PROJECT REPORT

REAL -TIME RIVER WATER MONITORING AND CONTROL SYSTEM

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CONTENT

ABSTRACT

Pollution of water is one of the main threats in recent times as drinking water is getting contaminated and polluted. The polluted water can cause various diseases to humans and animals, which in turn affects the life cycle of the ecosystem. If water pollution is detected in an early stage, suitable measures can be taken and critical situations can be avoided. To make certain the supply of pure water, the quality of the water should be examined in real-time. Smart solutions for monitoring of water pollution are getting more and more significant these days with innovation in sensors, communication, and Internet of Things (IOT) technology. In this system, a detailed review of the latest works that were implemented in the arena of smart water pollution monitoring systems is presented. The paper proposes a cost effective and efficient IOT based smart water quality monitoring system which monitors the quality parameters uninterruptedly. The developed model is tested with three water samples and the parameters are transmitted to the cloud server for further action.Water pollution is one of the biggest fear for the green globalization. In order to ensure the safe supply of the drinking water the quality needs to be monitor in real time. In this paper we present a design and development of a low cost system for real time monitoring of the water quality in IOT(internet of things).The system consist of several sensors is used to measuring physical and chemical parameters of the water. The parameters such as temperature,PH,flow sensor of the water can be measured. The measured values from the sensors can be processed by the core controller. The Arduino model can be used as a core controller. Finally, the sensor data can be viewed on IBM cloud using WI-FI system

CHAPTER 1

INTRODUCTION

In the 21st century, there were lots of inventions, but at the same time were pollutions, global warming and so on are being formed, because of this there is no safe drinking water for the world's pollution. Hence there is need of developing better methodologies to monitor the water quality.The water quality parameters pH measures the concentration of hydrogen ions. It shows the water is acidic or alkaline. Pure water has 7pH value, less than 7 pH has acidic, more than 7pH has alkaline. The range of pH is 0-14 pH. For drinking purpose it should be 6.5-8.5pH. Temperature sensor measures how the water is, hot or cold. Flow sensor measures the flow of water through flow sensor. The traditional methods of water quality monitor involves the manual collection of water samples from different locations.

The internet has become a common interface that many devices use in order to simplify the daily life of many people giving the ability to search for information, store their own information in the cloud while also giving them better ways of managing information. From the time of its introduction, the number of people that use mobile phones and the internet to communicate with other people has increased dramatically to become one of the major means of communication. People with the help of smartphones can now connect to the internet without the need for a computer, while still offering the same functionality but through different means. With the introduction of advanced software and hardware devices, smartphones are now powerful devices and have become an important part of people's daily lives. A major aspect is how the Smartphone is able to connect and communicate with other devices.

2.LITERATURE SURVEY

This research paper focuses on Detection on water pollution and water management using smart sensors.To ensure the safe supply of drinking water the quality should be monitored in real time for that purpose new approach IOT (Internet of Things) based water quality monitoring has been proposed.Thissystem consists some sensors. Which measure the water quality parameter such as pH, turbidity, conductivity, dissolved oxygen, temperature. The measured values from the sensors are processed by microcontroller. Based on a study of existing water quality monitoring system and scenario of water we can say that proposed system is more suitable to monitor water quality parameters in real time.[1]

This research paper focuses on Sensor Web for River Water Pollution Monitoring and Alert System Sensor Web has provided infrastructure for collecting and processing data from distributed and heterogeneous sensors. This set of technologies has found various implementations, especially in the area of environmental monitoring. The Sensor Web architecture for crisis management, described in this paper, provides active monitoring of measuring parameters and timely responses in cases of environmental disasters. The River Water Management and Alert System built on this architecture enable access, control and management of river water pollution.[2]

This research paper focuses on Wireless Sensor Network for River Water Quality Monitoring in India. This paper introduces a river water quality monitoring system based on wireless sensor network which helps in continuous and remote monitoring of the water quality data in India. The wireless sensor node in the system is designed for monitoring the pH of water, which is one of the main parameters that affect the quality of water. Wireless sensor Network which aids in River Water Quality Monitoring. This paper also proposes a novel technique for the design of a water quality sensor node which can be used for monitoring the pH of water.[3]

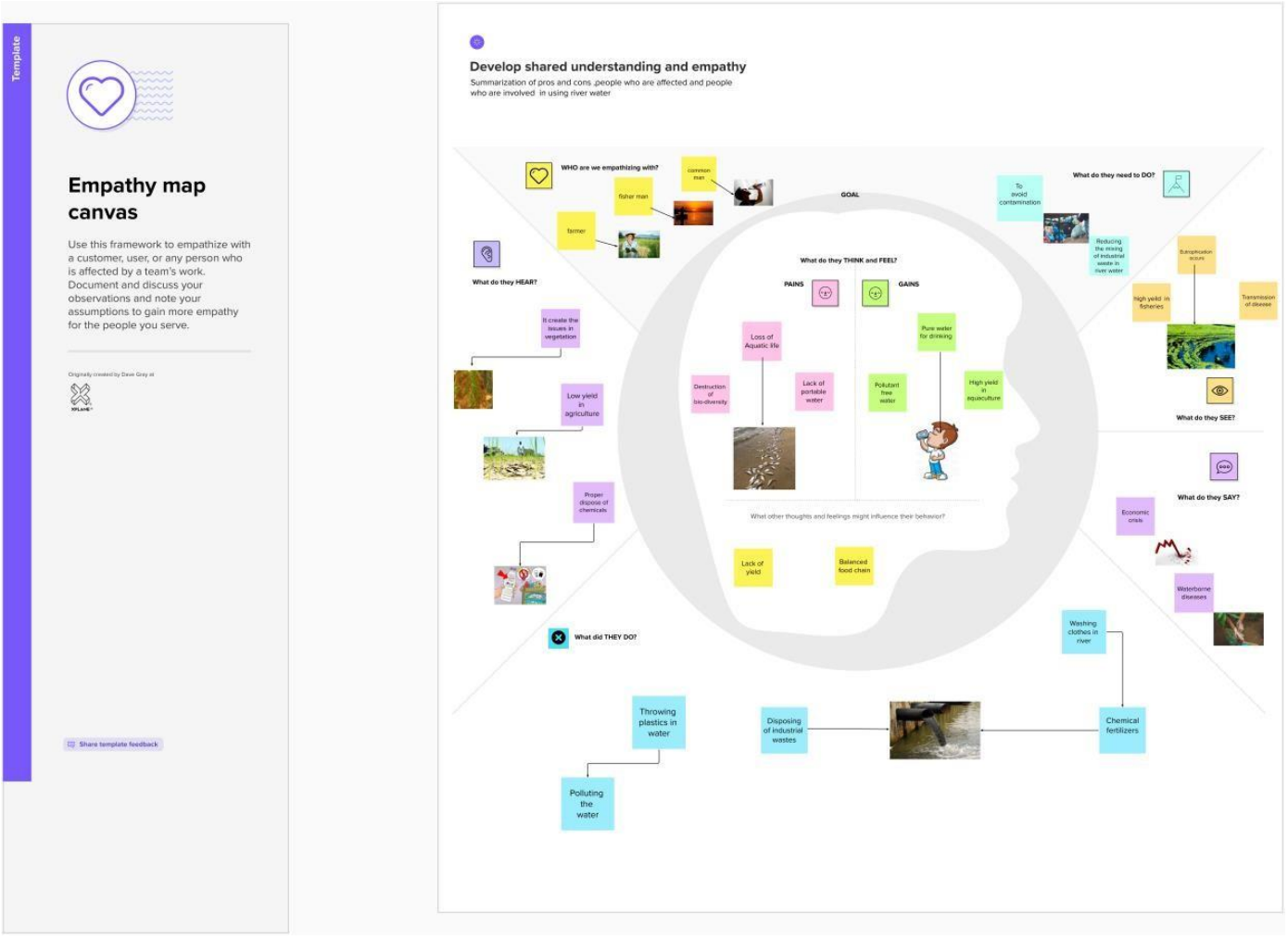
This research was developed using arduino microcontroller,water level sensor, mobile phone.The level of water sensed by the water level sensor was sent to the controller where it, in turn updates the information to server. The information stored in the server was sent to the mobile phone. The user in turn makes the decision to turn on or turn off the motor by operating the buttons in the mobile. The sensor is of contact-type. Measurement range is limited and has short lifespan when exposed to moist environment. Human intervention is necessary.[4]

This research paper focuses on Wireless Sensor Network for River Water Quality Monitoring in India This paper introduces a river water quality monitoring system based on wireless sensor network which helps in continuous and remote monitoring of the water quality data in India. The wireless sensor node in the system is designed for monitoring the pH of water, which is one of the main parameters that affect the quality of water[5]

Chapter-3

IDEATION & PROPOSED SOLUTION

3.1Empathy Map Canvas:



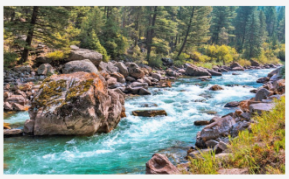
3.2 Ideation and brainstroming

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



Share template feedback

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

PROBLEM STATEMENT

Water is a finite resource that is necessary for agriculture, industry and the survival of all living things on the planet, including humans. Many people are unaware of the need of drinking adequate amounts of water on a daily basis.

2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

BIRUNTHIKA S

- Quality of Water
- Irrigation purpose
- Human needs
- Prevention of diseases

GOMATHI B

- Need for pure water
- Prevent contamination
- Avoid drought
- Tourism

JAYALAKSHMI S

- Aquatic life improvement
- Transportation
- Dam maintainence
- Fishing

MUNISHA R

- Depends on season
- Wild life survival
- Improve natural resouces
- Easy to treat waste water

3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

REQUIREMENTS

- Area for River flow
- Need of water
- Wildlife needs

QUALITIES

- Quality of water
- Oxygen Molecules
- Improve natural resources

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

Importance

Our earth is the only planet with water.But nowadays the quality and nature of the water get diminished. Hence it should be monitored and protected.

Feasibility

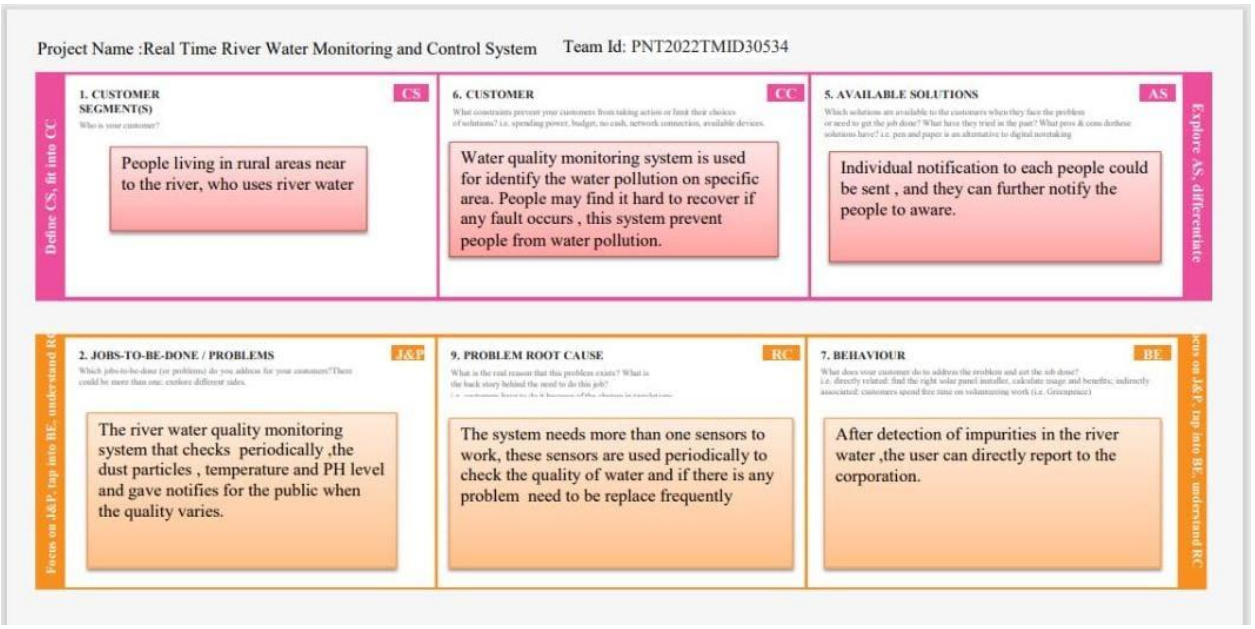
Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

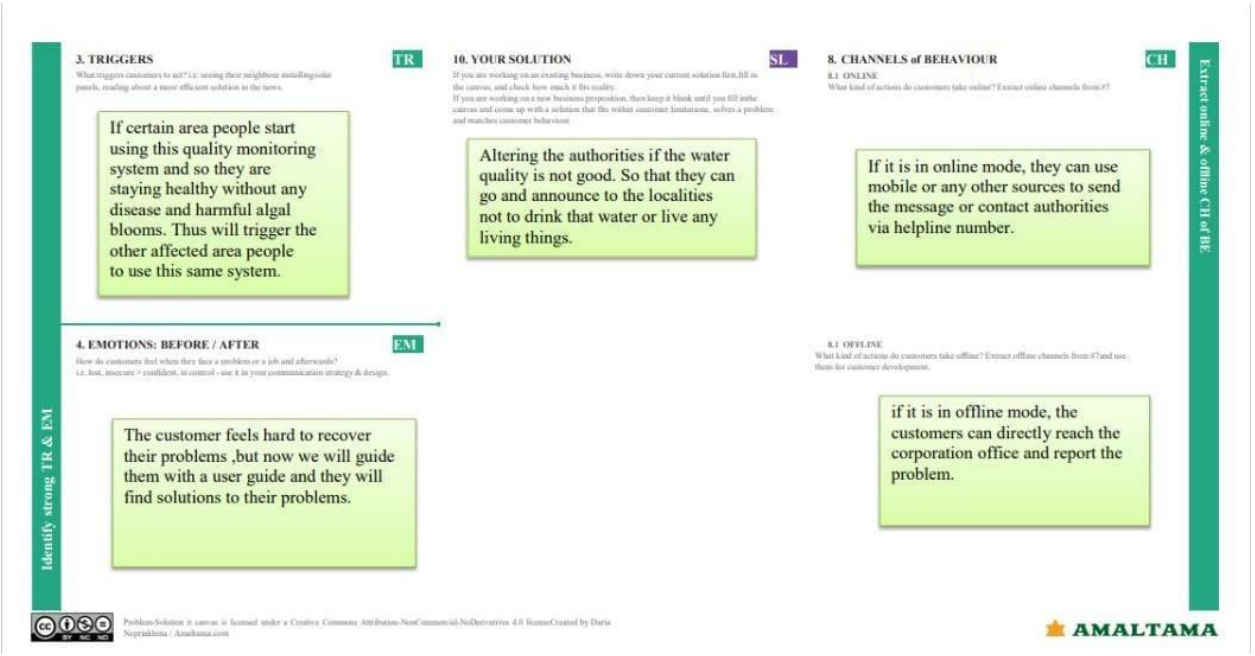
3.3 PROPOSED SOLUTION

The proposed system is named as intelligent water monitoring system based on IoT. The components that are being used in development of the proposed system model are NodeMCU, precise River water Quality depth detection sensors, which calculate the increase in River water Quality accurately, submersible motor pump, to evacuate excess water to storage tank. Alerting system is been introduced using IoT technology which gives alert mail to the user efficiently without any registration or usage of internet. Immediate action like evacuation of water measures are taken with the help of relay and a motor which reduces the risk of user about loss of goods or grain.

In this,we present the theory on real time monitoring of water quality in IoT environment. The overall block diagram of the proposed method is explained.Each and every block of the system is explained in detail.In this proposed block diagram consist of several sensors (temperature, pH) is connected to core controller. The core controller are accessing the sensor values and processing them to transfer the data through internet. Ardunio is used as microcontroller. The sensor data can be viewed on the internet wi-fi system.

3.4 Problem solution fit





4 REQUIREMENTANALYSIS

4.1FUNCTIONAL REQUIREMENTS

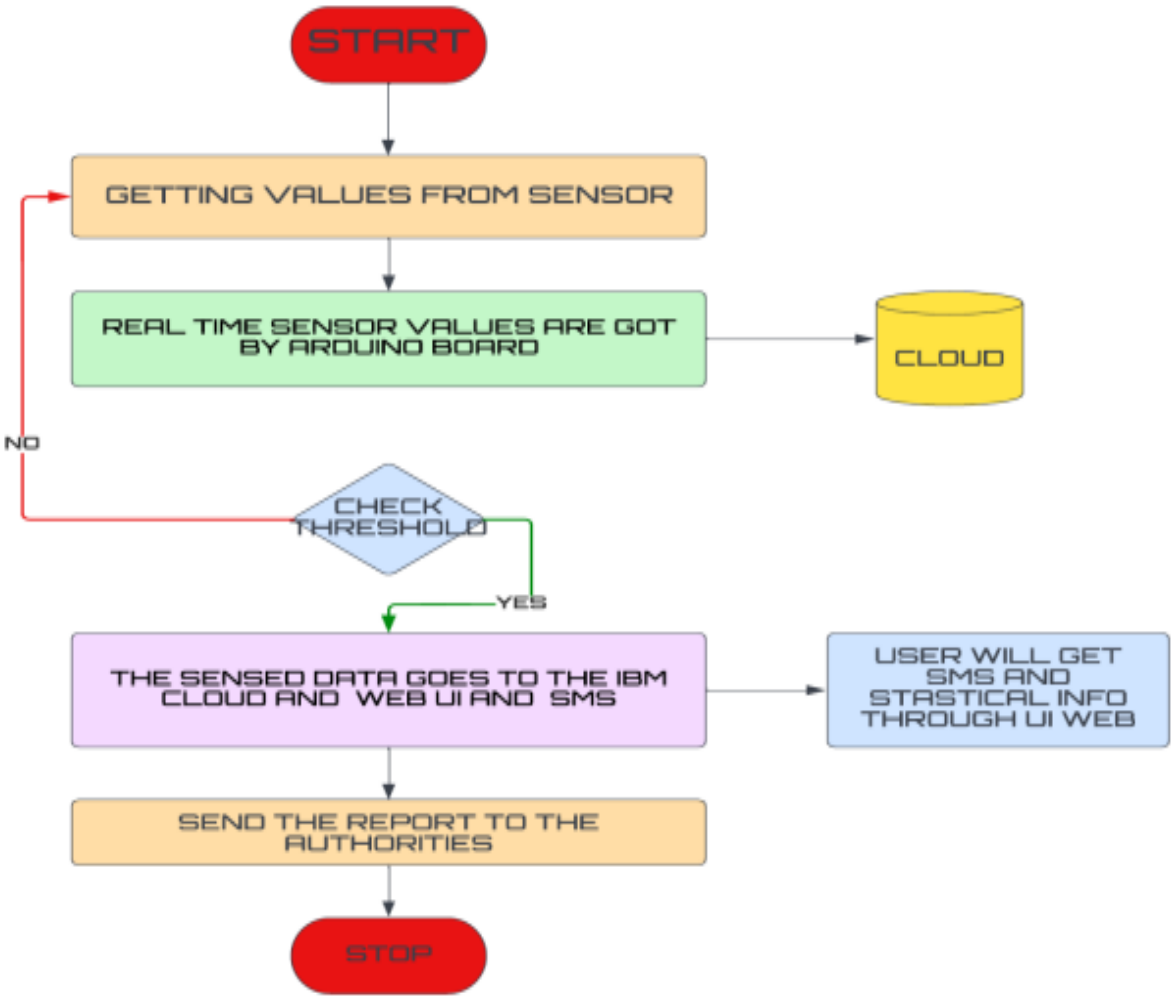
FR No.	Functional Requirement(Epic)	Sub Requirement(Story/Sub-Task)
FR-1	River water monitoring	➢ Sensors(datatransfer) ➢ Monitoring intrusion of ph sensors,temperatureand humidity
FR-2	Ph forecast	➢ PH sensor ➢ Forecasting the PH values through sensor ➢ The PH of the river water is monitored
FR-3	Temperature forecast	➢ Temperature sensor ➢ Detecting the temperature ➢ Display the temperature oscillation of the respective one.
FR-4	River monitoring	➢ Sensors(datatransfer) ➢ PH and temperature are detected and if PH is less than 7 it is not safe to drink the water.

4.2 Non-functional Requirements

NFR-1	**Reliability**	Consistency in tolerance,accuracy maintained,application uptime enhanced
NFR-2	**Performance**	Provides accurate data, efficient functioning despite unexpected variations in climatic conditionsand Geographical terrains
NFR-3	**Availability**	Down time:available90%of the time in everymonth Tablet'sdown time:available 99%of the time

Chapter- 5
PROJECT DESIGN

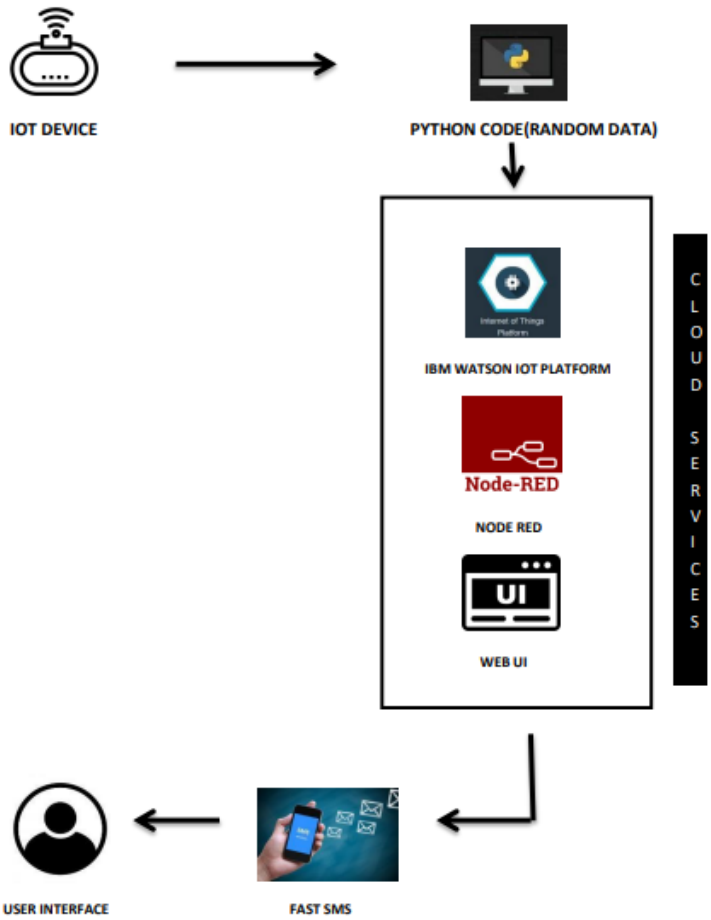
5.1 DATA FLOW DIAGRAM



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,behaviour,and other aspects of the software to project stakeholders.



Explanation for the Architecture Diagram:

- The device will detect thePH ,temperature and flow of the river time.
- If the PH value lows,then the quality of water is not good and aware people not to drink the water.
- It also generates an alarm.
- The image URL will be stored in the IBM Cloudant DB service.
- Device will also monitor the river water levels, temperature, and humidity value.
- The image will be retrieved from Object storage and displayed in the web application.
- Users canal so control the motors through web applications.

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 applicationthrough Google	I can register & accessthe dashboard with Google	High	Sprint-1
		USN-4	As a user, I can register for the applicationthrough Gmail	I can register through themail.	Medium	Sprint-2
	Login	USN-5	As a user, I can log into the application by entering email, password & captcha	I can receive login credentials.	High	Sprint-1
	Interface	USN-6	As a user, the interface should be user-friendly manner	I can able to accesseasily.	Medium	Sprint-1
Customer (Web user)	dashboard	WUSN-1	As a web user, I can access the specific info (ph value, temp, humidity, quality).	I can 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 understandby 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 itis salty or not	High	Sprint-1
	Color visibility	CCE-3	As a customer care , I can able predict the watercolor	I can easily know the condition by color	High	Sprint-1

Chapter–6

PROJECT PLANNING & SCHEDULING

6.1 SprintPlanning & 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 confirmingMy password.	2	High	BIRUNTHIKA.S
Sprint-2	Confirmation	USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	
	Login	USN-5	As a user, I can log into the application byentering email & password	1	High	
	IBM Cloud service Access		Get access to IBM cloud services.	2	High	
Sprint-3	Create the IBM Watson IoT and device Settings	USN-6	To create the IBM Watson IoT Platform and integrate the microcontroller with it, to send the sensed data onCloud	2	High	GOMATHI.B
	Create a node red service	USN-7	To create a node red service to integrate the IBM Watson along with the Web UI	2	Medium	JAYALAKSHMI.S
	Create a Web UI	USN-8	To create a Web UI, to access the data from the cloudAnd display all parameters.	2	Medium	MUNISHA.R
	To develop a Python code	USN-9	Create a python code to sense the physical quantityAnd store data.	2	Medium	BIRUNTHIKA.S
	Publish Data to cloud.	USN-10	Publish Data that is sensed bythe microcontroller to the Cloud	3	High	GOMATHI.B
Sprint-4	Fast-SMS Service	USN-11	Use Fast SMS to send alert messages once the parameters like pH, Turbidity and temperature goes beyond the threshold	3	High	JAYALAKHMI.S MUNISHA.R
	Testing	USN-12	Testing of project and final deliverables	3	Medium	

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint EndDate (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	9 Days	28 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-2	20	4 Days	06 Nov 2022	09 Nov 2022	20	09 Nov 2022
Sprint-3	20	9 Days	09 Nov 2022	18 Nov 2022	20	18 Nov 2022
Sprint-4	20	5 Days	18 Nov 2022	22 Nov 2022	20	22 Nov 2022

CHAPTER-7

CODING

7.1Feature1:

```
#include <WiFi.h>

#include <HTTPClient.h>

#include "ESP32_MailClient.h"

#include <String.h>


const char* ssid = "IoT_Data";

const char* pass = "IoT@1432";


int wl = 36;

int wlv= 0;


int motor = 21;


//Mail Communication

#defineemailSenderAccount    "sampletestmail.786@gmail.com"

#defineemailSenderPassword   "Sample@786"

#defineemailRecipient        "b.sindhiya191201@gmail.com"
```

```
#definesmtpServer           "smtp.gmail.com"

#definesmtpServerPort       465

#defineemailSubject         "River water Quality Notification"


// The Email Sending data object contains config and data to send

SMTPDatasmtpData;

// Callback function to get the Email sending status

void sendCallback(SendStatus info);

int count1 = 0;

int count2 = 0;


void setup() {

Serial.begin(9600);  /* Define baud rate for serial communication */

pinMode(wl, INPUT);

pinMode(motor, OUTPUT);


delay(100);


Serial.println("River water Quality Monitoring and Control System...");

Serial.println("System Ready...!");

delay(2000);
```

```
Serial.print("Connecting");

WiFi.begin(ssid, pass);


  while (WiFi.status() != WL_CONNECTED) {

Serial.print(".");

delay(500);

  }

delay(500);

Serial.print("Connecting");


}


void loop() {


wlv = analogRead(wl);

  //wlv = wlv/10;


if(wlv>= 1500){

digitalWrite(motor, HIGH);

    count1++;
```

```
delay(500);
send_mail_on();

 }
if(wlv<= 1000){
digitalWrite(motor, LOW);
   count1--;
   count2 = count1;
delay(500);
send_mail_off();
 }

Serial.print("River water Quality : ");
Serial.print(wlv);

Serial.println();
delay(1000);
}

void send_mail_on()
{
```

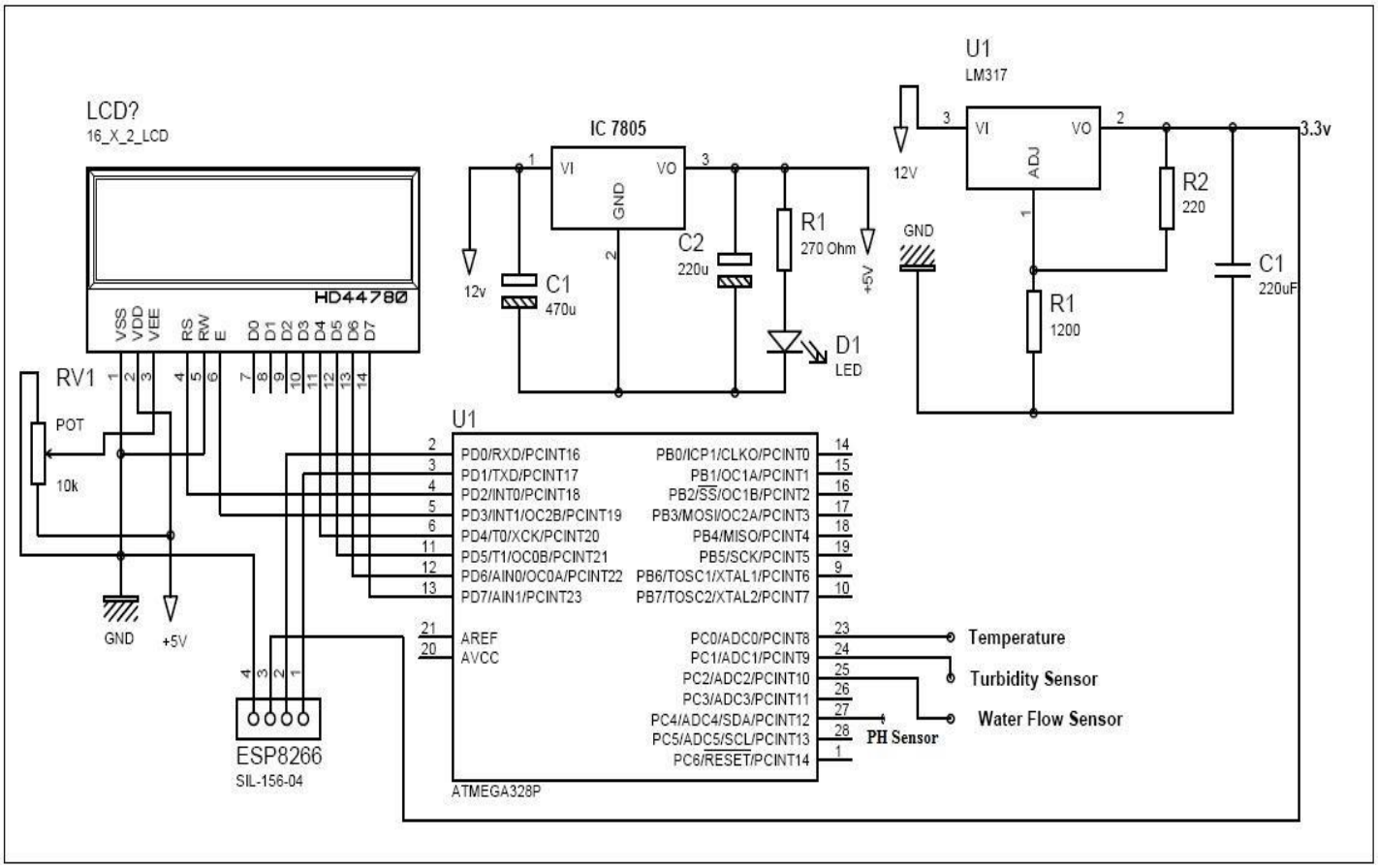
```
if(count1 == 1){
  // Set the SMTP Server Email host, port, account and password
smtpData.setLogin(smtpServer, smtpServerPort, emailSenderAccount, emailSenderPassword);
  // Set the sender name and Email
smtpData.setSender("Notification Mail", emailSenderAccount);
  // Set Email priority or importance High, Normal, Low or 1 to 5 (1 is highest)
smtpData.setPriority("High");
  // Set the subject
smtpData.setSubject(emailSubject);
  // Set the message with HTML format
smtpData.setMessage("<div style=\"color:#F20D0D;\"><h1>Notification Mail Alert - Motor ON...!</h1><p>-River water Quality Low Detected... Motor ON-</p></div>", true);
  // Add recipients, you can add more than one recipient
smtpData.addRecipient(emailRecipient);
smtpData.setSendCallback(sendCallback);
  //Start sending Email, can be set callback function to track the status
  if (!MailClient.sendMail(smtpData))
Serial.println("Error sending Email, " + MailClient.smtpErrorReason());
  //Clear all data from Email object to free memory
smtpData.empty();
delay(1000);
```

```
return;
 }
}

void send_mail_off()
{
if(count2 >= count1){
   // Set the SMTP Server Email host, port, account and password
smtpData.setLogin(smtpServer, smtpServerPort, emailSenderAccount, emailSenderPassword);
   // Set the sender name and Email
smtpData.setSender("Notification Mail", emailSenderAccount);
   // Set Email priority or importance High, Normal, Low or 1 to 5 (1 is highest)
smtpData.setPriority("High");
   // Set the subject
smtpData.setSubject(emailSubject);
   // Set the message with HTML format
smtpData.setMessage("<div style=\"color:#F20D0D;\"><h1>Notification Mail Alert - Motor OFF...!</h1><p>-River water Quality High Detected... Motor OFF-</p></div>", true);
   // Add recipients, you can add more than one recipient
smtpData.addRecipient(emailRecipient);
smtpData.setSendCallback(sendCallback);
```

```
   //Start sending Email, can be set callback function to track the status
   if (!MailClient.sendMail(smtpData))
Serial.println("Error sending Email, " + MailClient.smtpErrorReason());
   //Clear all data from Email object to free memory
smtpData.empty();
delay(1000);
return;
  }
}


// Callback function to get the Email sending status
void sendCallback(SendStatusmsg) {
  // Print the current status
Serial.println(msg.info());
  // Do something when complete
  if (msg.success()) {
Serial.println("----------------");
  }
}
```

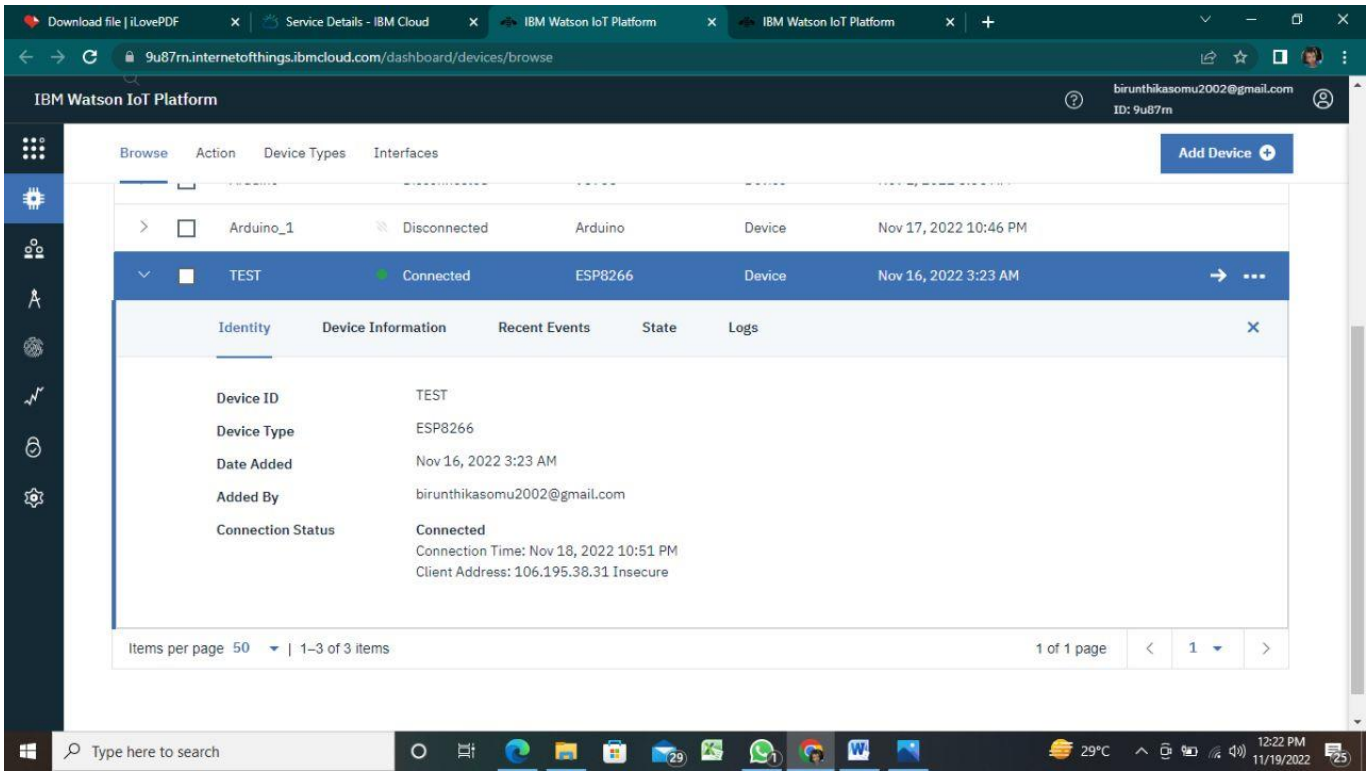


CIRCUIT DIAGRAM

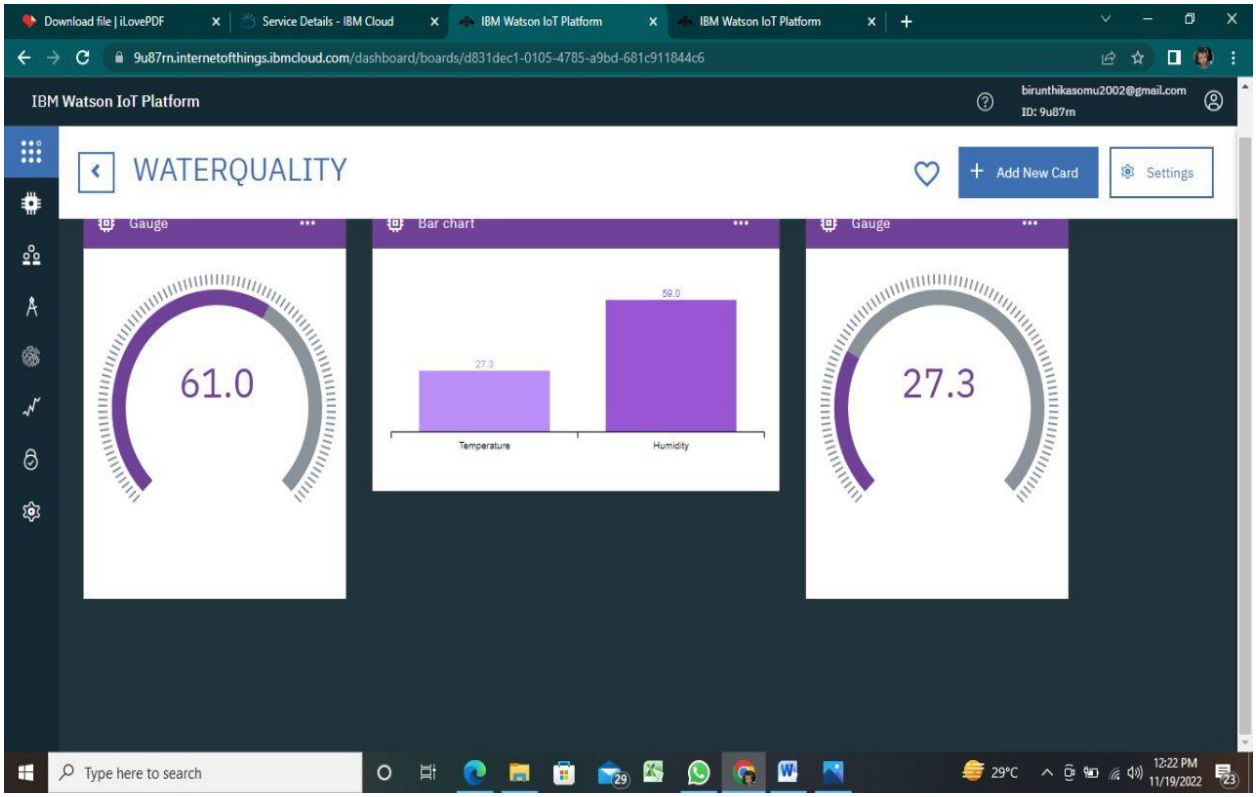
Chapter-8

RESULTS

8.1 output in IBM cloud



8.2 Output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Service Details - IBM Cloud
IBM Watson IoT Platform
IBM Watson IoT Platform
9u87rn.internetofthings.ibmcloud.com/dashboard/boards/d831dec1-0105-4785-a9bd-681c911844c6
IBM Watson IoT Platform
birunthikasomu2002@gmail.com
ID: 9u87rn
WATERQUALITY
Add New Card
Settings
Gauge
61.0
Bar chart
27.3
59.0
Temperature
Humidity
Gauge
27.3
Type here to search
29°C
12:22 PM
11/19/2022

9.Advantages and Disadvantages

Advantages:

1. This process can ptotect against harmful organisms.
2. Known about PH of the river water.
3. Improved risk management.
4. Reduce maintainance cost

Disadvantages:

1. This process may not remove pesticides.
2. Open storage can contaminated easily

10.CONCLUSION

Monitoring of PH & Temperature of Water makes use ofwater detection sensor with unique advantage and existing WIFI network. The system can monitor water quality automatically, and it is low in cost and does not require people on duty.So the water quality ytesting is likely to be more economical,convenient and fast.The system has good flexibility.Only by replacing the corresponding sensors and changing the relevant software programs, this system can be used to monitor other water quality parameters. The operation is simple. The system can be expanded to monitor hydrologic,airpollution,industrial and agricultural production and soon.It has widespread application and extension value.

By keeping the embedded devices in the environment for monitoring enables selfprotection (i.e., smart environment) to the environment. To implement this need todeploy the sensor devices in the environment for collecting the data and analysis. Bydeploying sensor devices in the environment, we can bring the environment into reallife i.e. it can interact with other objects through the network. Then the collected dataandanalysis results will beavailable to the end user through theWi-Fi.

11.FUTURESCOPE:

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

12 BIBLIOGRAPHY:

1. Perumal, Thinagaran, Md Nasir Sulaiman, and Chui Yew Leong. “Internet of Things (IoT) enabled water monitoring system.” In 2015 IEEE 4th Global Conference on Consumer Electronics (GCCE), pp. 86-87. IEEE, 2015.
2. Gunde, Shavarsidha, A. K. Chikaraddi, and V. P. Baligar. “IoT based flow control system using Raspberry PI.” In 2017 International Conference on Energy, Communication, Data Analytics and Soft Computing (ICECDS), pp. 1386-1390. IEEE, 2017.
3. Shah, Priyen P., Anjali A. Patil, and Subodh S. Ingleshwar. “IoT based smart water tank with Android application.” In 2017 International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud)(ISMAC), pp. 600-603. IEEE, 2017.
4. raba, MS Bennet, Naresh Rengaswamy, and O. Deepak. “IoT Based Smart Water System.” In 2018 3rd International Conference on Communication and Electronics Systems (ICCES), pp. 1041-1045. IEEE, 2018.
5. Min-Allah, N., Farooqui, M., Alwashmi, A., Almahasheer, S., Alsufayyan, M. and Altulaihan, N., 2018, December. Smart Monitoring of Water Tanks in KSA. In 2018 International Conference on Computational Science and Computational Intelligence (CSCI) (pp. 1044-1047). IEEE.