DHANALAKSHMI SRINIVASAN COLLEGE OF ENGINEERING, COIMBATORE – 641105.

SMART FARMER IOT ENABLED SMART FARMING APPLICATION.

Team Leader : Manikandan R

Team Members : Mathuvuni M , Muralikrishnan V , Sivanathan M

Team Id : PNT2022TMID43896

Industry Mentor: Bharadwaj

Faculty Mentor Name: Mukunthan. S

S.NO	NAME	REGISTER NUMBER	MAIL ID
1	Manikandan R	721919106045	Manikandan19@dsce.ac.in
2	Mathuvini M	721919106047	Madhuvini19@dsce.ac.in
3	Muralikrishnan V	721919106050	muralikrishnan19@dsce.ac.in
4	Sivanathan M	721919106072	sivanathan19@dsce.ac.in

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SMART FARMER IOT ENABLED SMART FARMING APPLICATION.

1.INTRODUCTION :

Smart Farmer - IoT Enabled Smart Farming Application.

IoT-based agriculture system helps the farmer in monitoring different parameters of his field like soil moisture, temperature, and humidity using some sensors. Farmers can monitor all the sensor parameters by using a web or mobile application even if the farmer is not near his field. Watering the crop is one of the important tasks for the farmers. They can make the decision whether to water the crop or postpone it by monitoring the sensor parameters and controlling the motor pumps from the mobile application itself.

Internet of Things (IoT) technology has brought revolution to each and every field of common man's life by making everything smart and intelligent. IoT refers to a network of things which make a self configuring network. The development of Intelligent Smart Farming IoT based devices is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage. The aim / objective of this report is to propose IoT based Smart Farming System assisting farmers in getting Live Data (Temperature, Soil Moisture) for efficient environment monitoring which will enable them to increase their overall yield and quality of products. The IoT based Smart Farming System being proposed via this report is integrated with Arduino Technology mixed with different Sensors and a Wi fi module producing live data feed that can be obtained online from Thingsspeak.com. The product being proposed is tested on Live Agriculture Fields giving high accuracy over 98% in data feeds.

1.1 PROJECT OVERVIEW:

The objectives of this report is to proposed IoT based Smart Farming System which will enable farmers to have live data of soil moisture environment temperature at very low cost so that live monitoring can be done.

The structure of the report is as follows: chapter I will cover over of overview of IoT Technology and agriculture-concepts and definition, IOT enabling technologies, IOT application in agriculture, benefits of IOT in agriculture and IOT and agriculture current scenario and future forecasts. Chapter II will cover definition of IOT based smart farming system , the components and modules used in it and working principal of it. Chapter III will cover algorithm and flowchart of the overall process carried out in the system and its final graphical output .chapter IV consist of conclusion, future scope and references**.**

1.2 PURPOSE

In every country agriculture is done from ages which are considered to be science and also art of cultivating plants. In day today life, technology is updating and it is also necessary to trend up agriculture too. IoT plays a key role in smart agriculture. Internets of Things (IoT) sensors are used to provide necessary information about agriculture fields. The main advantage of IoT is to monitor the agriculture by using the wireless sensor networks and collect the data from different sensors which are deployed at various no des and send by wireless protocol. By using IoT system the smart agriculture is powered by NodeMCU. It includes the humidity sensor, temperature sensor, moisture sensor and DC motor. This system starts to check the humidity and moisture level. The sensors are used to sense the level of water and if the level is below the range then the system automatically stars watering. According to the change in temperature level the sensor does its job. IoT also shows the information of humidity, moisture level by including date and time. The temperature level based on type of crops cultivated can also be adjusted.

2.LITERATURE SURVEY

1.Design and Implementation of a Smart Farm System

(Article in Association of Arab Universities Journal of Engineering Sciences · January 2017) Most nations around the world depend on farming for their way of life, and it also affects their economies. In dry or rain-scarce places, irrigation becomes challenging; as a result, it must be managed remotely for farmer safety, Agro-resource protection, and productivity preservation. Farmers frequently overirrigate their fields. Various irrigation regimens were required for various types of soil, and the irrigation also depends on a variety of parameters, including temperature, wind speed, and moisture levels at the time, season, crop growth stage, etc. This study proposes that a smart farm would include configurable scheduling and automatic tank level detection for an automated watering system regulating for irrigation water storage and farm-based.

2.IoT-Enabled Smart Agriculture: Architecture, Applications, and Challenge (Vu Khanh Quy 1, Nguyen Van Hau 1, Dang Van Anh 1, Nguyen Minh Quy, Nguyen Tien Ban 2, Stefania Lanza 3, Giovanni Randazzo 4 and Anselme Muzirafuti 4,*) Food security is becoming a serious worry for all countries in the globe due to the development of the global population, the depletion of natural resources, the loss of farmland, and the rise in unpredictable environmental conditions. These difficulties are factors influencing the agricultural sector's shift to smart agriculture include the use of big data and Internet of Things (IoT) technologies to enhance operational productivity and effectiveness. Wireless sensor networks, cognitive radio, and other cutting-edge technologies are all integrated into the Internet of Things (IoT). Big data, ad hoc networks, cloud computing, and user applications. This research provides a IoT solutions study and shows how IoT may be included into the smart agricultural industry. We address the idea of IoT-enabled smart cities in order to accomplish this goal

3.IoT based Smart Soil Monitoring System for Agricultural Production (Divya J., Divya M.Janani V) Both the economy and the existence of the Indian people depend on agriculture. The goal of this project is to develop an embedded-based irrigation and soil monitoring system that will lessen the need for manual field monitoring and deliver data via a mobile app. The technique is designed to assist farmers in boosting agricultural productivity. The equipment used to inspect the soil includes a pH sensor, a temperature sensor, and a humidity sensor. Farmers may choose to plant the best crop for the land based on the findings. Wi-Fi is used to transmit sensor data to the field manager, and a mobile app is used to generate crop recommendations. Use of an automatic watering system is necessary when the soil temperature is high. The crop picture is collected and sent.

4.Development of Smart Drip Irrigation System Using IoT (Anushree Math, Layak Ali, Pruthviraj U) Agriculture is extremely important in the country of India. Therefore, it's essential to water the plants properly to maximise yield per unit of space and thus produce good output. The act of irrigation involves giving plants a certain amount of water at a specific time. This project's goal is to use a sophisticated drip irrigation system to water the plants on the National Institute of Technology Karnataka campus. The system's primary controller for accomplishing this is the open-source platform. To provide the most recent characteristics of the factors that continuously affect plant healthiness, a variety of sensors have been used. Depending on the data obtained from the RTC module, a solenoid valve is controlled to supply water to the plants at regular intervals. The entire irrigation system may be managed and monitored using the website. This website has a feature that lets you manually or automatically regulate how often plants are watered. Using a Raspberry Pi camera that provides live streaming to the webpage, the health of the plants is tracked. Through a wireless network, the controller gets information about water flow from the water flow sensor. The controller examines this data to see if the pipe has any leaks. Weather forecasting is also done to limit the amount of water provided, making it more reliable and effective

5 Smart IOT Based Crop-Field Monitoring And Automation Irrigation System (crop yields, decreases water and fertiliser consumption, and aids in the assessment of field weather conditions R. Nageswara Rao, B.Sridhar) India and other agrarian nations are significantly dependent on agriculture for their development. The country's progress has traditionally been hampered by the agricultural sector. The only way to overcome this problem is through smart agriculture, which entails modernising current agricultural systems. In order to make agriculture smarter, the suggested plan makes use of automation and Internet of Things technology. The Internet of Things enables applications such as irrigation decision support, crop growth monitoring, and crop selection (IoT). A Raspberry Pi-based autonomous irrigation Internet of Things system has been suggested to modernise and increase crop productivity. The primary goal of this project is to grow crops while utilising the least amount of water feasible. On order to concentrate on the water accessible to plants, most farmers squander a lot of time in the fields. The proposed system calculates the necessary amount of water based on the sensor data. Two sensors measure the soil's temperature and humidity as well as the amount of sunshine received each day and transmit the information to the base station. The suggested methods must compute the irrigation water quantity based on these factors. The system's integration of Precision Agriculture (PA) and cloud computing, which increases, is its main advantage.

6.IOT Based Smart Agriculture System (G. Sushanth1, and S. Sujatha) Since Internet of Things (IoT) sensors may provide information about agricultural area and then act on it based on user input, smart agriculture is a revolutionary notion. The goal of this research is to create a smart agricultural system that uses cutting-edge technologies including wireless sensor networks, the Internet of Things, and Arduino. The study makes advantage of upcoming technologies like smart agriculture and the Internet of Things (IoT) through automation. Crop efficiency can be increased by having the ability to monitor environmental conditions. This study's goal is to create a system that uses sensors to track temperature, humidity, wetness, and even the movement of animals that could harm crops in agricultural areas. If there is a discrepancy, the system will then use Wi-Fi, 3G, or 4G to send the farmer's smartphone both an SMS notification and a notification on the corresponding app. Using an android app, the system's duplex communication link, which is based on a cellular Internet interface, enables data inspection and irrigation schedule modification. The device has the potential to be helpful in water-scarce, remote places due to its energy independence and low cost

2.1 EXISTING PROBLEM

The research in agriculture area is enhanced in various aspects to improve the quality and quantity of productivity of agriculture. Researchers have been worked on many different projects on soil attributes, different weather conditions. A few review studies examined the implementation of Artificial Intelligence (AI) and application of IOT for agricultural monitoring. The authors highlighted smart farming system based on acquiring data and utilizing them to make optimized decisions, there by reducing the costs and enhancing environmental friendly practices. A decision – making method was used for the identification and watering process, and they discussed the implementation of fuzzy logic system. A system is developed by using sensors and according to the decision from a server based on sensed data, the irrigation system automated. By using wireless transmission, the sensed data forwarded towards to web server database. If the irrigation is automated, then that means if the moisture and temperature fields fall below the potential range. The user can monitor and control the system remotely with the help of application which provides a web interface to user. The complete real-time and historical environment is expected to help to achieve efficient management and utilization of resources. we can move to IOT Based Smart Agriculture Monitoring System develop with various features like GPS based remote controlled monitoring, moisture and temperature sensing, intruders scaring, security, leaf wetness and proper irrigation facilities.

2.2 REFERENCES:

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[2] Joaquin Gutierrez, Juan Francisco Villa-Medina et.al, "Automated Irrigation System Using a Wireless Sensor Network and GPRS Module", IEEE Transactions on Instrumentation and Measurement, 2013.

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[4] Basha, Elizabeth, and Daniela Rus, “Design of early warning flood detection systems for developing countries”, International Conference on Information and Communication Technologies and Development, 2007.

[5] K. Jyostsna Vanaja, Aala Suresh et.al, “IOT based Agriculture System Using NodeMCU”, International Research Journal of Engineering and Technology, Vol.05.

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2.3 PROBLEM STATEMENT DEFINITION:

CUSTOMER PROBLEM STATEMENT:

Mr.Vasanth is a farmer with an engineering background. He's moved into agriculture with his father. Since he is a beginner in farming, he needs someone to guide him in the initial years and he plan to incorporate technology into farming to reduce the work and labour, improve productivity, more yield, suggestions to improve soil, and next crop planting ideas. He is actively researching a few agro products that solve his problem. These problems are common to many beginning and experienced farmers

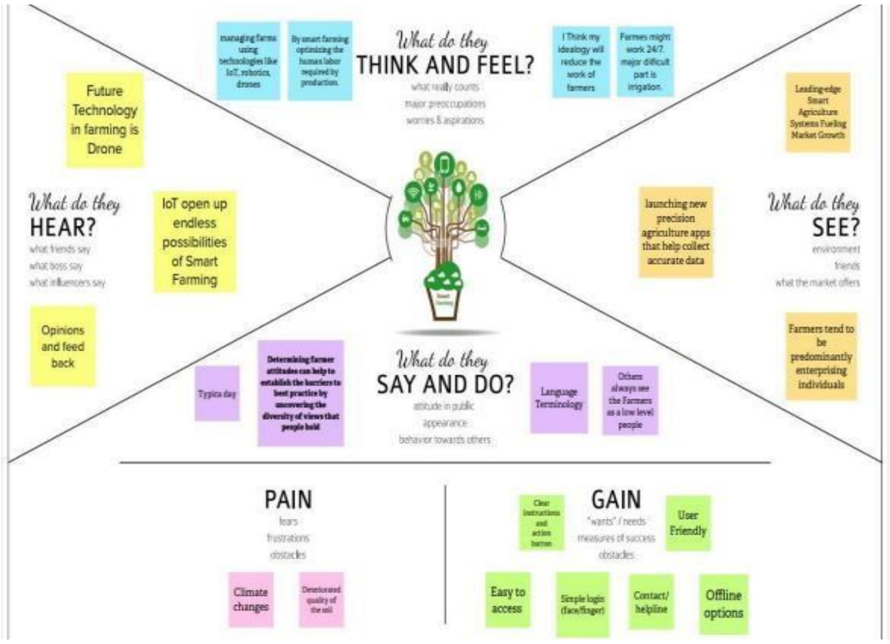
Who does the problem affect?	Persons who do Agriculture
What are the boundaries of the problem?	Labour cost, Cope with climate change, soil erosion and biodiversity loss.
What is the issue?	Loss of agricultural land and the decrease in the varieties of crops and livestock produced.
When does the issue occur?	Increasing pressures from climate change,soil erosion, its mostly starts from first day farming
Why is it important that we fix the problem?	It is required for the growth of betterquality food products. It is important to maximize the crop yield. It is important to maintain soil richness

What solution to solve this issue?	An application is introduced to know about various data about their land
	remotely, where they can schedule some events for a month or a day. It also provides suggestions to users based on the crop they planted.
What methodology used to solve the issue?	Some search results info from internet based on crop planted. Arduino microcontroller to control the process and various sensors for data. An alert message using GSM. An app built using MIT App Inventor.

Example:

3 IDEATION & PROPOSED SOLUTION:

3.1 EMPATHY MAP CANVAS:



3.2 IDEATION & BRAINSTORMING:

Arduino Mega Board:

Arduino is an open -source electronics prototyping platform based on flexible, easyto-use hardware and software.

It'sintended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments.

Or more simply, you load on some code and it can read sensors, perform actions based on inputs from buttons, control motors, and accept shields to further expand its capabilities.

Really, you can do almost anything. All Arduino boards have one thing in common: they are programmed through the Arduino IDE.

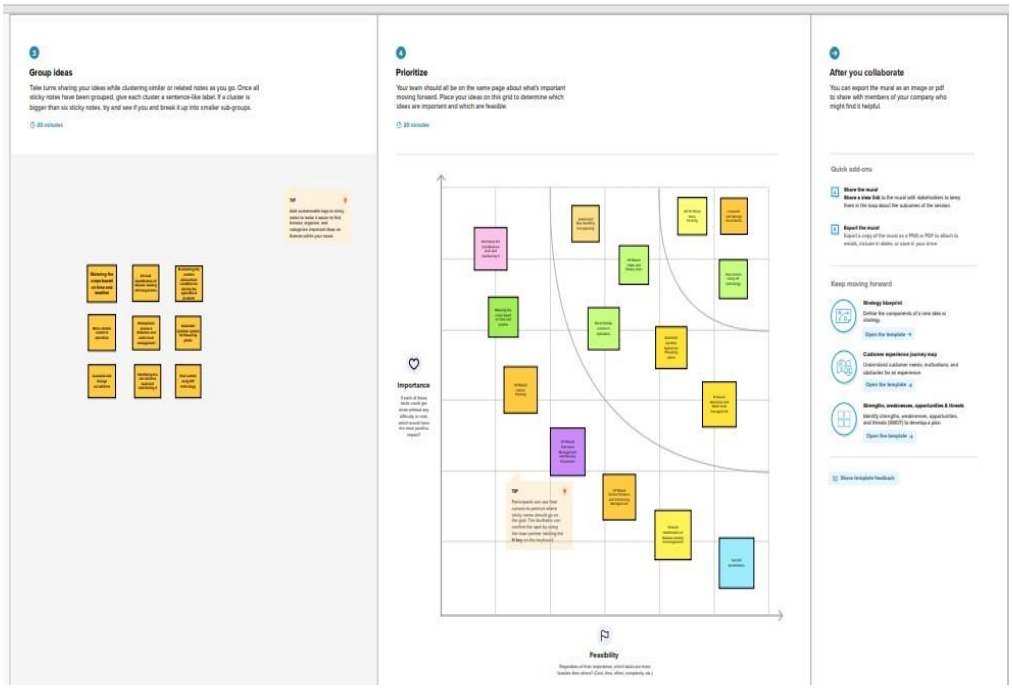
This is the software that allows you to write and upload code. Beyond that, there can be a lot of differences

The number of inputs and outputs (how many sensors, LEDs, and buttons you can use on a single board), speed, operating voltage, and form factor are just a few of the variables.

Some boards are designed to be embedded and have no programming interface (hardware) which you would need to buy separately.

Some can run directly from a 3.7V battery, others need at least 5V

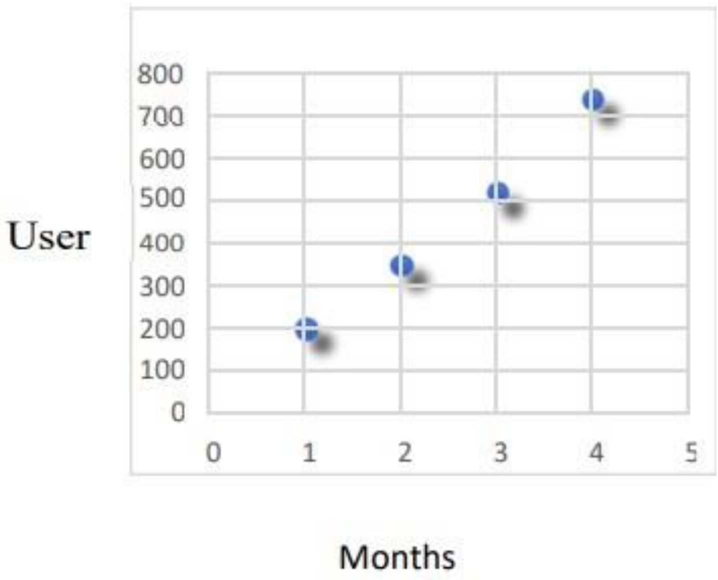
BRAINSTORMING:



3.3 PROPOSED SOLUTION:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	• Watering the field is a difficult process, Farmers have to wait in the field until the water covers the whole farm field. • Power Supply is also one of the problems. In Village Side, the power supply may vary. • The Biggest Challenges Faced by IoT in the Agricultural Sector are Lack of Information, High Adoption, Cost and Security Concerns, etc

2.	Idea / Solution description	• As is the case of precision Agriculture Smart Farming Technique Enables Farmers better to monitor the fields and maintain the humidity level accordingly. • The Data collected by sensors, In terms of humidity, temperature, moisture, and dew detections help in determining the weather pattern in Farms. So cultivation is done for suitable crops.
3.	Novelty / Uniqueness	ALERT MESSAGE – IoT sensor nodes collect information from the farming environment, such as soil moisture, air humidity, temperature, nutrient ingredients of soil, pest images, and water quality, then transmit collected data to IoT backhaul devices. REMOTE ACCESS – It helps the farmer to operate the motor from anywhere
4.	Social Impact / Customer Satisfaction	• Reduces the wages for labors who work in the agricultural field. • It saves a lot of time. • IoT can help improve customer relationships by enhancing the customer's overall experience. • Easily identify maintenance needs, build better products, send personalized communications, and more. • IoT can also help e-commerce businesses thrive and increase sales. • It make a wealthy society

5.	Business Model (Revenue Model)	
6.	Scalability of the Solution	Scalability in smart farming refers to the adaptability of a system to increase the capacity, for example, the number of technology devices such as sensors and actuators, while enabling timely analysis

3.4 Problem Solution Fit:

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Who is your customer?
i.e. working parents of 0-5 y.o. kids

The customer for this product is a farmer who grows crops. Our goal is to help them, monitor field parameters remotely. This product saves agriculture from extinction.

6. CUSTOMER CONSTRAINTS CC

What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

Using a large number of sensors is difficult. An unlimited or continuous internet connection is required for success.

5. AVAILABLE SOLUTIONS AS

Which solutions are available to the customers when they face the problem

or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper

The irrigation process is automated using IoT. Meteorological data and field parameters were collected and processed to automate the irrigation process. Disadvantages are efficiency only over short distances, and difficult data storage.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.

The purpose of this product is to use sensors to acquire various field parameters and process them using a central processing system. The cloud is used to store and transmit data using IoT. The Weather API is used to help farmers make decisions. Farmers can make decisions through mobile applications.

9. PROBLEM ROOT CAUSE RC

What is the real reason that this problem exists? What is the back story behind the need to do this job?

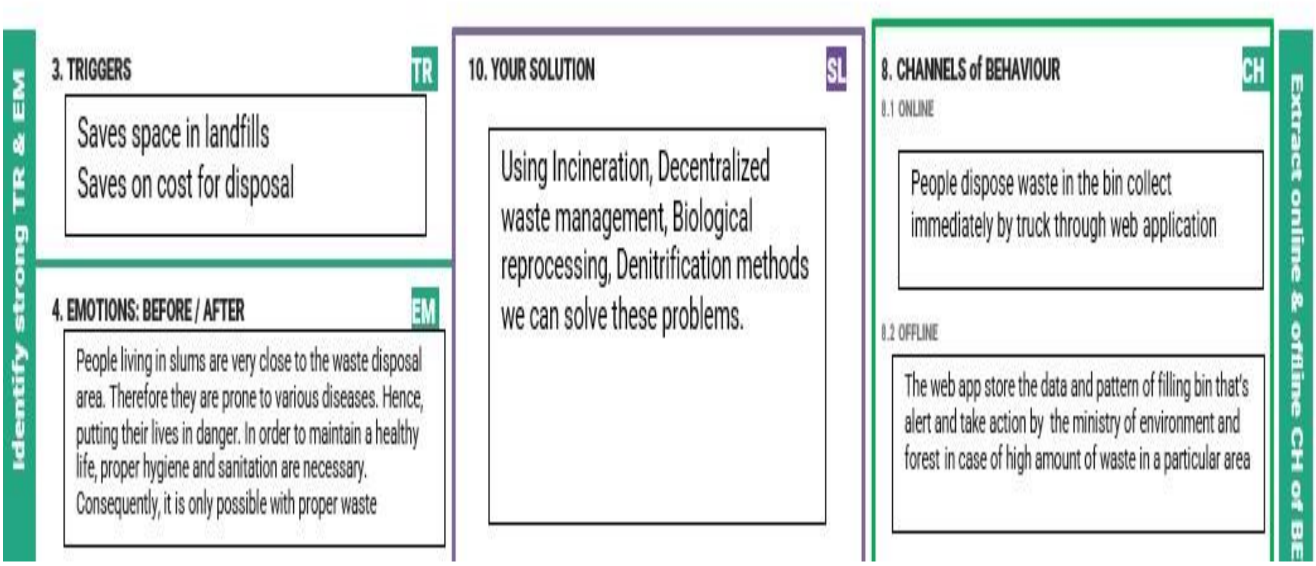
Frequent changes and unpredictable weather and climate made it difficult for farmers to engage in agriculture. These factors play an important role in deciding whether to water your plants. Fields are difficult to monitor when the farmer is not at the field, leading to crop damage.

7. BEHAVIOUR BE

What does your customer do to address the problem and get the job done?
i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

Use a proper drainage system to overcome the effects of excess water from heavy rain. Use of hybrid plants that are resistant to pests.

Focus on J&P, tap into BE, understand RC



4 . REQUIREMENTS ANALYSIS:

4.1.FUNCTIONAL REQUIREMENTS:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	raspberry pi	To interface temperature, humidity, soilmoisture sensors and irrigation system(motor)
FR-2	IBM cloud	To Store and display sensor parameters and control irrigation using internet
FR-3	Node-RED	TO program raspberry pi and integrate it to cloud
FR-4	MIT app inventor	To create app to display sensor parameters and to control irrigation systems
FR-5	Open Weather API	To create app to display sensor parameters and to control irrigation system

4.2 NON FUNCTIONAL REQUIRMENTS:

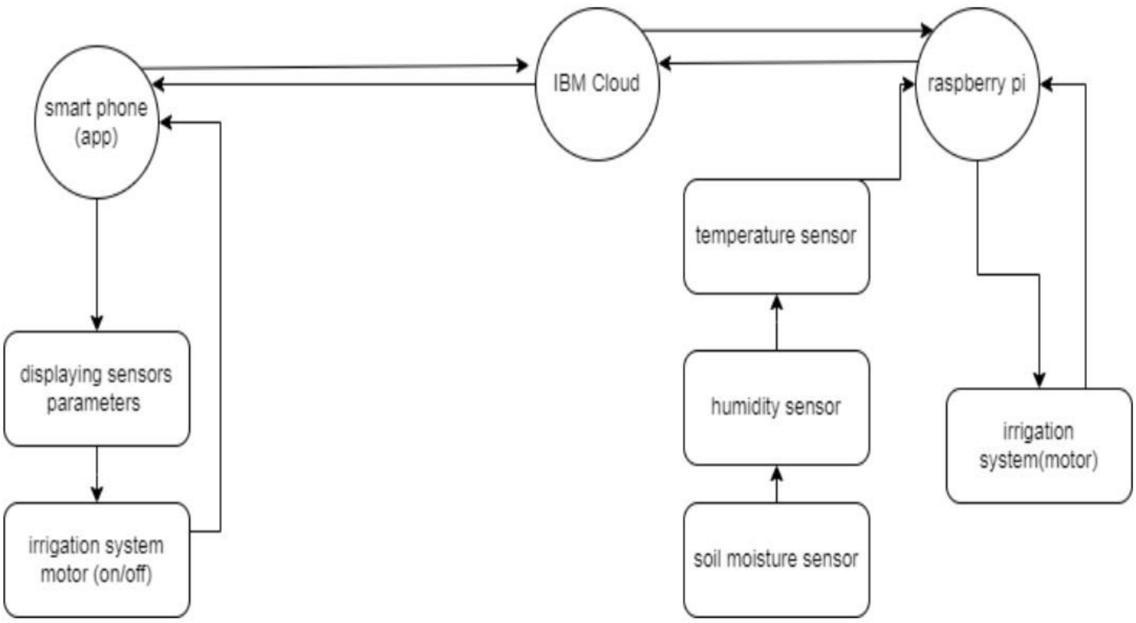
Following are the non-functional requirements of the proposed solution.

FR No	Non-Functional Requirement	Description
NFR-1	Usability	The temperature sensor, humidity sensor, soil moisture sensor and irrigation system(motor) is connected to raspberry pi which is connected to IBM cloud ,the farmer can view temperature ,humidity and soil moisture in his smart phone and can also control irrigation using his smart phone connected to internet
NFR-2	Security	User id and password is provided to farmer to prevent third party access
NFR-3	Reliability	It specifies how likely the system or its element would run without a failure.
NFR-4	Performance	Every 10 seconds to raspberry pi will update sensor parameters to cloud
NFR-5	Scalability	IOT enabled smart farming system can be automated autonomously without farmers input and disease detection can be implemented using OpenCV

5 . PROJECT DESIGN:

5.1 DATA FLOW DIAGRAMS:

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



5.2 SOLUTION & TECHNICAL ARCHITECTURE :

5.2.1 SOLUTION ARCHITECTURE.

STEP 1: When the temperature of the soil is increased, the temperature sensor will detect the temperature and water is passed to the land.

STEP 2: The water is passed to the land by the help of sprinkler, the sprinkler will sprinkle the water to the land. Moisture level- threshold set is between 20% and 60%. Turn ON at 20%. Turn OFF at 60%.

STEP 3: When there any disturbance caused by any living being, the PIR sensor will detect it and intimate the farmer by means of alarm.

STEP 4: The plants growth can be monitored by the camera. The camera will send the pic and there is an app implemented in system ,that will detect the plants nutrition level.

Nutrition level of nitrogen is 2-10ppm. Nutrition level of phosphorous is 25-50ppm. Nutrition level of potassium is 40-80 ppm.

STEP 5: The moisture level in the soil is detected by the humidity sensor.

STEP 6: The water level in the tank is detected by the controller.

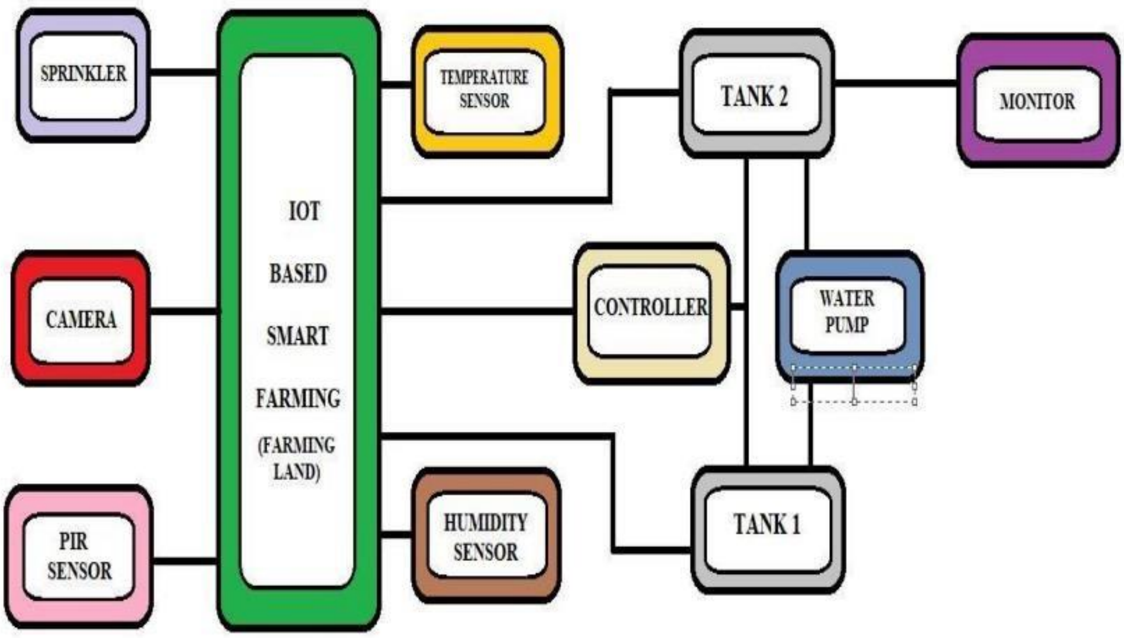
STEP 7: The water pump will pump the water from ground tank to the surface tank.

STEP 8: The farmer will monitor the soil fertility and other activities by means of internet connection with a computer.

STEP 9: The water is stored at surface used for the present generation.

STEP 10: The water stored at the underground is used for the future use.

SOLUTION ARCHITECTURE DIAGRAM:



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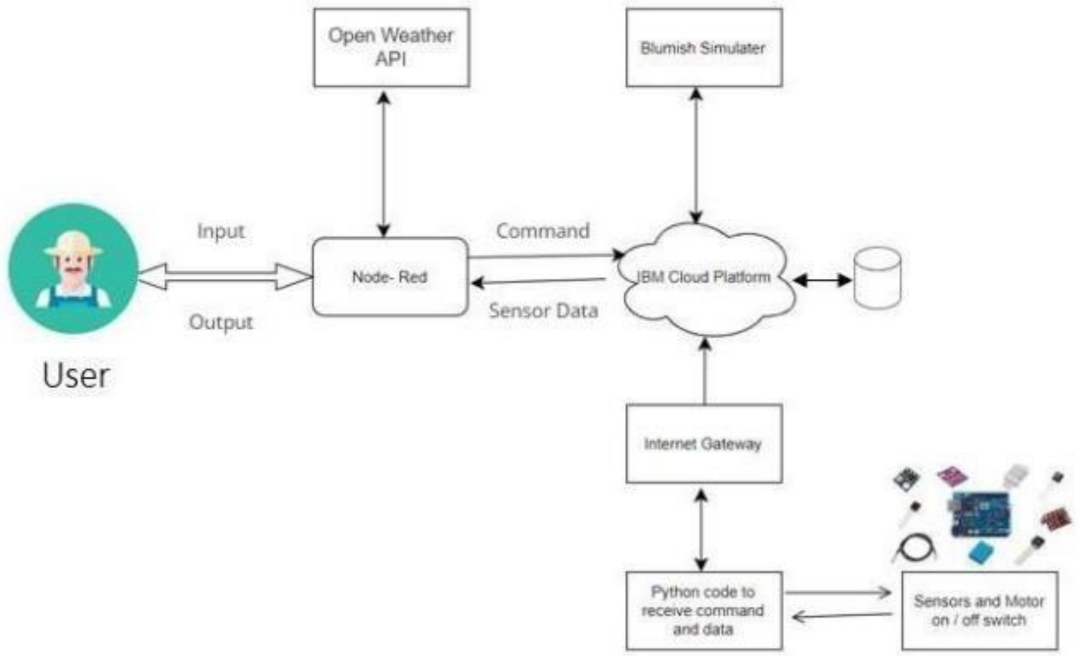
5.2.2 TECHNICAL ARCHITECTURE:



1.The different soil parameters temperature, soil moistures and then humidity are sensed using different sensors and obtained value is stored in the IBM B2 cloud.

2.Arduino UNO is used as a processing Unit that process the data obtained from the sensors and whether data from the weather API.

3.NODE-RED is used as a programming tool to write the hardware, software and APIs. The MQTT protocol is followed for the communication.

4.All the collected data are provided to the user through a mobile application that was developed using the MIT app inventor. The user could make a decision through an app, weather to water the field or not depending upon the sensor value. By using the app they can remotely operate the motor switch.

5.3 USER STORIES :

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
farmer (Mobile app)	displaying sensor parameters	USN-1	farmer can view temperature, humidity and soil moisture in his mobile connected to ibm cloud	displaying sensor parameters	High	Sprint1
farmer (Mobile app)	controlling irrigation	USN-2	after seeing the sensor parameters farmer can turn on or off the irrigation system(motor)using mobile phone	controlling irrigation system	High	Sprint1
raspberry pi	microcomputer setup in farm field	USN-3	temperature sensor, humidity sensor, soil moisture sensor and irrigation system is interface with raspberry pi which is connected to IBM cloud	smart farming system is setup in farm field	High	Sprint2
IBM cloud	Iot (data transfer)	USN-4	raspberry pi is connected to IBM cloud to monitor and control farm field remotely using internet	data exchange using internet	Medium	Sprint1

6 PROJECT PLANNING & SHEDULING:

6.1 SPRINT PLANNING & ESTIMATION:

Product Backlog, Sprint Schedule, and Estimation:

Sprint	Functional Requirement (Epic)	User story Number	User Story / Task	Story Points	Priority	Team members
Sprint1	Control of motor and Lights	USN 1	As a user, I want to control the Motor and lights using android application.	2	High	Manikandan
Sprint2	Control of Traps and Gate valves	USN 2	As a user, I want to control the traps and gate valves using mobile app.	1	High	Mathuvini
Sprint3		USN 3	As a user, I want to monitor RYB phase using mobile app	2	Low	Muralikrishnan
Sprint4		USN 4	As a user, I can access all the above things by using android app and web application	2	Medium	Sivanathan

Project Tracker, Velocity & Burndown Chart:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint 1	20	4 DAYS	24-10-2022	27-10- 2022	20	29-10-2022
Sprint 2	20	4 DAYS	28-10-2022	03-11- 2022		
Sprint 3	20	2 DAYS	04-11-2022	05-11- 2022		
Sprint 4	20	3 DAYS	06-11-2022	08-11-2022		

6.2 SPRINT DELIVERY SCHEDULE :

Sprint	Functional Requirement (Epic)	User Story Number	User Story /Task	Story Points	Priority	Team Member
Sprint-1	Registration (Farmer Mobile User)	UNS-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Manikandan Mathuvini Muralikrishnan Sivanthan
Sprint-1	Login	UNS-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Manikandan Mathuvini Muralikrishnan Sivanthan
Sprint-2	User Interface	UNS-3	As a user, I can register for the application through Facebook	3	Low	Manikandan Mathuvini Muralikrishnan Sivanthan
Sprint-1	Data Visualization	UNS-4	As a user, I can register for the application through GMAIL	2	Medium	Manikandan Mathuvini Muralikrishnan Sivanthan
Sprint-3	Registration (Farmer Web User)	UNS-1	As a user, I can log into the application by entering email and password	3	High	Manikandan Mathuvini Muralikrishnan Sivanthan

Sprint-2	Login	UNS-2	As a registered user, I need to easily login log into my registered account via the web page in minimum time	3	High	Manikandan Mathuvini Muralikrishnan Sivanthan
Sprint-4	Web UI	UNS-3	As a user, I need to have a friendly user interface to easily view and access the resources	3	Medium	Manikandan Mathuvini Muralikrishnan Sivanthan
Sprint-1	Registration (Chemical Manufacturer - Web user)	UNS-1	As a new user, I want to first register using my organization email and create a password for the account	2	High	Manikandan Mathuvini Muralikrishnan Sivanthan
Sprint-4	Login	UNS-2	As a registered user, I need to easily log in using the registered account via the web page	3	High	Manikandan Mathuvini Muralikrishnan Sivanthan

Sprint-3	Web UI	UNS-3	As a user, I need to have a userfriendly interface to easily view and access the resources.	3	Medium	Manikandan Mathuvini Muralikrishnan Sivanthan
Sprint-1	Registration (Chemical Manufacturer	UNS-1	As a user, I want to first register using my	1	High	Manikandan Mathuvini Muralikrishnan Sivanthan
	- Mobile User)		email and create a password for the account.			
Sprint-1	Login	UNS-2	As a registered user, I need to easily log in to the application.	2	Low	Manikandan Mathuvini Muralikrishnan Sivanthan

Project Tracker, Velocity & Burndown Chart:

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	12	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	6	6 Days	31 Oct 2022	05 Nov 2022	20	30 OCT 2022
Sprint-3	6	6 Days	07 Nov 2022	12 Nov 2022	20	6 NOV 2022
Sprint-4	6	6 Days	14 Nov 2022	19 Nov 2022	20	7 NOV 2022

Velocity:

AV for sprint 1= Sprint Duration /velocity =12/6=2

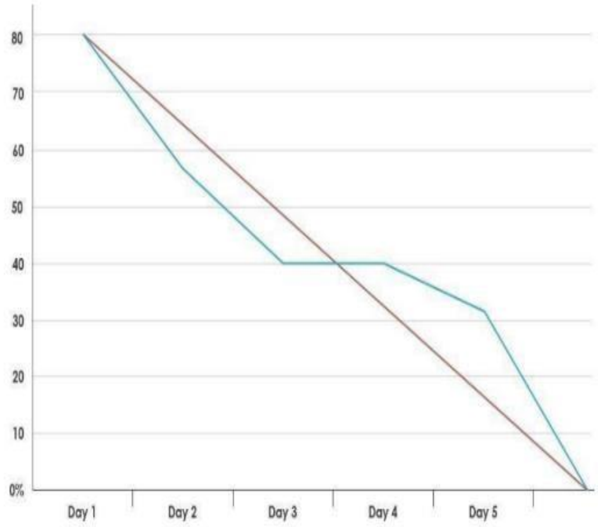
AV for sprint 2= Sprint Duration/Velocity=6/6=1

AV for Sprint 3=Sprint Duration/Velocity=6/6=1

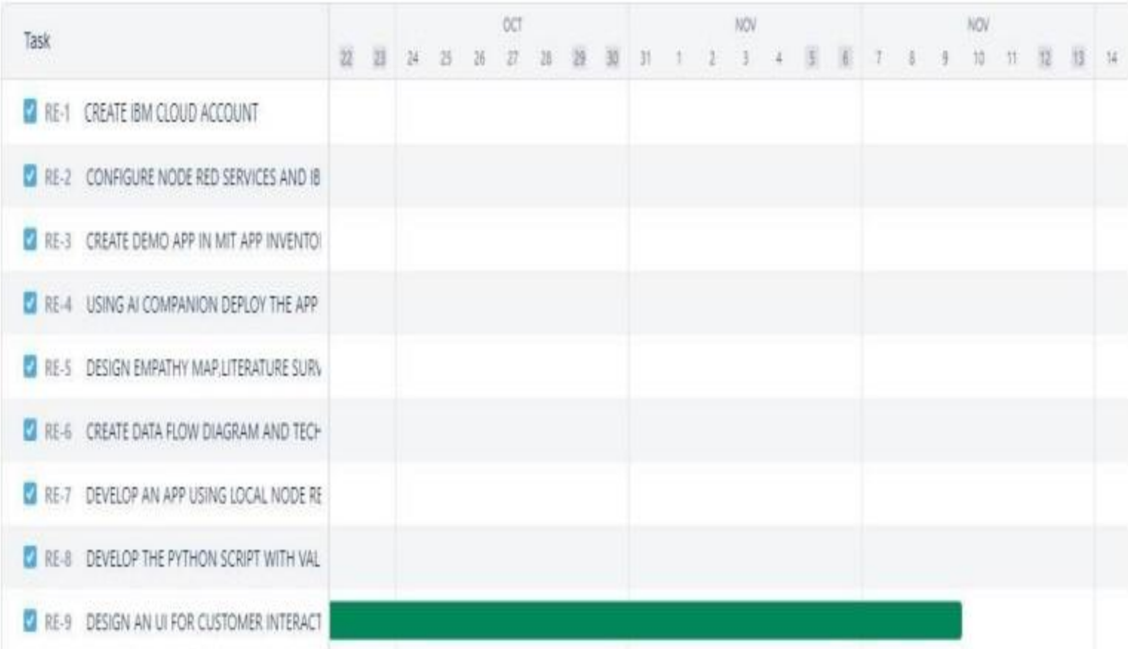
AV for Sprint 4=Sprint Duration/Velocity=6/6=

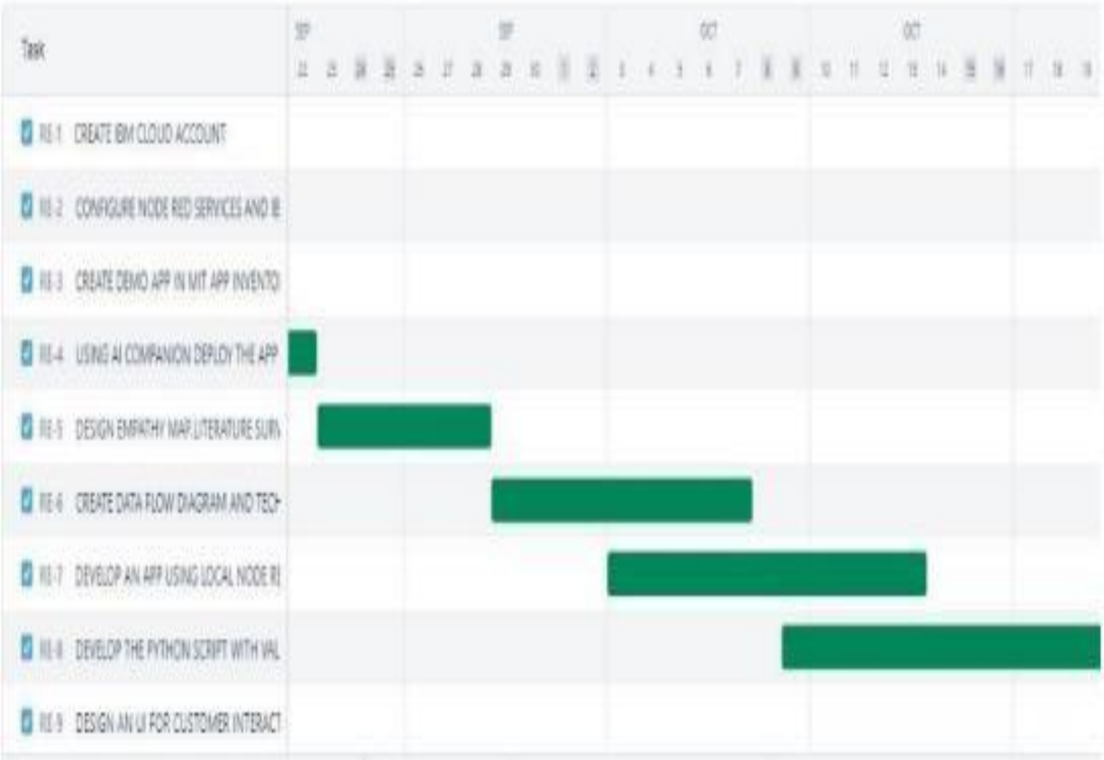
Burndown Chart:

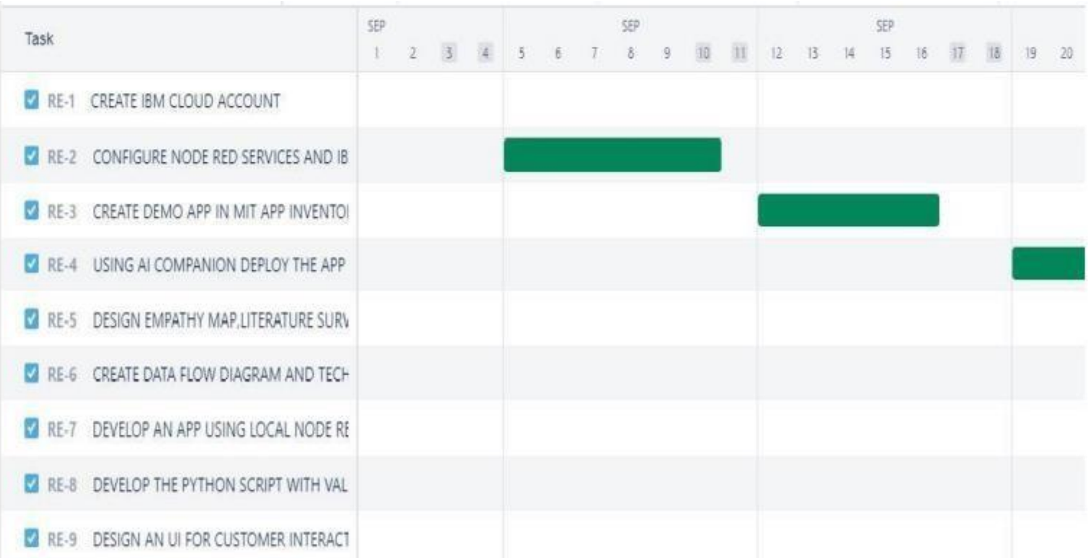
A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time



6.3 REPORTS FROM JIRA.




Task
SEP
OCT
CREATE IBM CLOUD ACCOUNT
CONFIGURE NODE RED SERVICES AND IB
CREATE DEMO APP IN MIT APP INVENTO
USING AI COMPANION DEPLOY THE APP
DESIGN EMPATHY MAP,LITERATURE SURV
CREATE DATA FLOW DIAGRAM AND TECH
DEVELOP AN APP USING LOCAL NODE RE
DEVELOP THE PYTHON SCRIPT WITH VAL
DESIGN AN UI FOR CUSTOMER INTERACT


Task
SEP
1 2 3 4
SEP
5 6 7 8 9 10 11
SEP
12 13 14 15 16 17 18
19 20
RE-1 CREATE IBM CLOUD ACCOUNT
RE-2 CONFIGURE NODE RED SERVICES AND IB
RE-3 CREATE DEMO APP IN MIT APP INVENTO
RE-4 USING AI COMPANION DEPLOY THE APP
RE-5 DESIGN EMPATHY MAP,LITERATURE SURV
RE-6 CREATE DATA FLOW DIAGRAM AND TECH
RE-7 DEVELOP AN APP USING LOCAL NODE RE
RE-8 DEVELOP THE PYTHON SCRIPT WITH VAL
RE-9 DESIGN AN UI FOR CUSTOMER INTERACT

7.CODING AND

SOLUTIONING: import

wiotp.sdk.device import

time import os import

datetime import random

myConfig = {"iden ty":{

"orgId":"04gt4e ", "typeId":

"NodeMCU", deviceId":

"12345"

},

"auth":{

"token": "123456789" }

}

client = wiotp.sdk.device.DeviceClient(config=myConfig,

logHandlers=None)

client.connect () def

myCommandCallback (cmd) :

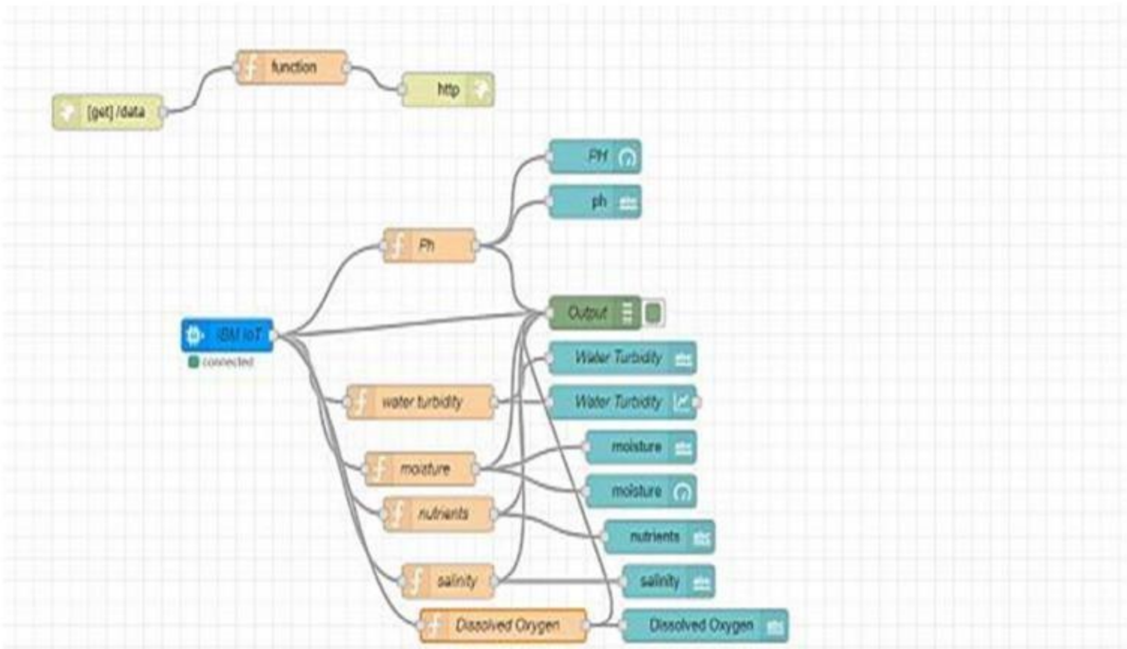
print ("Message received from

IBM IoT Pla orm:

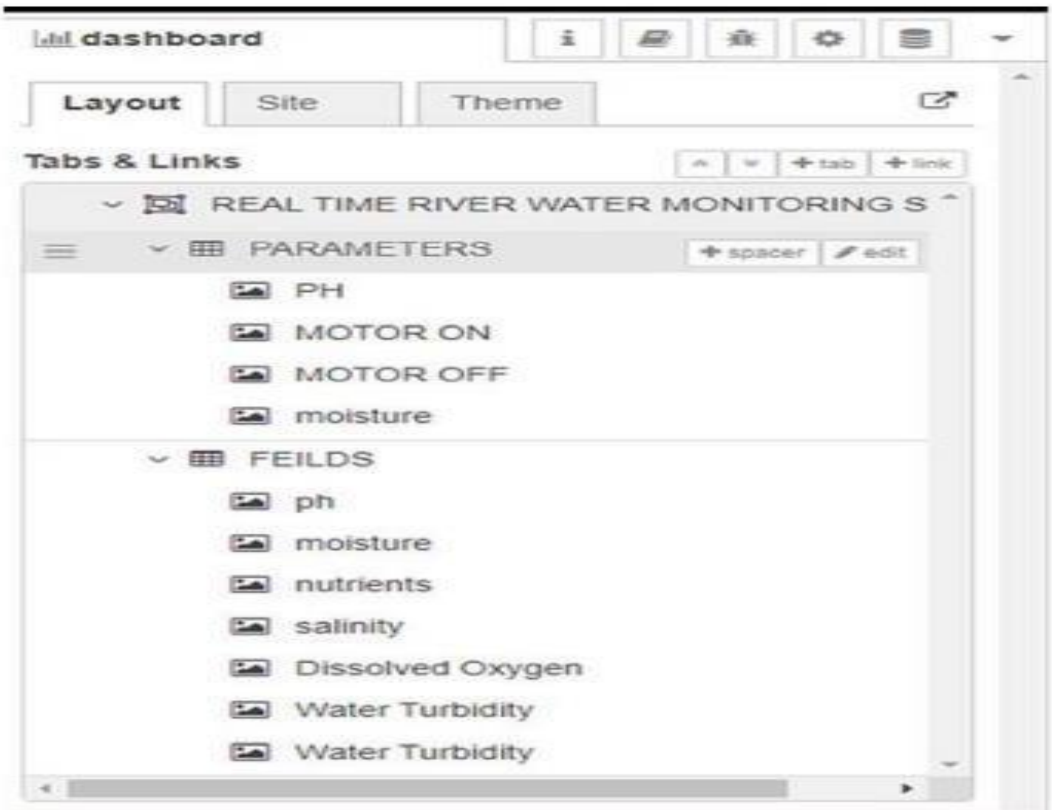
```
%s" % cmd.data['command'])

m=cmd.data['command']     if(m=="motoron"):

print ("Motor is switched on")

elif(m=="motoroff"):         ("Motor is switched

OFF")     print(" ")  while True:

soil=random.randint(10,100)

temp=random.randint(-20, 125)

hum=random.randint(0, 100) my

Data={'soil_moisture': soil, 'temperature':temp,

'humidity ':hum}


   Client . publish Event (even  tId="status", msg
Format="j son",
data=my Data, q o s=0 , on Publish=None)     print

("Published data Successfully: %s", my Data)

time.sleep(2)

client. Command Call back = my Command Call back client

.  disconnect ()
```

7.1: Feature 1 & 2

NODE RED SERVICE ASSOCIATED WITH IBM CLOUD:

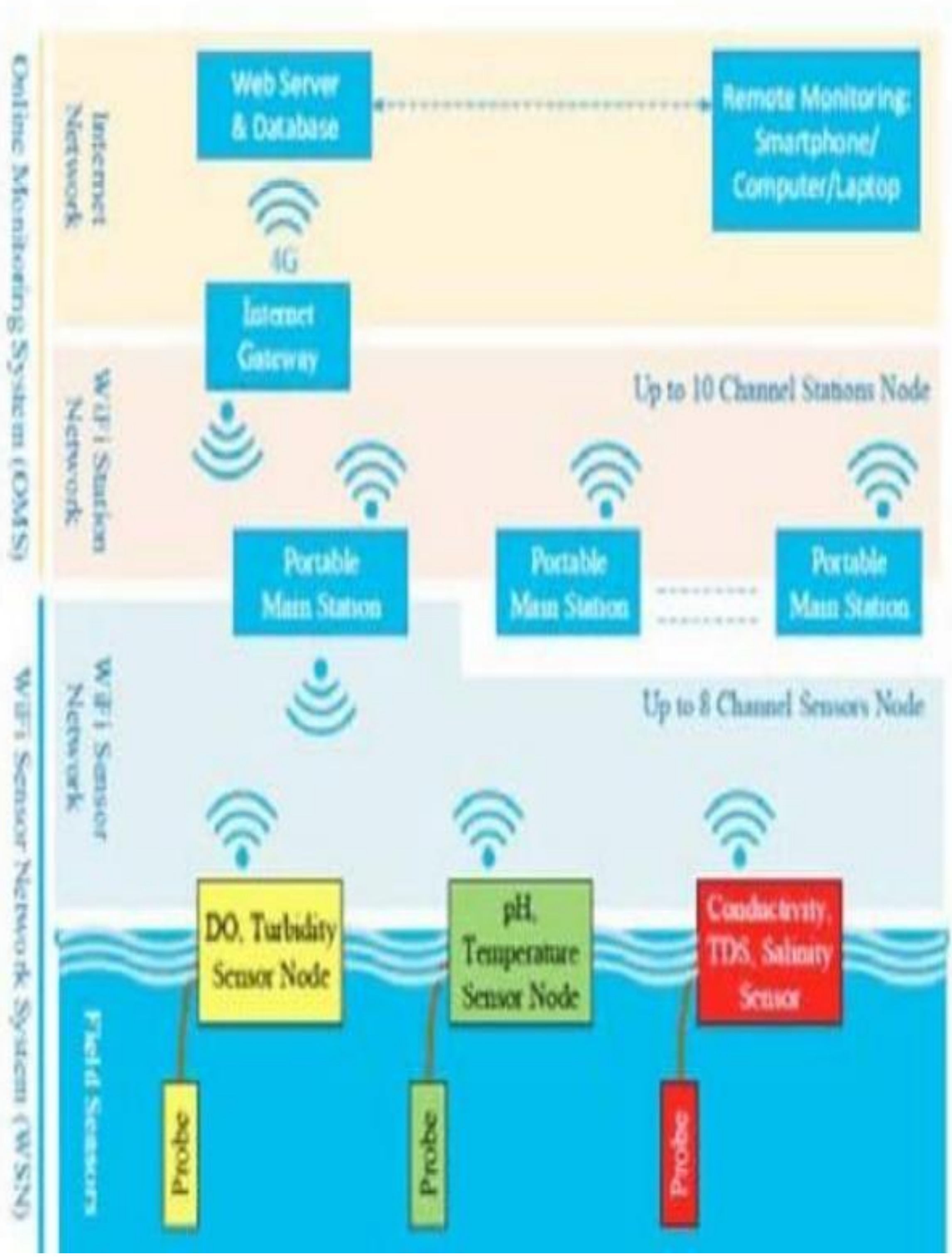


Node red Dashboard:



7.2 Database Schema (if applicable):

7. (continued)



8. Testing:

8.1. Test Cases:

This report shows the number of test cases that have passed, failed, and untested.

Section	Total caes	Not Tested	Fail	Pass
Print Engine	15	0	0	15
Client Application	45	0	0	45
Security	1	0	0	1
Outsource Shipping	2	0	0	2
Exception Reporting	10	0	0	10
Final Report Output	4	0	0	4
Version Control	3	0	0	3

8.2. User Acceptance Testing :

1. Purpose of Document: The purpose of this document is to briefly explain the test coverage and open issues of the REAL TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEMS project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis: This report shows the number of resolved or closed bugs at each severity level, and how they were resolved.

Resolution	Severity1	Severity2	Severity3	Severity4	Sub total
By Design	9	5	4	3	21
Duplicate	2	0	2	0	4
External	3	4	1	2	10
Fixed	10	1	5	17	33
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	2	3
Won't Fix	0	3	3	1	7
Totals	24	13	17	25	79

9.Result:

In Figure 5 (a), we are displaying the resulting sensed pH, temp, turbidity, and ORP values.

It continuously senses the values of pH, temp, turbidity, and ORP and the resulting values are displayed to the LCD, PC or mobile in real-time.

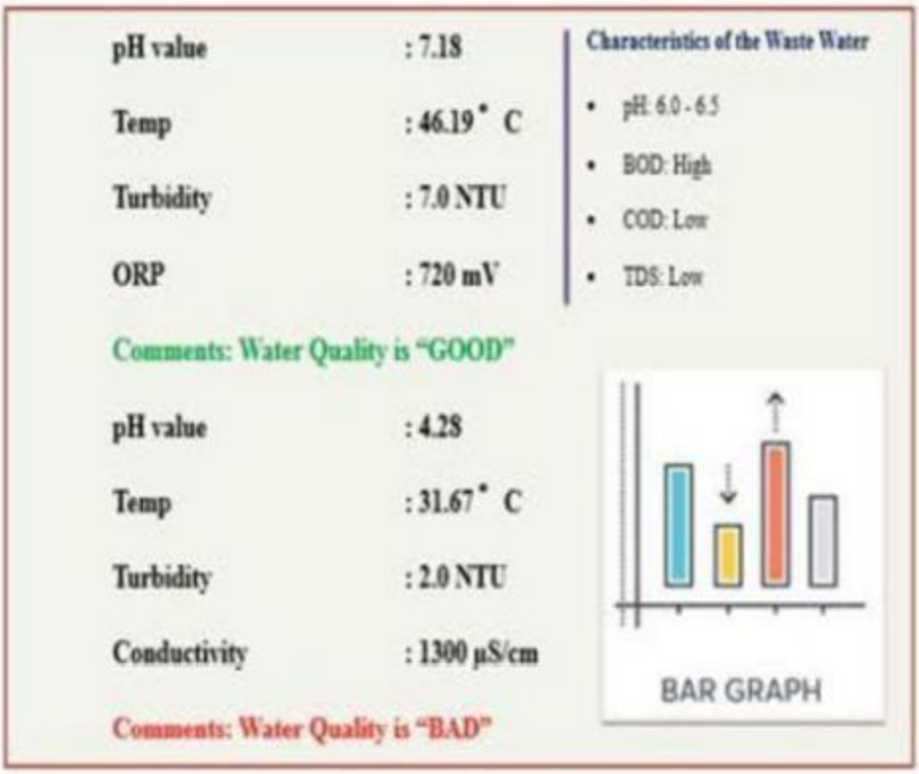
If the acquired value is above the threshold value comments will be displayed as 'BAD'.

If the acquired value is lower than the threshold value comments will be displayed as 'GOOD'.

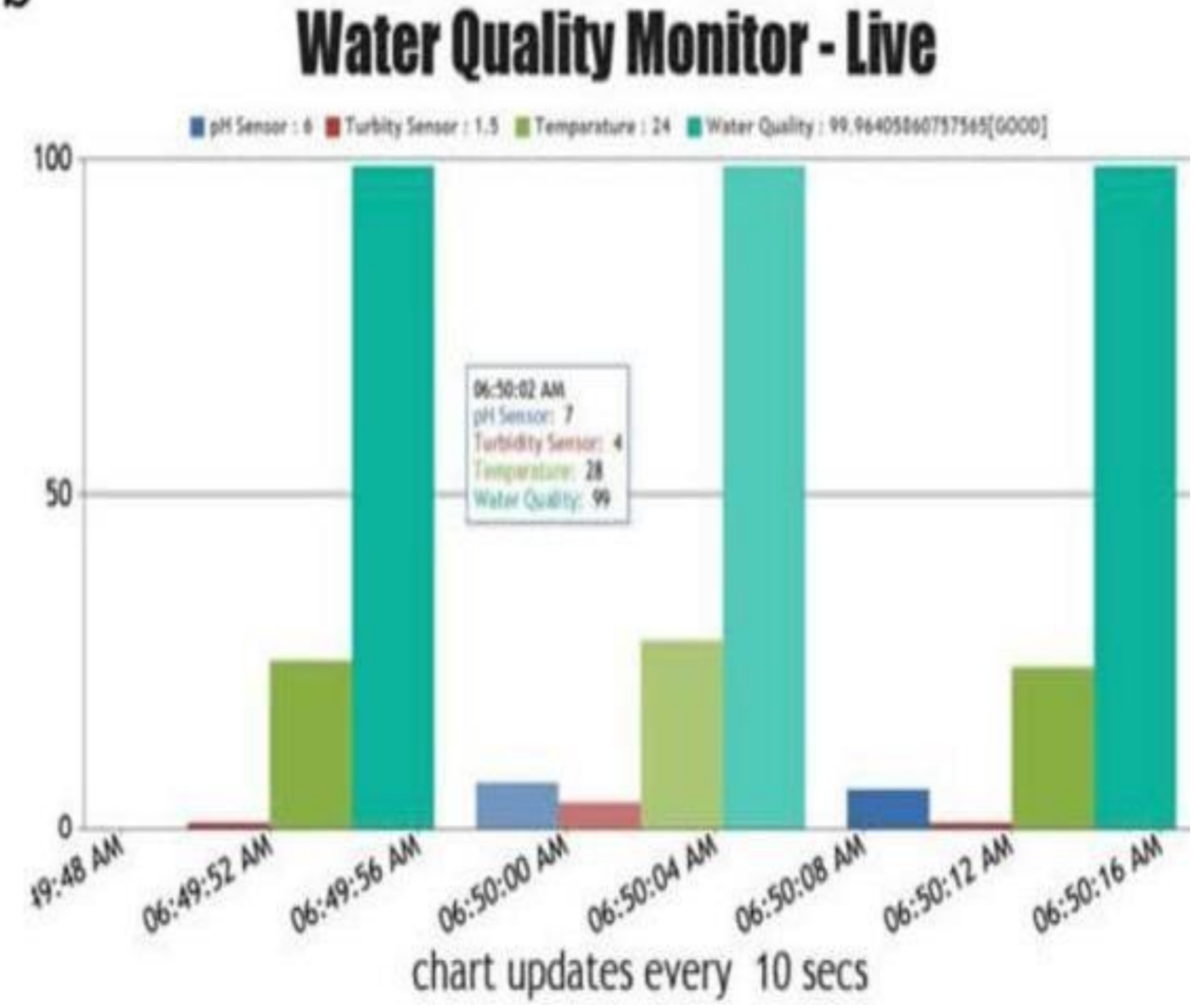
A bar/line graph will also be shown for perfect understanding

The time series representation of sensor data with decision is shown in Figure 5 (b).

a



b


Water Quality Monitor - Live
pH Sensor : 6
Turbity Sensor : 1.5
Temparature : 24
Water Quality : 99.964058607575 65[GOOD]
100
50
0
06:50:02 AM
pH Sensor: 7
Turbidity Sensor: 4
Temparature: 28
Water Quality: 99
19:48 AM
06:49:52 AM
06:49:56 AM
06:50:00 AM
06:50:04 AM
06:50:08 AM
06:50:12 AM
06:50:16 AM
chart updates every 10 secs

9. 1.Performance Metrics:

			NFT - Risk Assessment						
S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Voluem Changes	Risk Score	Justification
1	REAL TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEM	New	Low	No Changes	Moderate	3days	>5 to 10%	ORANGE	As we have seen the changes

Performance Table:

PARAMETER	PERFORMANCE	DESCRIPTION
ADMIN TESTING	95%-100%	THE TESTING DONE BEFORE IT IS DEPLOYED AS AN APP
CUSTOMER SATISFACTION	75-85%	THE CUSTOMER NEED TO BE SATISFIED WITH THE MOBILE APPLICATION
USER INTERFACE	65-85%	THE APP CAN USED BY ANYONE.(EASE OF ACCESS)
SEVER RESPONSE	50-75%	URL- RESPONSE

DATA VALIDATION WITH NO. OF TEST CASE	60-80% (15-30 TESTCASE)	VALID DATA FROM THE APP
ERROR	3-5%	REAL-TIME DELAY MAY OCCUR

10. Advantages & Disadvantages

Advantages:

Farms can be monitored and controlled remotely.

Increase in convenience to farmers.

Less labour cost.

Be er standards of living.

Due to automation it will reduce the time to check the parameters.

This is economically affordable for comman people.

Provides the prevention from diseases caused by water.

Accuracy in measurement

SMS alert is sent to the user

Disadvantages:

Lack of internet/connectivity issues.

Added cost of internet and internet gateway infrastructure.

Farmers wanted to adapt the use of Mobile App.

It is difficult to collect the water samples from all the area of the water body.

The cost of analysis is very high.

The lab testing and analysis takes some time and hence the lab results do not reflect real time water quality measurement due to delay in measurement.

The process is time consuming due to slow process of manual data collection from different locations of the water body.

The method is prone to human errors of various forms.

11.CONCLUSION:

This presents a detailed survey on the tools and techniques employed in existing smart water quality monitoring systems. Also, a low cost, less complex water quality monitoring system is proposed. The implementation enables sensor to provide online data to consumers. The proposed setup can be improved by incorporating algorithms for anomaly detection in water quality. So, this proposed system will surely helpful to the society for safe supply of water. 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 ML lib, Deep learning neural network models, and Belief Rule Based (BRB) system will be conducted [20- 27].

This research would recommend conducting systematic experimentation of the proposed technologies in diverse qualities of river water in Bangladesh. Due to the limitation of the budget, we only focus on measuring the quality of river water parameters. This project can be extended into an efficient water management system of a local area. Moreover, other parameters which wasn't the scope of this project such as total dissolved solid, chemical oxygen demand and dissolved oxygen can also be quantified. So the additional budget is required for further improvement of the overall system.

12. FUTURE SCOPE:

We use water detection sensor has unique advantage. It consumes less time to monitor than a manual method for checking polluted levels, and notifies immediately to reduce affected rate of pollution in water.

who are living in rural areas near to the river will be very satisfied with our idea. It will be useful to monitor water pollution in specific area. So, this system prevents people from water pollution. It will be used for farming purpose to check quality water, temperature and PH level. Our Impact of this project is also creating a social satisfaction for farmers too. The scalability of this project gives the addition of more different type of sensors. By interfacing the relay we can control the supply of water. We can also implement as a revenue model. This system could also be implemented in various industrial processes. The system can be modified according to the needs of the user and can be implemented along with lab view to monitor data on computers.

Author contributions

This work was carried out in collaboration between all authors. All the authors have accepted responsibility for the entire content of this submitted manuscript and approved the submission. MSUC, TBE, SG, AP, MMA, NA, and MSH carried out the study design, performed the experiments, data collection, data interpretation, and statistical analysis.

Authors MSUC, TBE, and AP collected the water samples. Authors SG and AP has arranged the software simulation study.

Authors TBE and MSH has arranged the biological study. MSUC, TBE, SG, AP, and MSH designed and planned the studies, supervised the experiments. MSH also acted for all correspondences.

MSUC, TBE, SG, AP, MMA, NA, and MSH participated in the manuscript draft and has thoroughly checked and revised the manuscript for necessary changes in format, grammar and English standard. KA checked the format, grammar and revised the manuscript. All authors read and agreed the final version of the manuscript.

Acknowledgements:

The authors are grateful to both the Department of Computer Science and Engineering.

13. APPENDIX:

13.1. Source Code.

Python Code To Publish Data:

#program to publish data in IBM Watson IOT platform import

time import sys import IBM iotf. Application import ibm iotf

. Device imports random

#Provide your IBM Watson Device Credentials

#Org_ID organization = "84708c"

#Device Type device Type = "abcd"

#device ID device Id = "12345" #Method

of Authentication auth Method = "token"

#Auth-token auth Token = "12345678"

#Exception handling method

#Try block try: device Options = {"org": organization, "type": device Type, "id":

Device Id, "auth-method": auth Method, "auth-token": authToken}

Device Cli= ibmiotf.device.Client (device Options)

#To handle the errors except Exception

as e:

print ("Caught evention connecting device: %s" % str(e)) sys. Exit ()

#device connection device Cli. connect() #While

Loop for getting the values while True:

Ph=random.

randint (6,8)

Water Turbidity=random.randint (15,100)
salinity=random. randint (500,1000)

Dissolved Oxygen=random.randint (60,130) conductivity=random.randint (100,1200) data = {'Ph' : Ph,

WaterTurbidity':WaterTurbidity,'salinity':salinity,'DissolvedOxygen':

Dissolved Oxygen, 'conductivity': conductivity}

#define myonpublishcallback function def

myonPublishCallback():

()

OUTPUT:

print ("Published Ph = %s" % Ph, "Water Turbidity = %s %%" %

Water Turbidity, "salinity = %s" % salinity,"DissolvedO2 = %s" %

Dissolved Oxygen, "conductivity = %s" % conductivity) if (Ph<7.4 and salinity

< 600 and Dissolved Oxygen < 80 and

conductivity < 200): if (Ph>7.4 and salinity > 900 and Dissolved Oxygen > 120 and conductivity > 1100):

print ("UNSAFE, THE VALUES OF PARAMETERS ARE

NOT IN THE RANGE") else: print ("Quality of River water is measured and its

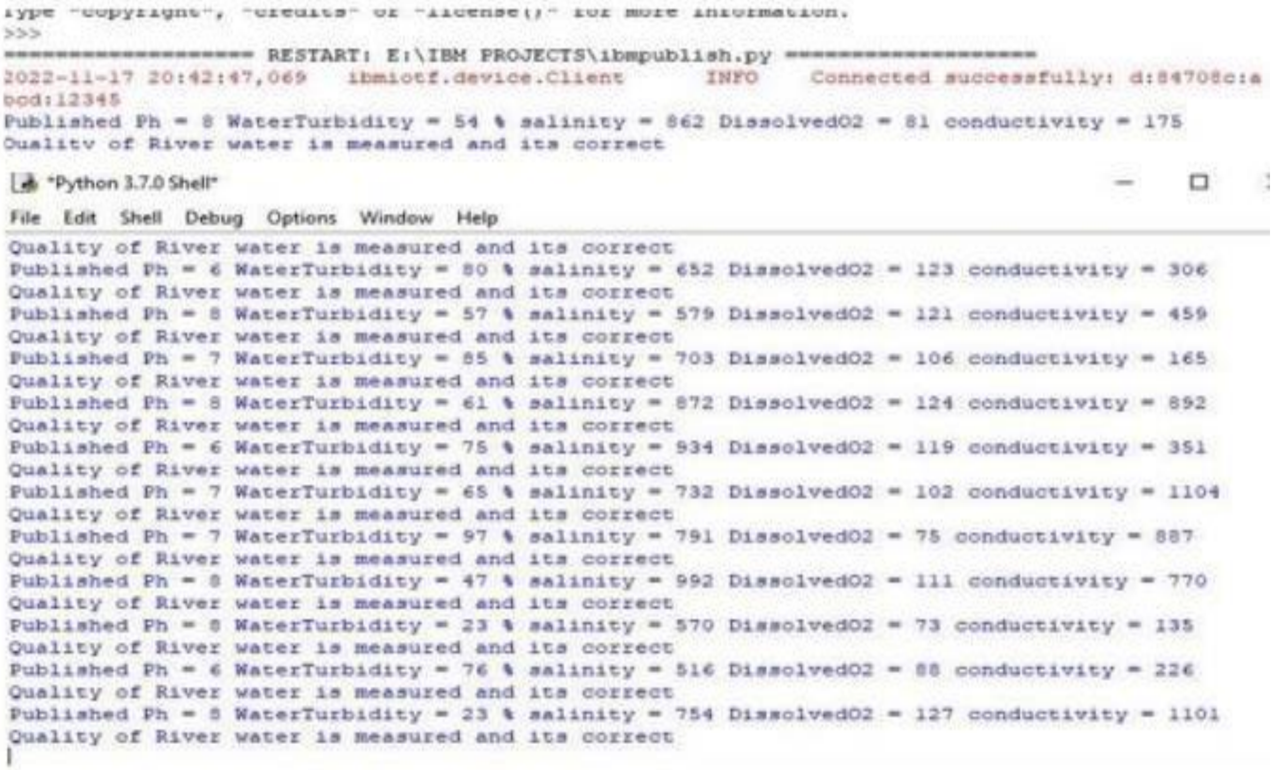
correct")

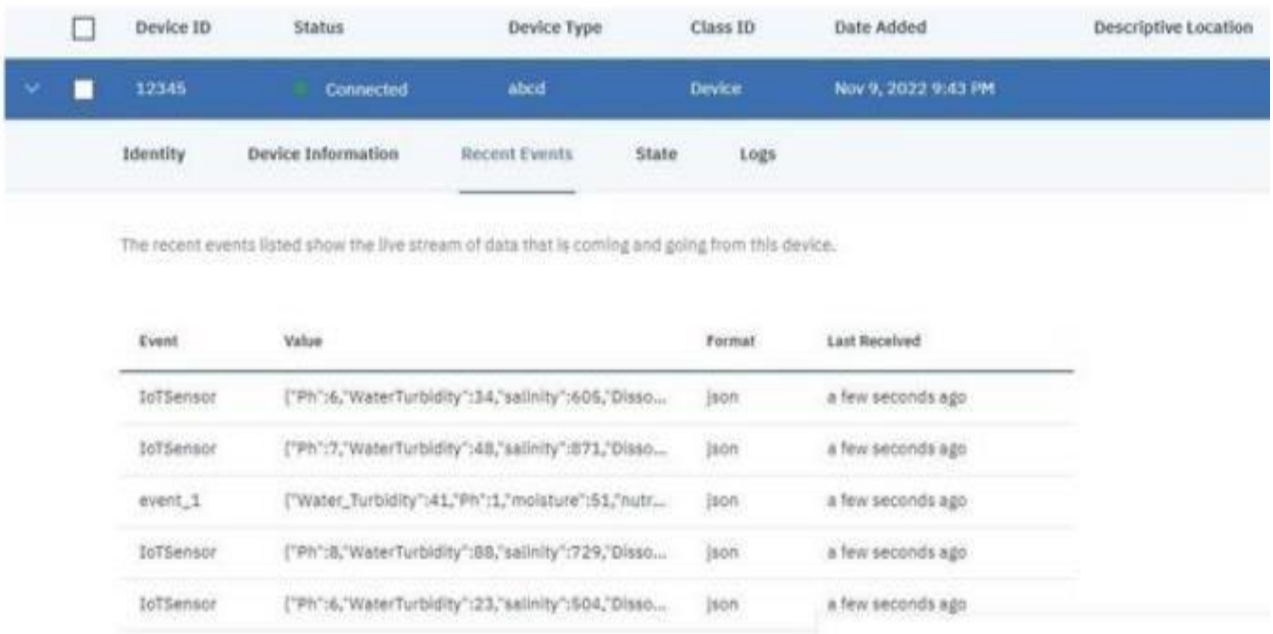
success = device Cli. Publish Event ("IoT Sensor", "json", data, qos=0,

on_publish = myonPublishCallback) if not success:

print ("Not connected to IOTF")

#Sleep time. Sleep (10) #disconnect device device Cli. Disconnect





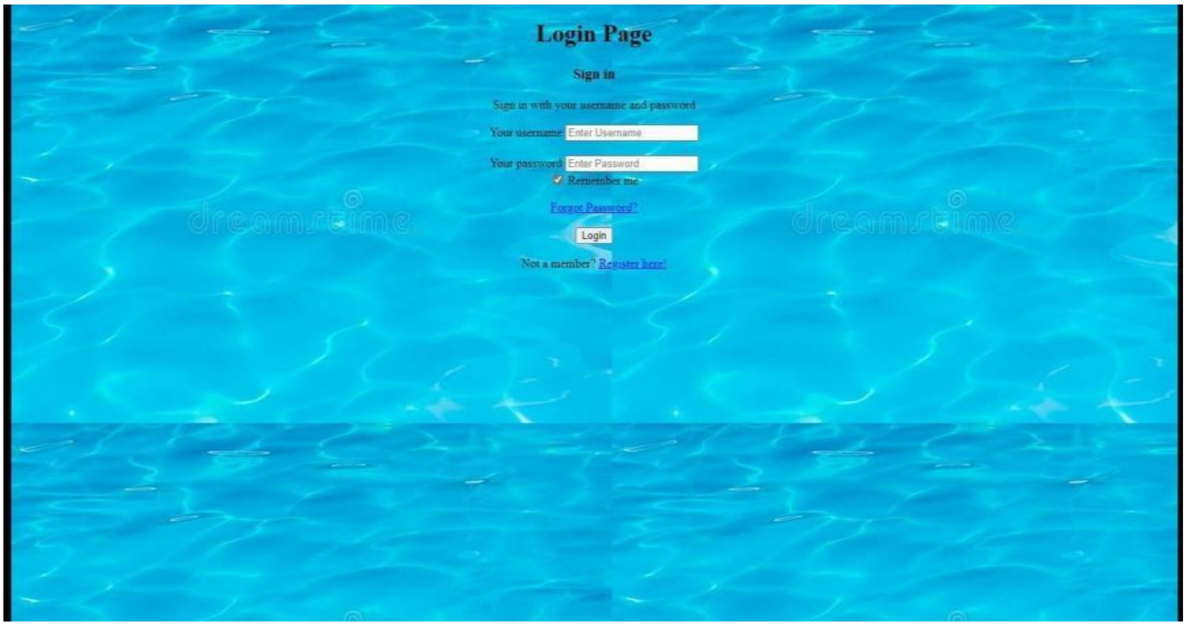
OUTPUT GRAPH:

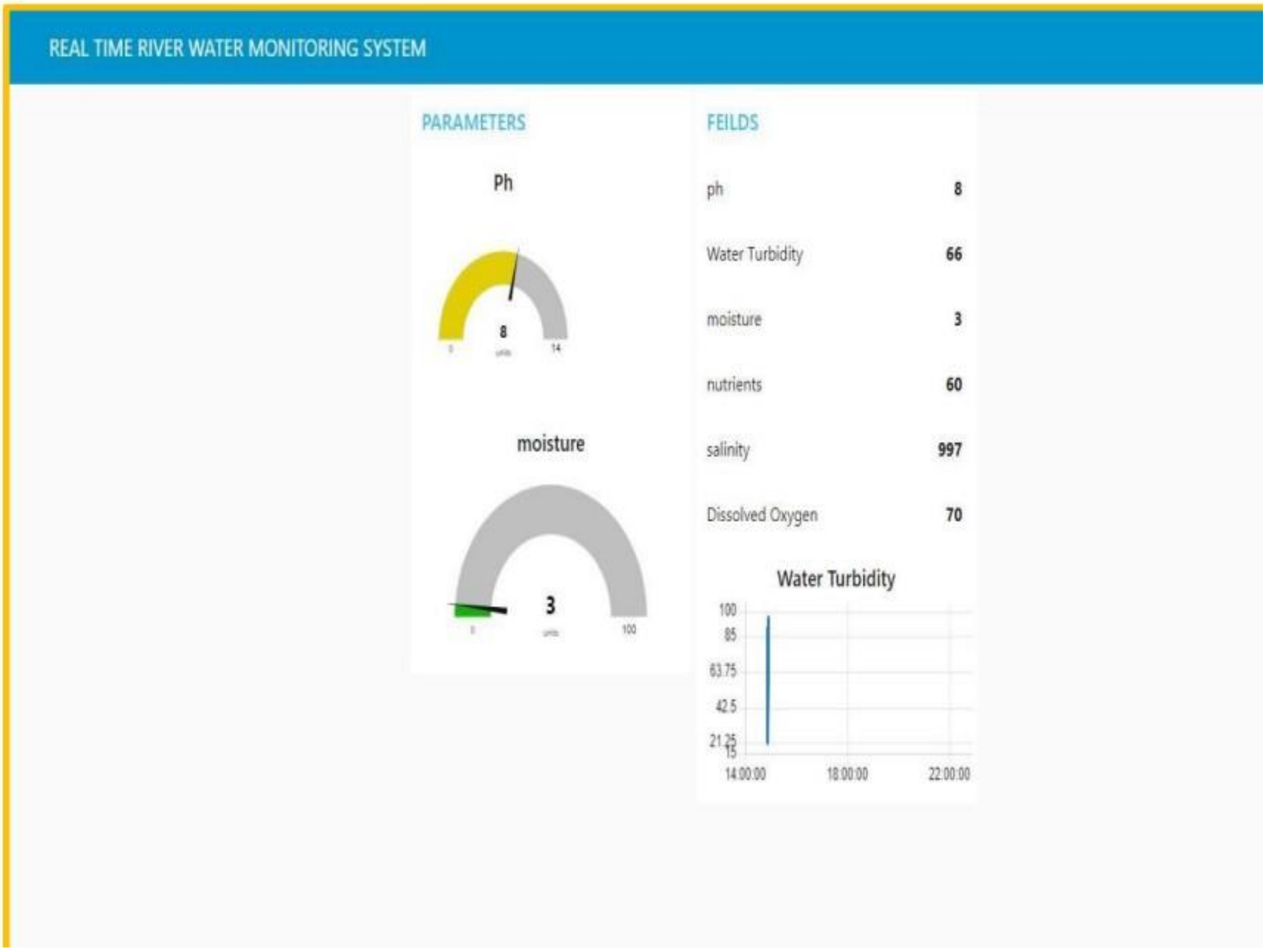
SOURCE CODE:

```
<!DOCTYPE html>
<html lang= "en" >
```

```
<head>      <style>        h1      {text-
   align:
 center;}  p  {text-align:  center;}  div   {text-align:  center;}  body  {
   background-image: url ("https://thumbs.dreamstime.com/b/clear-
transparent-light-blue-  water-pool-texture-background-150961732.jpg");
background-color:
#cccccc;
    }
   </style>
   <meta charset="UTF-8">
   <meta http-equiv="X-UA-Compatible" content="IE=edge">
   <meta name="viewport" content="width=device-width, initial-scale=1.0">
   <title>Login page in HTML</title>
</head>
<body>
   <h1>Login Page</h1>
   <form action="">
      <! -- Headings for the form -->
      <div class="headings Container">
         <h3>Sign in</h3>
         <p>Sign in with your username and password</p>
      </div>


      <! -- Main container for all inputs -->  requ<div
      class="main Container">
         <! -- Username -->
         <label for="username">Your username</label>

         <input type="text" placeholder="Enter Username" name="username" ired>


         <br><br>
```

```
        <! -- Password -->
        <label for="pswrd">Your password</label>
        <input type="password" placeholder="Enter Password" name="pswrd" required>

        <! -- sub container for the checkbox and forgot password link -->
        <div class="subcontainer">
          <label>
<input type="checkbox" checked="checked" name="remember"> Remember me
          </label>
          <p class="forgotpsd"> <a href="#">Forgot Password?</a></p>
        </div>
        <button type="submit" onclick="window.location.href = 'https://node-redqltdp-2022-
11-07.eu-gb.mybluemix.net/ui';">Login</button>
        <! -- Sign up link -->
<p class="register">Not a member? <a href="#">Register here!</a></p>

      </div>
    </p>

  </form>
  </body>
  </html>
```


Login Page
Sign in
Sign in with your username and password
Your username: Enter Username
Your password: Enter Password
Remember me
Forgot Password?
Login
Not a member? Register here!


REAL TIME RIVER WATER MONITORING SYSTEM
PARAMETERS
Ph
8
0
14
moisture
3
0
100
FEILDS
ph 8
Water Turbidity 66
moisture 3
nutrients 60
salinity 997
Dissolved Oxygen 70
Water Turbidity
100
85
63.75
42.5
21.25
15
14:00:00
18:00:00
22:00:00