	High	Naveen Kumar Pradeepa
Sprint-3	Create Web UI	USN-9	To create Web UI to access the data from the cloud.	3	High	Nandini Prasanna
Sprint-3	Create web application	USN-10	To create the web application.	2	Medium	Nandini Prasanna

Sprint-3	Source code creation	USN-11	To create the source code for the project.	3	High	Prasanna Naveen Kumar
Sprint-4	Publish data	USN-12	Publish the sensed data to the cloud.	3	High	Prasanna Naveen Kumar
Sprint	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Story Points**	**Priority**	**Team Members**
Sprint-4	SMS	USN-13	If the sensed values are higher than the standard values it sends the message to the authorities.	3	High	Nandini Pradeepa
Sprint-4	Testing	USN-14	Testing the developed project.	3	High	Nandini Pradeepa

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	10	6 Days	24 Oct 2022	29 Oct 2022	10	29 Oct 2022
Sprint-2	10	6 Days	31 Oct 2022	05 Nov 2022	10	05 Nov 2022
Sprint-3	10	6 Days	07 Nov 2022	12 Nov 2022	10	12 Nov 2022
Sprint-4	10	6 Days	14 Nov 2022	19 Nov 2022	10	19 ov 2022

6.3 Report from JIRA

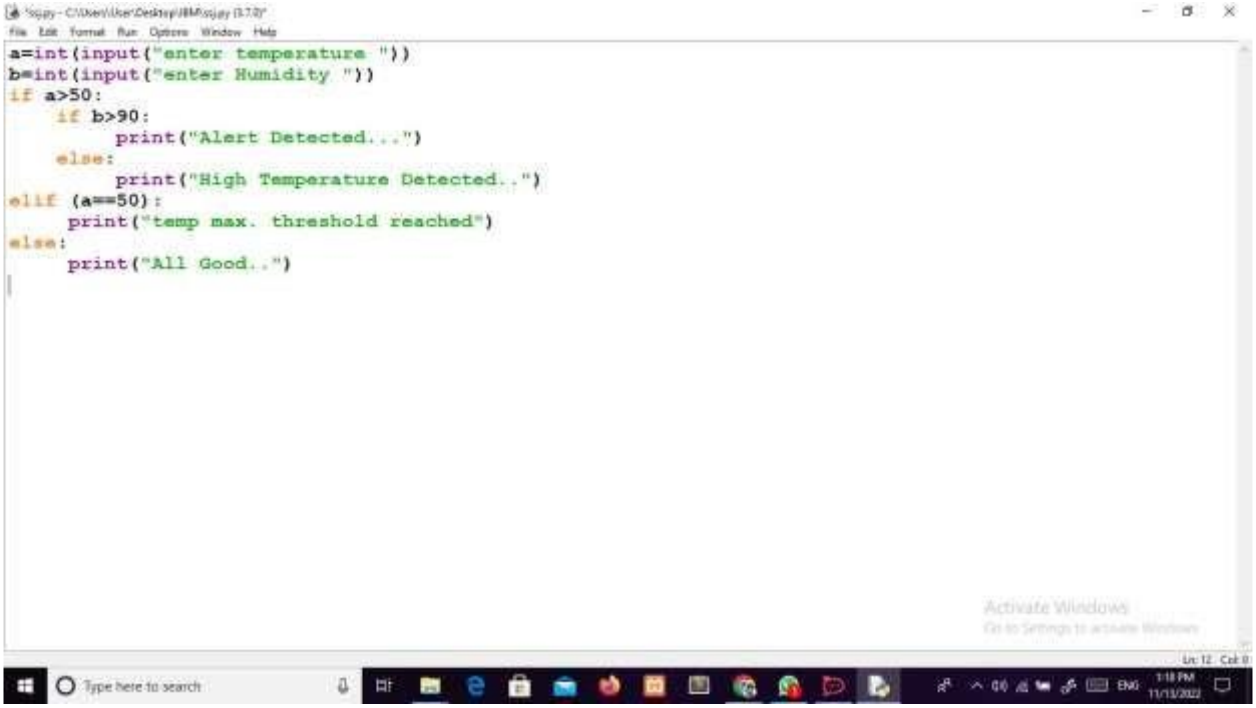
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let’s calculate the team’s average velocity (AV) per iteration unit (story points per day)

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

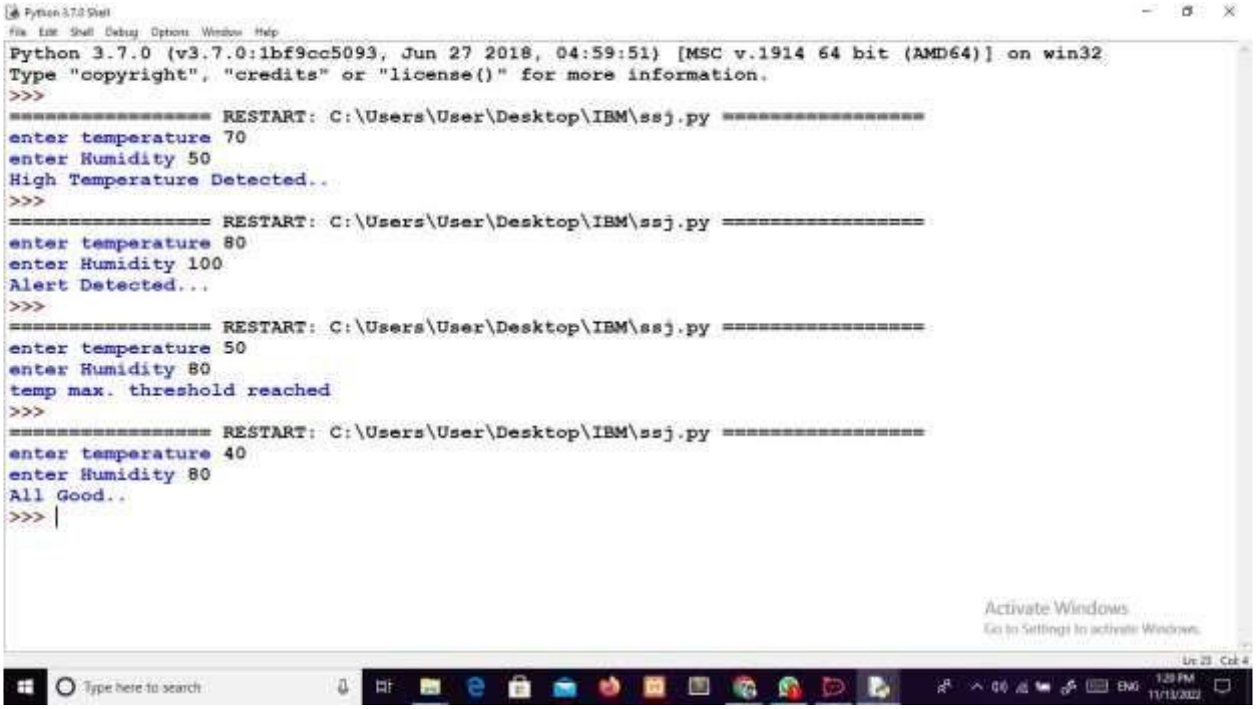
CHAPTER 7

CODING AND SOLUTION

7.1 Feature 1


ss.py - C:\Users\User\Desktop\IBM\ss.py (3.7.0)
File Edit Format Run Options Window Help
Activate Windows
Go to Settings to activate Windows
Ln: 12 Col: 0
Type here to search
ENG
1:18 PM
11/13/2022

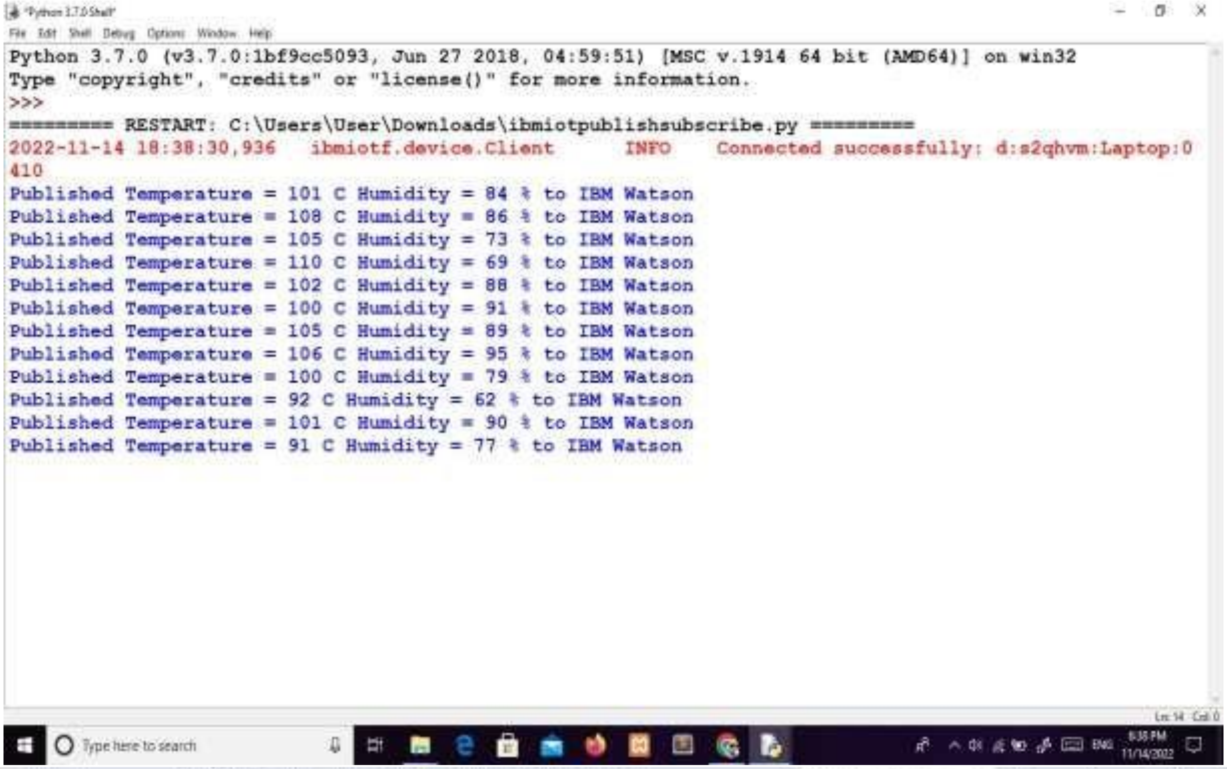
```
a=int(input("enter temperature "))
b=int(input("enter Humidity "))
if a>50:
    if b>90:
         print("Alert Detected...")
    else:
         print("High Temperature Detected..")
elif (a==50):
     print("temp max. threshold reached")
else:
     print("All Good..")
```



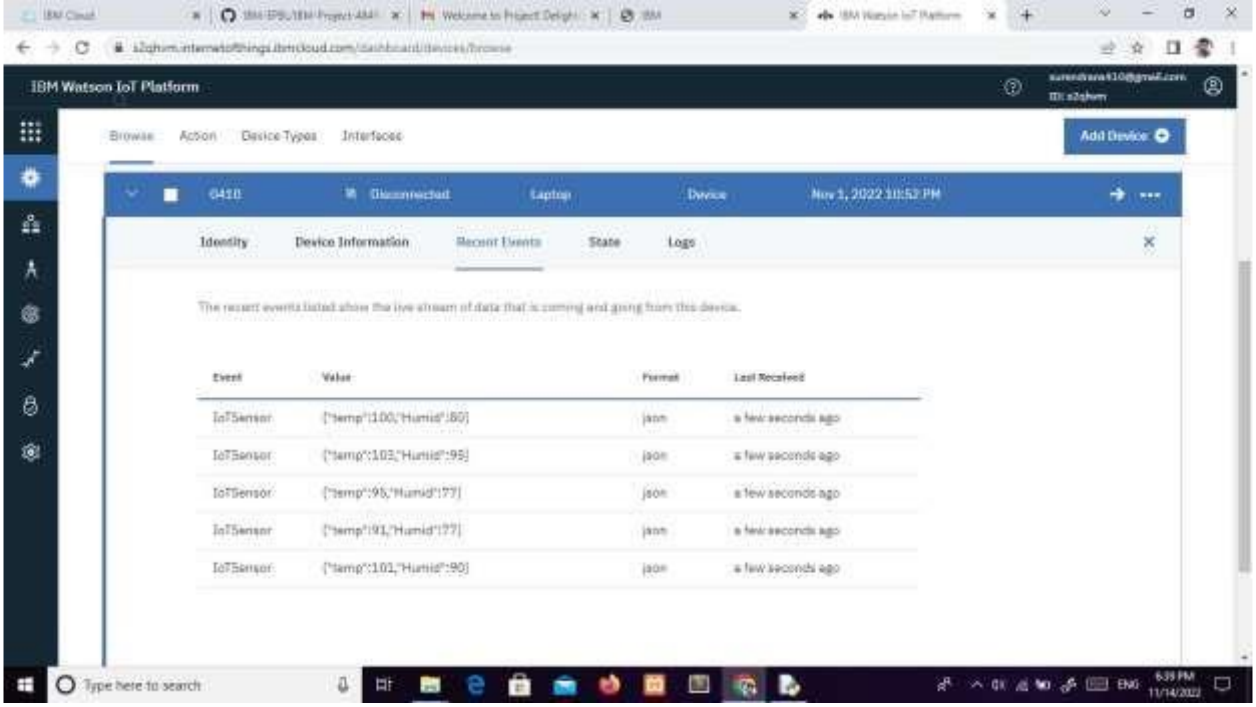
```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
================= RESTART: C:\Users\User\Desktop\IBM\ssj.py =================
enter temperature 70
enter Humidity 50
High Temperature Detected..
>>>
================= RESTART: C:\Users\User\Desktop\IBM\ssj.py =================
enter temperature 80
enter Humidity 100
Alert Detected...
>>>
================= RESTART: C:\Users\User\Desktop\IBM\ssj.py =================
enter temperature 50
enter Humidity 80
temp max. threshold reached
>>>
================= RESTART: C:\Users\User\Desktop\IBM\ssj.py =================
enter temperature 40
enter Humidity 80
All Good..
>>> |
```

7.2 Feature 2

```
import time import sys
import ibmiotf.application
import ibmiotf.device import
random
#Provide your IBM Watson Device Credentials
organization = "s2qhvm" deviceType = "Laptop"
deviceId = "0410" authMethod =
"token"  authToken =
"20011004"

# Initialize GPIO

def myCommandCallback(cmd):     print("Command
received: %s" % cmd.data['command'])
status=cmd.data['command']     if status=="lighton":
print ("led is on")     elif status=="lightoff":         print ("led is
off")     else:
        print("please send the proper command")

    #print(cmd)

try:
 deviceOptions = {"org": organization, "type": deviceType, "id": deviceId,
"auth-method": authMethod, "auth-token": authToken}
 deviceCli = ibmiotf.device.Client(deviceOptions)
         #..............................................

except Exception as e:   print("Caught exception
connecting device: %s" % str(e))
 sys.exit()

# Connect and send a datapoint "hello" with value "world" into the cloud as an event
of type "greeting" 10 times deviceCli.connect()

while True:
        #Get Sensor Data from DHT11

        PH=random.randint(90,110)
        Turbidity=random.randint(60,100)

        data = { 'PH' : PH, 'Turbidity': Turbidity }
        #print data         def myOnPublishCallback():             print ("Published PH
value = %s C" % PH, "Turbidity= %s %%" % Turbidity, "to IBM Watson")

        success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish=myOnPublishCallback)         if not success:             print("Not
connected to IoTF")
        time.sleep(1)

        deviceCli.commandCallback = myCommandCallback

# Disconnect the device and application from the cloud deviceCli.disconnect()
```



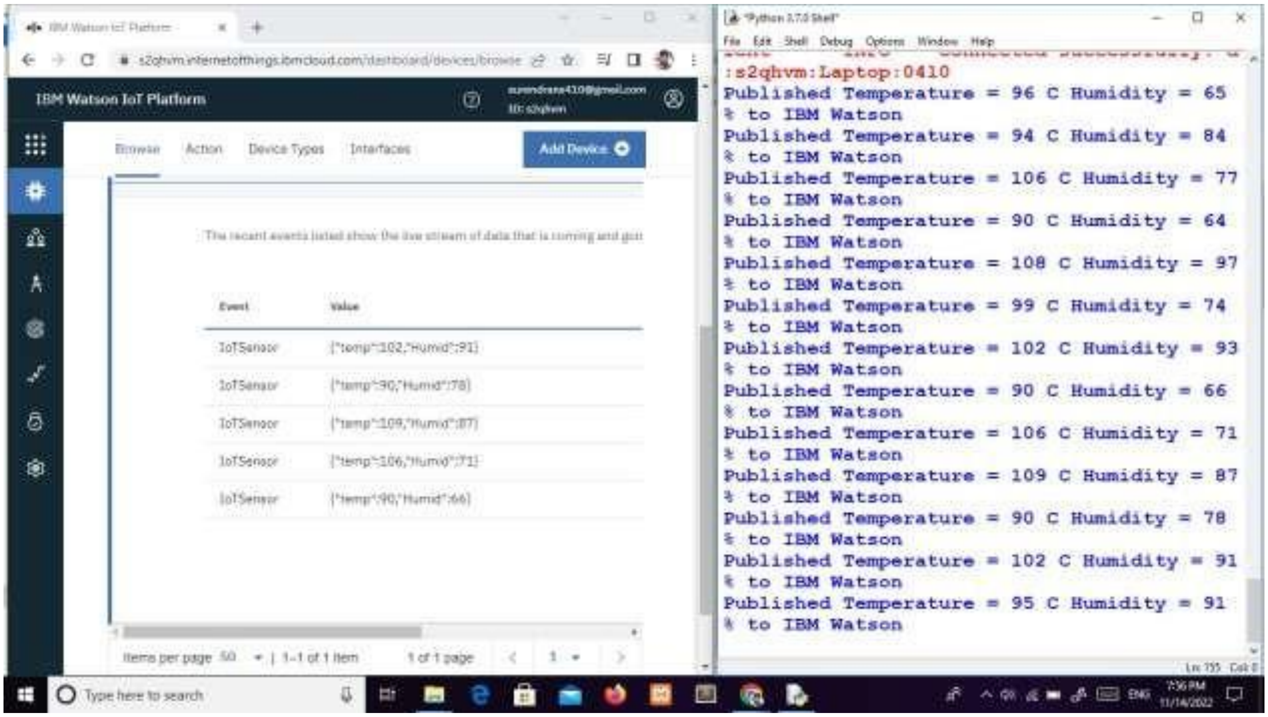
```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
========= RESTART: C:\Users\User\Downloads\ibmiotpublishsubscribe.py =========
2022-11-14 18:38:30,936   ibmiotf.device.Client      INFO    Connected successfully: d:s2qhvm:Laptop:0
410
Published Temperature = 101 C Humidity = 84 % to IBM Watson
Published Temperature = 108 C Humidity = 86 % to IBM Watson
Published Temperature = 105 C Humidity = 73 % to IBM Watson
Published Temperature = 110 C Humidity = 69 % to IBM Watson
Published Temperature = 102 C Humidity = 88 % to IBM Watson
Published Temperature = 100 C Humidity = 91 % to IBM Watson
Published Temperature = 105 C Humidity = 89 % to IBM Watson
Published Temperature = 106 C Humidity = 95 % to IBM Watson
Published Temperature = 100 C Humidity = 79 % to IBM Watson
Published Temperature = 92 C Humidity = 62 % to IBM Watson
Published Temperature = 101 C Humidity = 90 % to IBM Watson
Published Temperature = 91 C Humidity = 77 % to IBM Watson
```



0410	Disconnected	Laptop	Device	Nov 1, 2022 10:52 PM

The recent events listed show the live stream of data that is coming and going from this device.

Event	Value	Format	Last Received
IoTSensor	{"temp":100,"Humid":80}	json	a few seconds ago
IoTSensor	{"temp":103,"Humid":95}	json	a few seconds ago
IoTSensor	{"temp":95,"Humid":77}	json	a few seconds ago
IoTSensor	{"temp":91,"Humid":77}	json	a few seconds ago
IoTSensor	{"temp":101,"Humid":90}	json	a few seconds ago



The recent events listed show the live stream of data that is coming and goi

Event	Value
IoTSensor	{"temp":102,"Humid":91}
IoTSensor	{"temp":90,"Humid":78}
IoTSensor	{"temp":109,"Humid":87}
IoTSensor	{"temp":106,"Humid":71}
IoTSensor	{"temp":90,"Humid":66}

```
:s2qhvm:Laptop:0410
Published Temperature = 96 C Humidity = 65
% to IBM Watson
Published Temperature = 94 C Humidity = 84
% to IBM Watson
Published Temperature = 106 C Humidity = 77
% to IBM Watson
Published Temperature = 90 C Humidity = 64
% to IBM Watson
Published Temperature = 108 C Humidity = 97
% to IBM Watson
Published Temperature = 99 C Humidity = 74
% to IBM Watson
Published Temperature = 102 C Humidity = 93
% to IBM Watson
Published Temperature = 90 C Humidity = 66
% to IBM Watson
Published Temperature = 106 C Humidity = 71
% to IBM Watson
Published Temperature = 109 C Humidity = 87
% to IBM Watson
Published Temperature = 90 C Humidity = 78
% to IBM Watson
Published Temperature = 102 C Humidity = 91
% to IBM Watson
Published Temperature = 95 C Humidity = 91
% to IBM Watson
```

CHAPTER 8
TESTING

8.1 Test Cases

The main benefit of testing is the **identification and subsequent removal of the errors**. However, testing also helps developers and testers to compare actual and expected results in order to improve quality. If the software production happens without testing it, it could be useless or sometimes dangerous for customers.

- Performance of the App.
- Analyzing the data from the system.
- Analyze the system performance with the expected performance.

CHAPTER 9
RESULTS

9.1 Performance Metrics

□ The performance of the system is good and it is easy to find the quality of the water. The performance of the system is achieved by nearly 80% of the expected output of the system.

CHAPTER 10
ADVANTAGES AND DISADVANTAGE

Advantages:

- Easy detect the quality of the river water. □Power consumption of the system is low.
- We can give the clean water.

- Easy to access the application.
- People are uses the river water without fear.
- Water pollution can be controlled.

Disadvantages:

- Cost of the sensor is high.
- If the problem arises in the system, it cannot be solved by the user.
- Sometimes, sensors give the wrong PH value.
- If the river gets flooded, then the sensors are damaged.
- Need to maintain the system always**.**

CHAPTER 11
CONCLUSION

A water detection sensor that has a special benefit is used to monitor water turbidity, PH, and temperature. The technology is low-cost, can automatically monitor water quality, and doesn't need someone to be on duty. Testing for water quality will therefore probably be less expensive, more practical, and quicker. The approach is quite flexible.

By simply swapping out the appropriate sensors and altering the necessary software packages, this system may be used to track various metrics related to water quality. The steps are simple to follow. The system can be enhanced to monitor, among other things, hydrologic, air pollution, industrial, and agricultural production. It is widely utilised and has a wide range of uses. By having embedded equipment for monitoring, the environment is able to defend itself.

CHAPTER 12
FUTURE SCOPE

The project's future scope includes environmental monitoring, drinking water quality control, waste water treatment and disinfection, among other things. Additionally, this technology might be used in a number of industrial procedures. To monitor data on computers, the system can be adjusted to suit the needs of the user and applied in conjunction with lab view.

CHAPTER 13
APPENDIX

13.1 Source Code

a. HTML code for registration (UI)

```
 <html>
   <head>
      <h1 style="background_color:darkblue;">IOT</h1>
   </head>
<body>
<p style="background_color:Green;">
<OL>
   <LI>Enter your name</LI>
   <LI>Mail ID</LI>
   <LI>mobile number</LI>
</OL>

<h4><a href="https://project mark.com/">project mark</a></h4>
<form method="post" action="/{{url}}">
   <label for="name">First name:</label><br>
   <input type="text" id="fname" name="fname"><br>
   <label for="mail id">Mail ID:</label><br>
   <input type="text" id="MID" name="MID"><br>
   <label for="mobile number">mobile number:</label><br>
   <input type="text" id="num" name="num"><br>
   <input type="submit" value="submit">
   <input type="reset" value="reset">
</form>
</body>
</html>
```

b. Arduino code

```
#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);
}
```

c. Python code

```
 import time import sys
import ibmiotf.application
import ibmiotf.device import
random
#Provide your IBM Watson Device Credentials
organization = "s2qhvm" deviceType = "Laptop"
deviceId = "0410" authMethod =
"token"  authToken =
"20011004"  # Initialize
GPIO

def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
status=cmd.data['command']     if status=="lighton":
print ("led is on")     elif status=="lightoff":         print ("led is
off")     else:
        print("please send the proper command")

    #print(cmd)

try:
 deviceOptions = {"org": organization, "type": deviceType, "id": deviceId,
"auth-method": authMethod, "auth-token": authToken}
 deviceCli = ibmiotf.device.Client(deviceOptions)
          #..............................................

except Exception as e:   print("Caught exception
connecting device: %s" % str(e))
 sys.exit()
```

```
# Connect and send a datapoint "hello" with value "world" into the cloud as an event
of type "greeting" 10 times deviceCli.connect()

while True:
        #Get Sensor Data from DHT11

        PH=random.randint(90,110)
        Turbidity=random.randint(60,100)

        data = { 'PH' : PH, 'Turbidity': Turbidity }
        #print data         def
myOnPublishCallback():
            print ("Published PH value = %s C" % PH, "Turbidity= %s %%" %
Turbidity, "to IBM Watson")

        success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish=myOnPublishCallback)         if not success:
print("Not connected to IoTF")         time.sleep(1)

        deviceCli.commandCallback = myCommandCallback

# Disconnect the device and application from the cloud deviceCli.disconnect()
```

13.2 GitHub and Project Demo Link

GitHub Link:

https://github.com/IBM-EPBL/IBM-Project-12134-1659376112