NALAIYATHIRAN PROJECT 2022

SMARTFARMER - IOT ENABLED SMART FARMING APPLICATION

BATCH : B2-2M4E

TEAM ID : PNT2022TMID26661

College: St Joseph college of Engineering

Submitted by

TEAM LEADER : SARAN KUMAR S

TEAM MEMBER 1 : SHANMUGAM V

TEAM MEMBER 2 : PAUL V

TEAM MEMBER 3 : YOGEHWARAN MS

TEAM MEMBER 4 : THAMIZHSELVAN L

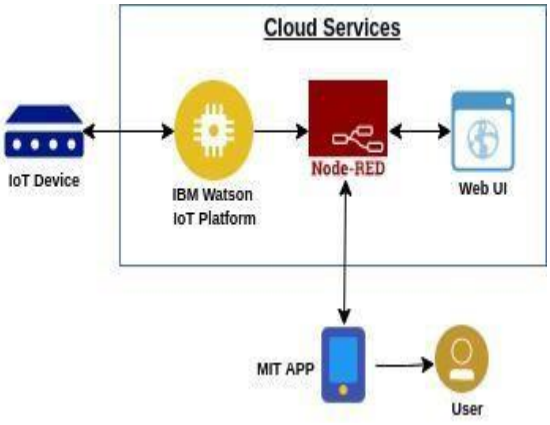
1. INTRODUCTION

✓ Smart farming refers to a farm management concept that uses modern technology with the aim of increase the quality and quantity of agricultural products. This approach includes aspects such as the Internet of Things (IoT), data management, soil scanning, as well as the access to GPS among other smart technologies.

1.1Project overview

❖ 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.



1.2Purpose

❖ The smart agriculture model main aim to avoid water wastage in the irrigation process.

❖ It is low cost and efficient system

- ❖ It includes NodeMCU, Arduino Nano, sensors like soil moisture and Dht11, solenoid valves, relays.

2. LITERATURE SURVEY

- ✓ Idea behind the project is to create a smart agriculture system that is connected to the internet of things. The technology is combined with an irrigation system to deal with Malaysia's variable weather. This system's microcontroller is a Raspberry Pi 4 Model B. The temperature and humidity in the surrounding region, as well as the moisture level of the soil, are monitored using the DHT22 and soil moisture sensor. The data will be available on both a smartphone and a computer. As a result, Internet of Things (IoT) and Raspberry Pi-based Smart Agriculture Systems have a significant impact on how farmers work.

2.1Existing problem

- ❖ The challenges of a smart agriculture system include the integration of these sensors and tying the sensor data to the analytics driving automation and response activities.
- ❖ It should utilize minimum resources in terms of hardware and value.
- ❖ This overcomes the manual operations required to observe and maintain the agricultural farms in both automatic and manual modes. It should be able to measure the rise or decrease in level of water yet as moisture within the soil.

2.2References

- ❖ Zuraida Muhammad,Muhammad Azri Asyraf Mohd Hafez,Nor Adni Mat"Smart Agriculture Using Internet of Things with Raspberry Pi." 2020.

- Divya J., Divya M.,Janani V.”IoT based Smart Soil Monitoring System for Agricultural Production” 2017.
- Shrihari M, ”A Smart Wireless System to Automate Production of Crops and Stop Intrusion Using Deep Learning” 2020.
- Izzatdin Abdul Aziz, MohdHilmiHasan, Mohd Jimmy Ismail, MazlinaMehat, NazleeniSamihaHaron, “Remote Monitoring in Agricultural Greenhouse Us- ing Wireless Sensor and Short Message Service (SMS)”, 2008.
- H.G.C.R.Laksiri, H.A.C.Dharmagunawardhana, J.V.Wijayakulasooriya ”Design and Optimization of loT Based Smart Irrigation System in Sri Lanka”2019 [4] Anushree Math, Layak Ali, Pruthviraj U ”Development of Smart Drip Irriga- tion System Using IoT”2018.
- Dweepayan Mishra1 ,Arzeena Khan2 Rajeev Tiwari3 , Shuchi Upadhay,”Automated Irrigation System-IoT Based Approach”,2018.
- Anurag D, Siuli Roy and SomprakashBandyopadhyay, “Agro-Sense: Precision Agriculture using Sensor-based Wireless Mesh Networks”, ITU-T “Innovation in NGN”, Kaleidoscope Conference, Geneva 12-13 May 2008.
- C. Arun, K. Lakshmi Sudha “Agricultural Management using Wireless Sensor Networks – A Survey”2nd International Conference on Environment Science and Biotechnology IPCBEE vol.48 (2012) © (2012) IACSIT Press, Singapore 2012.
- Bogena H R, Huisman J A, OberdEˆ rster C, etal. Evaluation of a low cost soil water content sensor for wireless network applications [J].

2.3 Problem statement definition

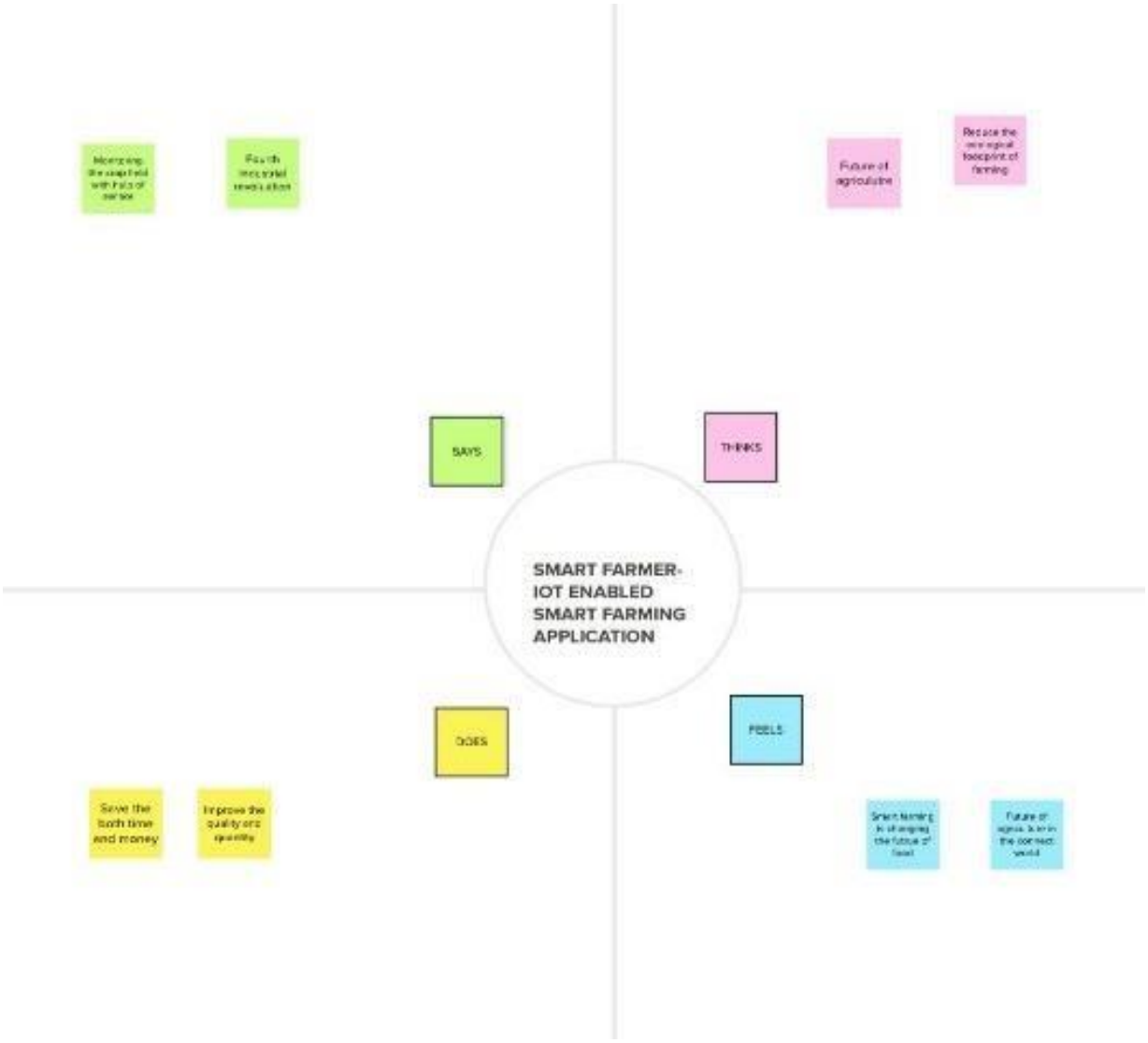
- To build an IoT solution for agriculture, You need to choose the sensors for your Device (or create a custom one).

- ❖ Your choice will depend on the types of Information you want to collect and the Purpose of your solution in general.
- ❖ Need a solid internal infrastructure.
- ❖ Internal systems have to be secure.
- ❖ The safe and timely delivery, and sharing of This data is one of the current smart Farming challenges.

3. IDEATION AND PROPOSED SOLUTION

3.1Empathy map canvas

.



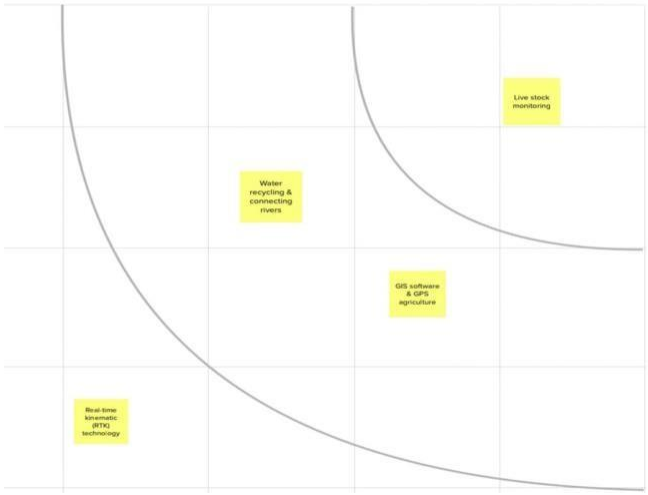
3.2 Ideation and Brainstorming

In our system,we automatically monitor the farming in real time using following idea’s

1. Smart green houses
2. Live stock Monitoring
3. Mini chromosome technology

4. Precision farming
5. Indoor farming
6. Urban farming
7. Agri-banking
8. Water recycling and connecting rivers
9. Farming software and online data
10. Drone and other aerial imagery
11. Satellite imagery
12. GIS software and GPS Agriculture
13. Real-time kinematic (RKT) technology
14. Laser scarecrows
15. Bee vectoring technologies
16. Merging datasets

Polarization



3.3 Proposed solution

1. Problem Statement (Problem to Be solved)

- ❖ Farmers are under pressure to produce more food AND use less energy and water in the process.
- ❖ A remote monitoring and control system will help farmers deal effectively with these pressures.

2. Idea / Solution description

- ❖ Smart farming refers to managing farms using modern Information and communication technologies to increase the quantity and quality of products while optimizing the human labor required.
- ❖ Among the technologies available for present day farmers are: Sensors: soil, water, light, humidity, temperature management.

3. Novelty / Uniqueness

- ❖ Smart farming combines concepts (precision agriculture, land management), scientific fields (earth observation, climate science) and cutting-edge technologies (image processing, GIS, UAV,

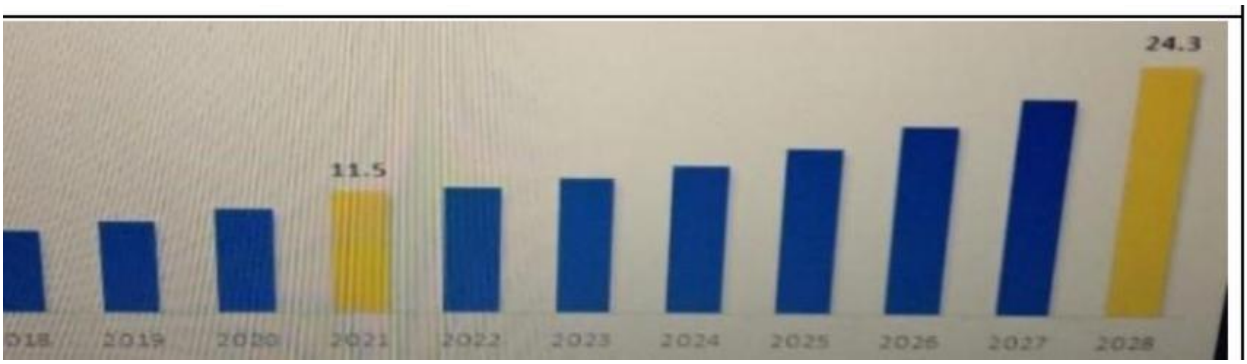
multispectral/hyperspectral imaging) that could improve the agricultural production.

- ❖ Each one of the aforementioned subfields involves different techniques and methods that offer the capability of being explored in depth.

4.Social Impact / Customer Satisfaction

- ❖ Major tech innovations in farming such as automation and robotics, livestock technology, modern greenhouse practices, precision agriculture and artificial intelligence and blockchain are enabling the shift towards modern farming practices.
- ❖ The journey from the farmer to the consumer in a food business is paramount to ensuring quality and taste for the consumer while empowering farmers.

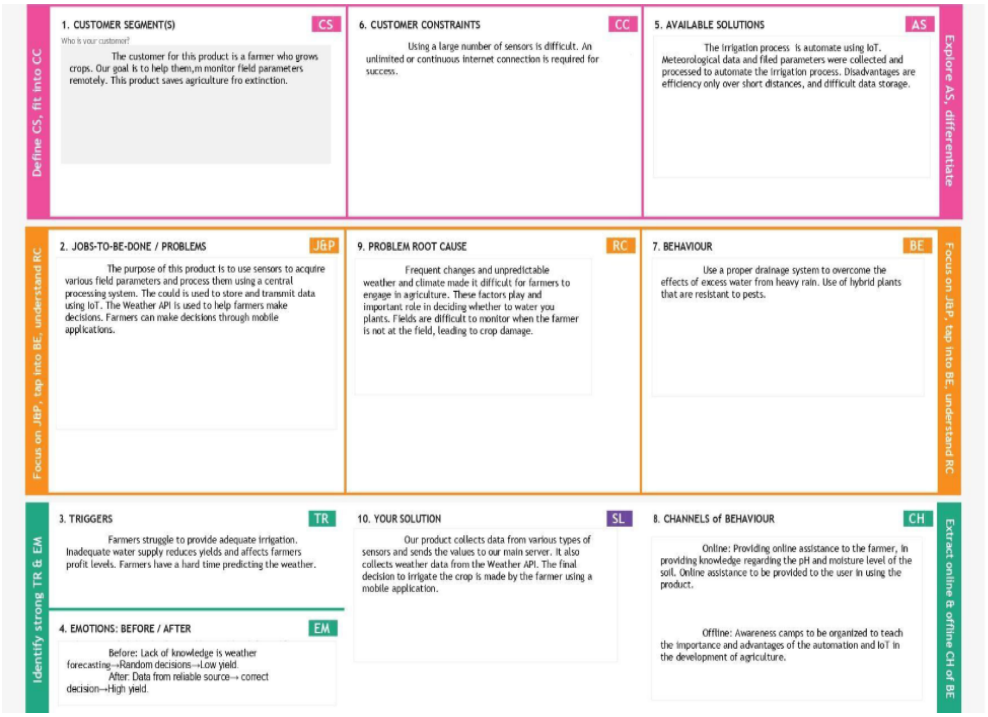
5.Business Model (Revenue Model)



6.Scalability of the Solution

- ❖ Scalability in smart farming refers to the adaptability of a system to increase the capacity,the number of technology device such as sensor and actuators.

3.4Problem solution fit:



4. REQUIREMENT ANALYSIS

4.1Functional Requirements

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	IOT devices	Sensor and WiFi module
FR-2	Software	Web UI, Node-red, IBN Watson, MIT app

4.2Non-Functional Requirements

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

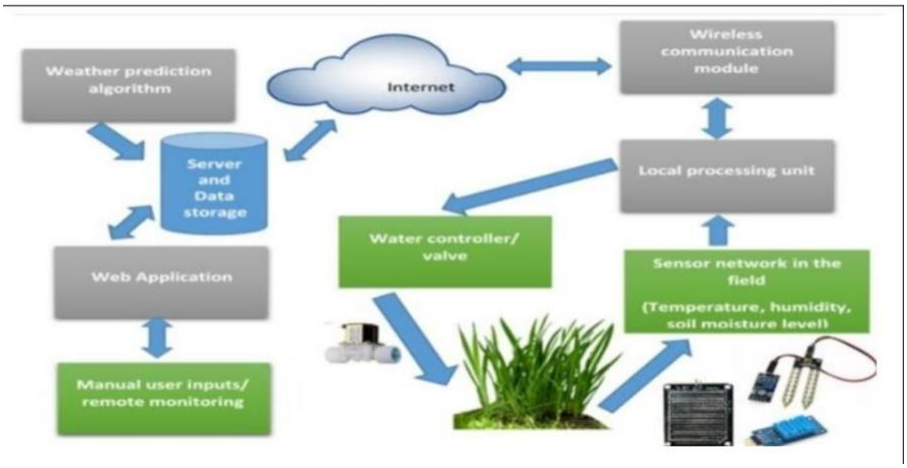
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Time consumability is less, Productivity is High
NFR-2	Security	It has low level of security features due to integration of sensor data

NFR-3	Reliability	Accuracy of data and hence it is reliable
NFR-4	Performance	Performance is High and highly productive
NFR-5	Availability	With permitted network connectivity the application is accessible
NFR-6	Scalability	It is perfectly scalable many new constraints can be added.

5. PROJECT DESIGN

5.1 Data flow diagram

- ✓ 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.

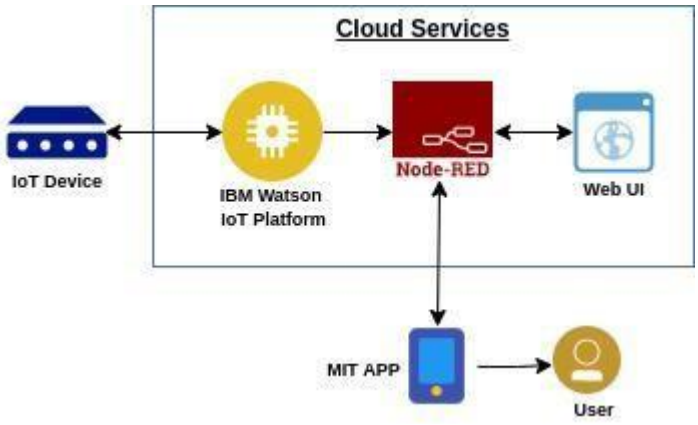


5.2 Solution and technical architecture

Solution Architecture

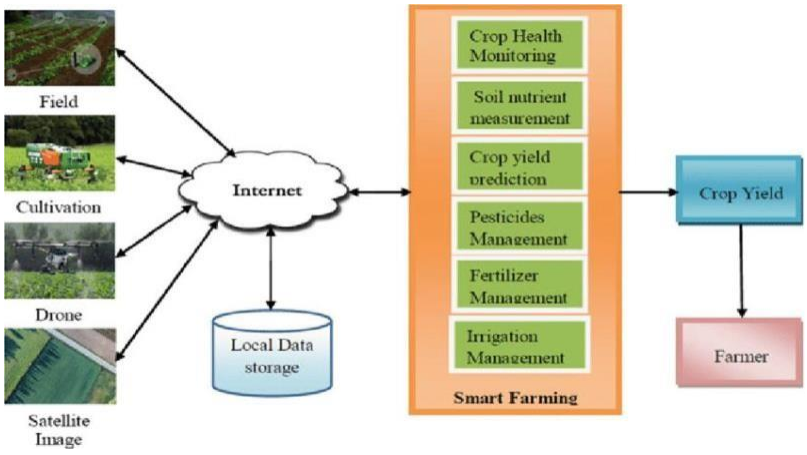
Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- ❖ Find the best tech solution to solve existing business problems.
- ❖ Define features, development phases, and solution requirements.
- ❖ Provide specifications according to which the solution is defined, managed, and delivered.



Technical Architecture

The Deliverable shall include the architectural diagram



5.3 User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	IOT devices	USN-1	Sensor and WiFi module		High	Sprint-1

Customer	Software	USN-2	IBM Watson,IOT platform, workflows for IOT scenarios using node - red		High	Sprint-2
Customer	MIT app	USN-3	To develop an application using MIT		High	Sprint-3
Customer	Web UI	USN-4	To make the user to interact with the software	To make the user to interact with the software	High	Sprint-4

6. PROJECT PLANNING AND SCHEDULING

6.1 Sprint planning and estimation

Product Backlog, Sprint Schedule, and Estimation

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	2	High	***Saran Kumar.S (Leader)***

			application by entering my email,password , and confirming my password.			
Sprint-1	Login	UNS-2	As a user, I will receive confirmation email once I have registered for the application	1	High	*Shanmugam.V* (Member 1)
Sprint-2	User Interface	UNS-3	As a user, I can register for the application through Facebook	3	Low	Paul.V (Member 2)
Sprint-1	Data Visualization	UNS-4	As a user, I can register for the application through GMAIL	2	Medium	*YogeshwaranM S(*Member 3)
Sprint-3	Registration (Farmer -Web User)	USN - 1	As a user, I can log into the application by entering email and password	3	High	*Thamizhsel vanL* (Member4)
Sprint - 2	Login	USN - 2	As a registered user, I need to easily login log into my registered account via the web page in minimum time	3	High	*SarankumarS* (Leader)
Sprint - 4	Web UI	USN - 3	As a user, I need to have a friendly user interface to easily view and access the resources	3	Medium	*ShanmugamV (Member1)*
Sprint - 1	Registration(Chemical Manufacturer Web user)	USN - 1	As a new user, I want to first register using my organization email and create a password forth ccount.	2	High	*Paulv* (Member 2)
Sprint - 4	Login	USN - 2	As a registered user, I need to easily log in using the registered account via the web page.	3	High	*YOGESHW ARANMS*(Member3)
Sprint - 3	Web UI	USN - 3	As a user, I need to have a user friendly interface to easily view and access the resources.	3	Medium	*ThamizhselvanL* (Member 4)
Sprint - 1	Registration (Chemical Manufacturer -	USN - 1	As a user, I want to first	1	High	*SarankumarS* (Leader)

	Mobile User)		register using my email and create a password for the account.			
Sprint - 1	Login	USN - 2	As a registered user, I need to easily log in to the application	2	Low	*ShanmugamV* (Member 1)

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	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

7.CODING AND SOLUTIONING

Import wiotp.sdk.device

Import time import os

Import datetime import

Random myConfig = {

“identity”: {

“orgId”: “3j2gcg”,

“typeId”: “ultrasonic”,

“deviceId”: “1407”

},

“auth”: {

“token”: “14073008”

} }

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

logHandlers=None) client.connect () def

myCommandCallback (cmd) :

print (“Message received from IBM IoT Platform: %s” %

cmd.data[‘command’]) m=cmd.data[‘command’] if

(m==”motoron”):

Print (“Motor is switched on”) elif

(m==”motoroff”):

Print (“Motor is switched OFF”)

Print (“ “) while

True:

Soil=random.ra

Ndint (0,100)

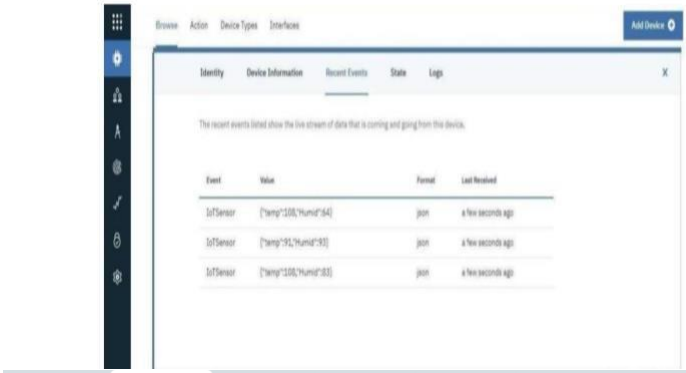
Temp=random.r

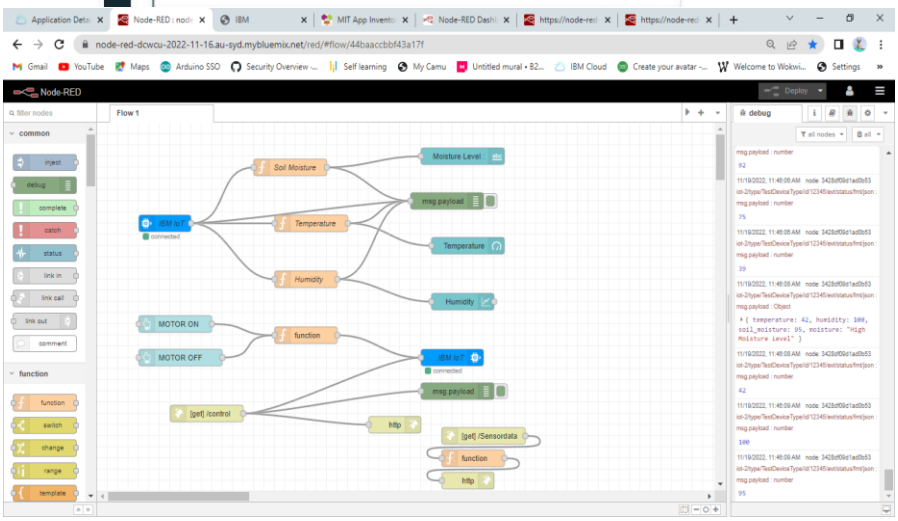
Andint (-20,

```
125)
Hum=random.r
Andint (0, 100)
myData={‘soil
moisture’: soil,
‘temperature’:te
Mp,
‘humidity’:hum
}
Client.publishE
Vent
(eventId=”statu
S”,
msgFormat=”js
on”,
data=myData, qos=0 , onPublish=None) print
(“Published data Successfully: %s”, myData)
Time.sleep (2)
Client.commandCallback = myCommandCallback
Client.disconnect ()
```

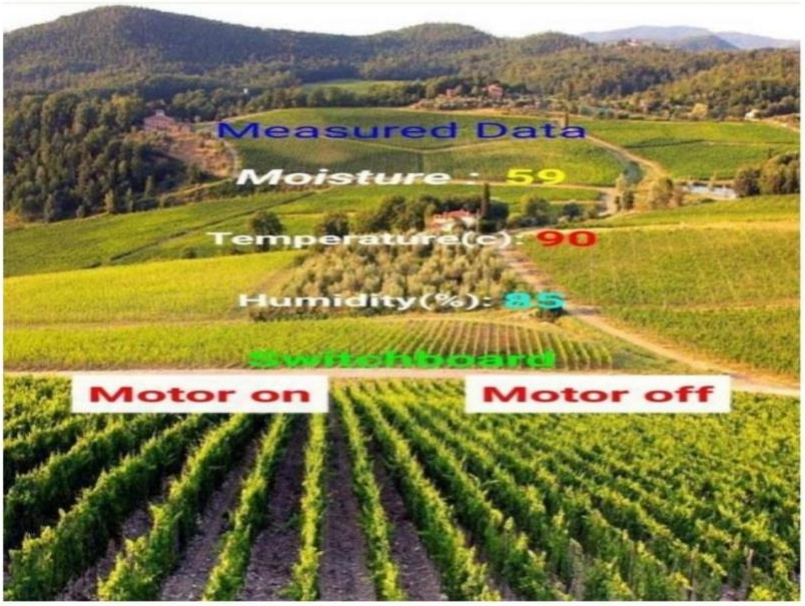
8. TESTING

8.1 Test case



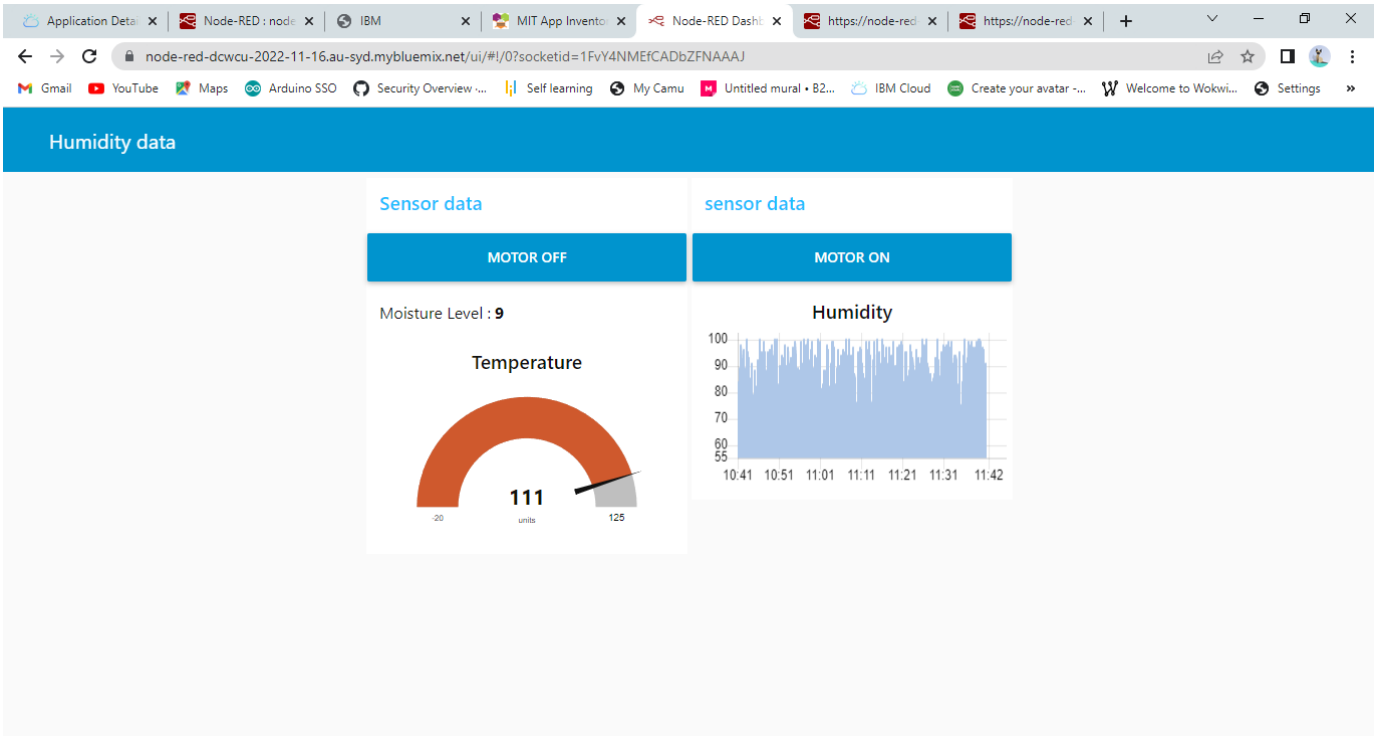


8.2 User Acceptance Testing



9. RESULTS

9.1 Performance Metrices



10. ADVANTAGES AND DISADVANTAGES

Advantages

- All conservation efforts such as water usage and increased production per land unit directly affect the environmental footprint positively.
- Analyzing production quality and results in correlation to treatment can teach farmers to adjust processes to increase quality of the product.
- Accurately tracking production rates by field over time allows for detailed predicting of future crop yield and value of a farm.
- Automating processes in planting, treatment and harvesting can reduce resource consumption, human error and overall cost.
- Farmers can visualize production levels, soil moisture, sunlight intensity and more in real time and remotely to accelerate decision making process.
- Weather predictions and soil moisture sensors allow for water use only when and where needed.

Disadvantages

- The Cost Involved in Smart Agriculture
- There could be wrong Analysis of Weather Conditions
- Farmers are not used to these high-end technologies. They do not understand computer language or the artificial intelligence.
- In the case of equipment like robots and computer-based intelligence for running the devices, it is highly unlikely that a normal farmer will be able to possess this knowledge or even develop them.
- The use of technology in farming and agriculture making it smart agriculture, is of course, a good initiative and a much-needed one with the present increasing demand in the food supply.

11. CONCULSION

Smart farming can make agriculture more profitable for the farmer. Decreasing resource inputs will save the farmer money and labor, and increased reliability of spatially explicit data will reduce risks.The envisaged smart farming the coming years is not just a rudimentary vision, but a path for research, technological development and most importantly for innovation. New IoT based solutions that are making an optimal usage of digital devices and the virtual world in challenging as well as harsh environments are promising a huge impact for agri-food business, technology providers and finally for all of us as consumers.

12.FUTURE SCOPE

- Smart farming" is an emerging concept that refers to managing farms using technologies like IoT, robotics, drones and AI to increase the quantity and quality of products while optimizing the human labor required by production.
- The Internet of Things (IoT) has provided ways to improve nearly every industry imaginable. In agriculture, IoT has not only provided solutions to often time-consuming and tedious tasks but is totally changing the way we think about agriculture.

13.APPENDIX

Source code

```
Import wiotp.sdk.device
Import time import os
Import datetime import
Random myConfig = {
“identity”: {
“orgId”: “3j2gcg”,
“typeId”: “ultrasonic”,
“deviceId”: “1407”
},
“auth”: {
“token”: “14073008”
} }
Client = wiotp.sdk.device.DeviceClient (config=myConfig,
logHandlers=None) client.connect () def
myCommandCallback (cmd) :
print (“Message received from IBM IoT Platform: %s” %
cmd.data[‘command’]) m=cmd.data[‘command’] if
(m==”motoron”):
Print (“Motor is switched on”) elif
(m==”motoroff”):
Print (“Motor is switched OFF”)
```

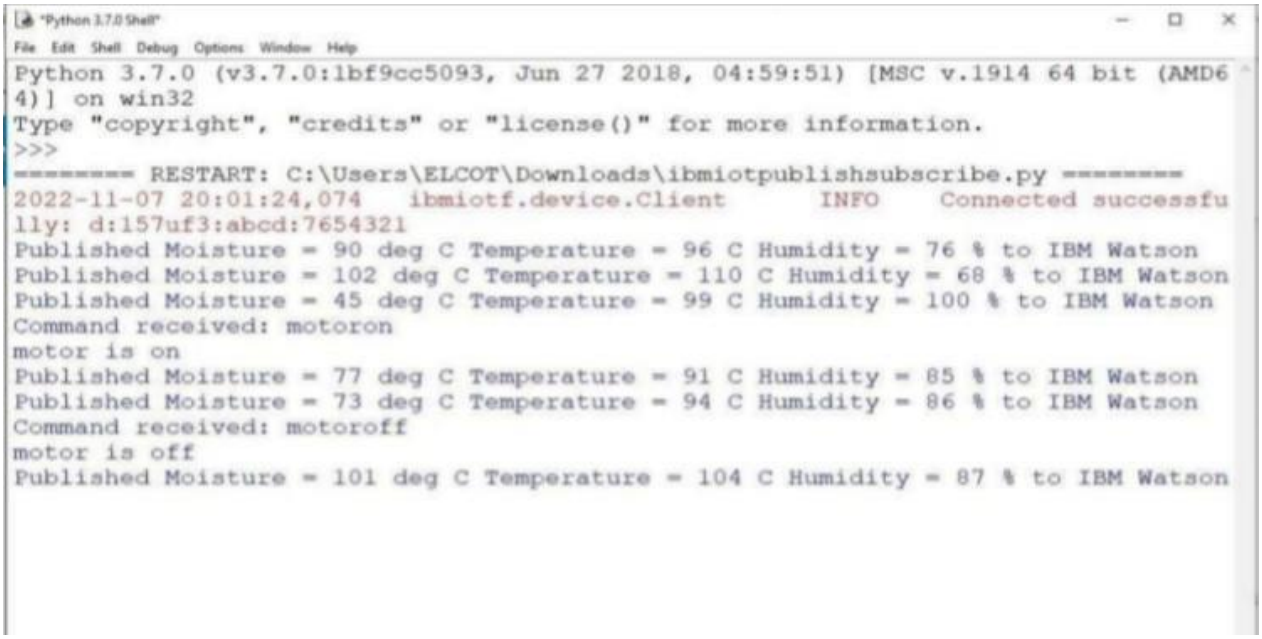
```
Print (“ “) while
True:
Soil=random.ra
Ndint (0,100)
Temp=random.r
Andint (-20,
125)
Hum=random.r
Andint (0, 100)
myData={‘soil
moisture’: soil,
‘temperature’:te
Mp,
‘humidity’:hum
}
Client.publishE
Vent
(eventId=”statu
S”,
msgFormat=”js
on”,
data=myData, qos=0 , onPublish=None) print
(“Published data Successfully: %s”, myData)
```

Time.sleep (2)

Client.commandCallback = myCommandCallback

Client.disconnect ()

Output



Gitup report link:

https://github.com/IBM-EPBL/IBM-Project-29179-1660121837

Project demo link:

https://youtu.be/pzJ8jfmSIto