IOT Based Smart Crop Protection System for Agriculture

AProjectreportsubmittedinpartial fulfillment of7th semesterindegreeOf

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IN

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SubmittedBy

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BONAFIDECERTIFICATE

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ABSTRACT

Limited The growth of the global population coupled with a decline in natural resources, farmland, and the increase in unpredictable environmental conditions leads to food security becoming a major concern for all nations worldwide. These problems are motivators that are driving the agricultural industry to transition to smart agriculture with the application of the internet of things(IOT) and big data solutions to improve operational efficiency and productivity. The IOT integrates a seriesof existing state of the art solutions and technologies, such as wireless sensor networks, cognitive radio ad hoc networks, cloud computing, big data and end user applications. This study presents a survey of IOT solutions and demonstrates how IOT can be integrated into the smart agriculture sector.

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1.Introduction :

In order to meet the current global needs of humanity, new solutions and technologies are constantly being proposed and implemented. This has led to the advent of the Internet of Things (IoT) . IoT is defined as the network of all objects that are embedded within devices, sensors, machines, software and people through the Internet environment to communicate, exchange information and interact in order to provide a comprehensive solution between the real world and the virtual world . In recent years, IoT has been applied in a series of domains, such as smart homes, smart cities , smart energy , autonomous vehicles , smart agriculture, campus management], healthcare, and logistics. An illustration of rich and diverse IoT applications for smart agriculture.In the smart agricultural sector, automation solutions and technologies, mechanical machines, knowledge, decision-making tools, services, and software are integrated seamlessly to help farmers improve productivity, product quality, and profitability.

PROJECT OBJECTIVE:

•It protects the plant the crop from decaying due to excess flow of water It greatly reduces the farmer's time

- Gradual intrusion of technology in agriculture
- which makes the agriculture easier
- Production can't be affected by water factor
- Make high profit with minimal capital

Bytheend ofthisprojectyouwill:

- World is reconstructed with emerging technology which makes the human life to be simpler and more simpler. In this project, we try to implement IOT in the agriculture. Idealogy behind this project is to protect the crops in the field and thereby no affect in the production.

2.LITERATURE SURVEY

2.1 REFERENCES

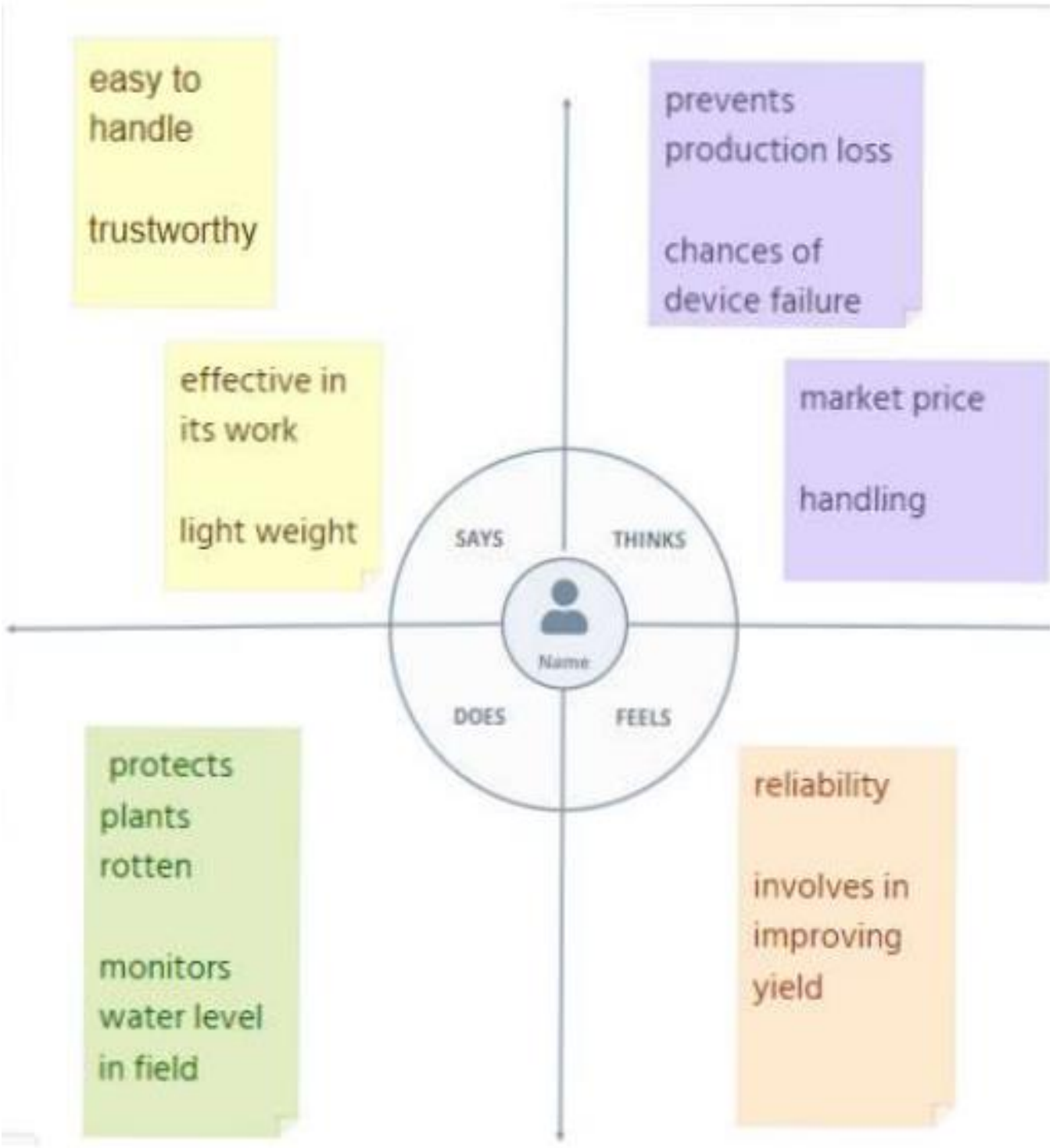
[1] Dahane, A., Benameur, R., Kechar, B., & Benyamina, A. (2020, October). An IoT basedsmart farming system using machine learning. In 2020 International Symposium on Networks, Computers and Communications (ISNCC) (pp. 1-6). IEEE. [2] Farooq, M. S., Riaz, S., Abid, A., Abid, K., & Naeem, M. A. (2019). A Survey on the Role ofIoT in Agriculture for the Implementation of Smart Farming. Ieee Access, 7, 156237-156271.

2.2 PROBLEMSTATEMENTDEFINITION

[1] The author describes farming is the backbone of the economy and it is the fundamental method for occupation. The large population of the world depends on farming for living day to day life. Around 70% of the Indian population depends on cultivation. Most of the cultivation cannot be productive only by physical activities so have to be handled by innovative technologies. Therefore, they use IoT innovation and SMS notification to address the critical part of farming. The past method of incorporating a keen water supply system with smart ideas. This undertaking is a follow up to a past method whose highlight features incorporates a keen water system with excellent control and insightful basic leadership in terms of exact continuous field information which regulates temperature, moisture and soil dampness of a particular crop. Controlling of every one of these activities will be monitored by PC with Internet and the tasks being performed by interfacing sensors and Arduino. With the observation results decisions are to be made. [2] The author describes internet of Things (IoT) technology has brought revolution to each and every field of the 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 an 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 Wifi 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.

3.IDEATION&PROPOSED SOLUTION:

3.1 EMPATHYMAPCANVAS



3.3 PROPOSED SOLUTION :

ProposedSolutionTemplate:

Projectteamshallfillthefollowinginformationinproposedsolutiontemplate.

S.No.	Parameter	Description
1.	ProblemStatement(Problemtobesolved)	Due to advancement in irrigation system and electric pumps farmers need to spend their entire time in the field to irrigate. They can leave the field once start the electric motor and water is dispatched to fields by irrigation system. sometimes overflow of water to fields happens results decaying of plant's root. So, we designed a device to monitor the water level in the field that is optable for the crop.
2.	Idea/Solutiondescription	Our device monitor the water level in the field and if it rises certain level an alert message send the farmer and he can stop the electric motor using his mobile phone. This would reduce the crop damage and water loss.
3.	Novelty/Uniqueness	It sharply monitors the water level in the field.
4.	SocialImpact/CustomerSatisfaction	By using this device customer can feel more relax and he restricted to go farm often.
5.	BusinessModel(RevenueModel)	Cost effective.
6.	ScalabilityoftheSolution	It works finer until it gets damage. There is no handling issue occurs.

3.4 PROBLEM SOLUTION FIT:

Project Title : **IOT Based Smart Crop Protection System for Agriculture**
Team id : PNT2022TMID33628

1.Customer segments Farmers are the customers who are unaware about the water level in the field while they irrigate the field using modern irrigation systems.	**2.Customer constrains** Constraint that customer will face about safety of the device which landed in the field.	**5.Available solutions** Solution which we prepared for this is using sensor to monitor water level and then gives alert message to farmers when it reaches threshold water level.
2. Jobs to be done Use sensors to measure the threshold water level in the field.	**9. Problem route cause** Inability to check the water level in the field while he is away from the field can face the consequence.	**5. Behavior** Taking caring about the device in the field.
3. Triggers Some of the triggers are advertisements in the television and information from the experts.	**10. Solution** Farmers unable to check the water level in the field while he is away from the field by using IOT based smart crop protection device.Farmers can easily monitor the water level in the field.	8. Channels of behavior 8. 1 **online** Farmers can know the working nature of device through online and can seek help from experts.
4. **Emotions** With the modern irrigation risk of accumulation of water in field results plant decay but this device overcomes that defect.		8. 2: **offline** Farmers can reach nearby showrooms to buy the device and also for repair.

4.REQUIREMENT ANALYSIS:

4.1FunctionalRequirements:

Followingarethefunctionalrequirementsoftheproposedsolution.

FR No.	FunctionalRequirement(Epic)	FUNCTIONS
FR-1	Moisture sensor	Confirms the presence of moisture in the field
FR-2	Float switch	Indicates the depth of water level in the field
FR-3	Arduino	Reads &process the input and control the outputs

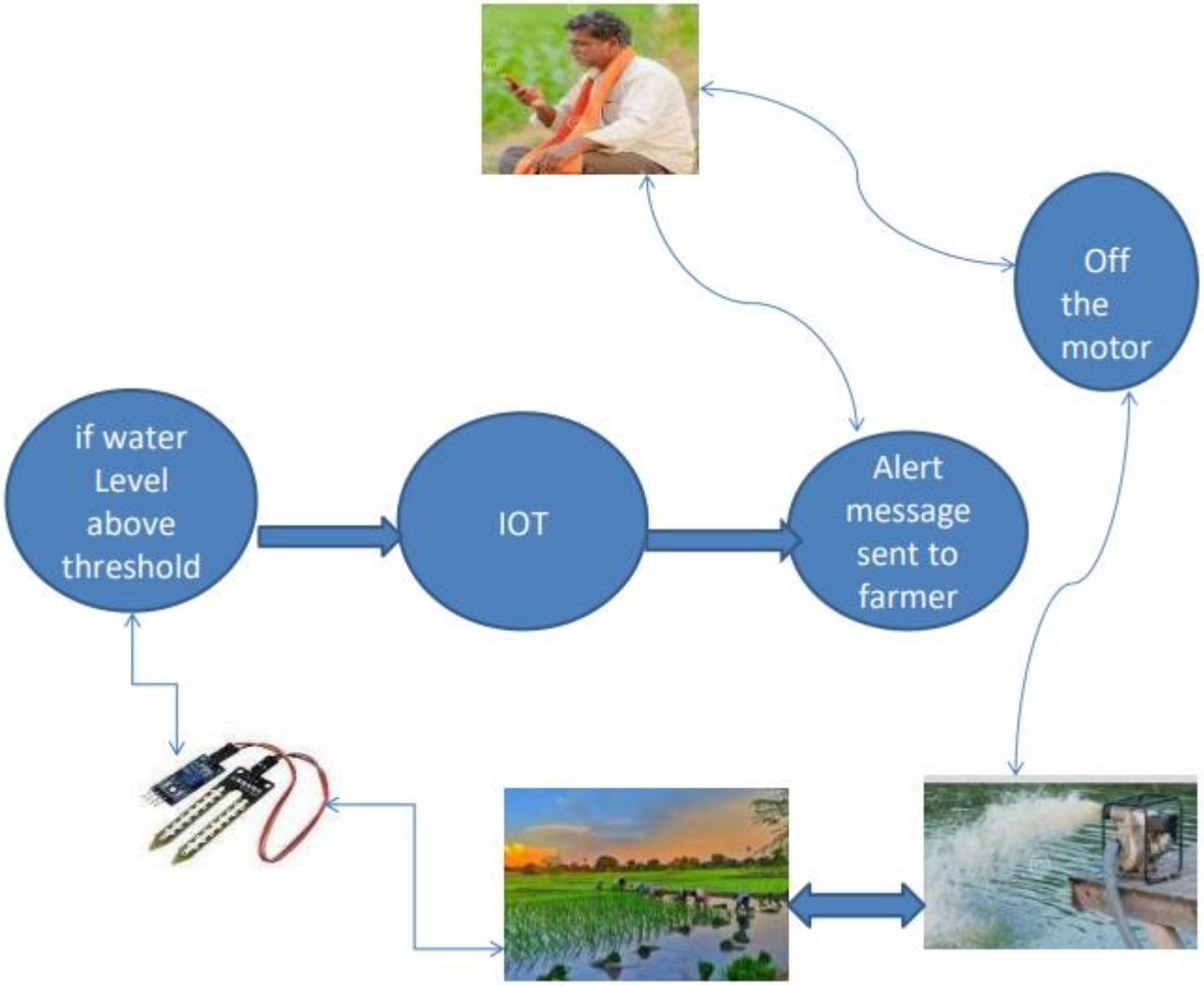
4.2 Non-functionalRequirements:

Followingarethenon-functionalrequirementsoftheproposedsolution.

FR No.	Non-FunctionalRequirement	Description
NFR-1	**Usability**	User-Friendly Application.
NFR-2	**Cost**	Affordable cost
NFR-3	**Reliability**	Highly trustable and works for long time.
NFR-4	**Performance**	Precise measurement and notifies instantly.
NFR-5	**Availability**	The solution can be used in many countries. This model can be used at any time anywhere.
NFR-6	**Scalability**	Reaching the on-scale requirement of the user.

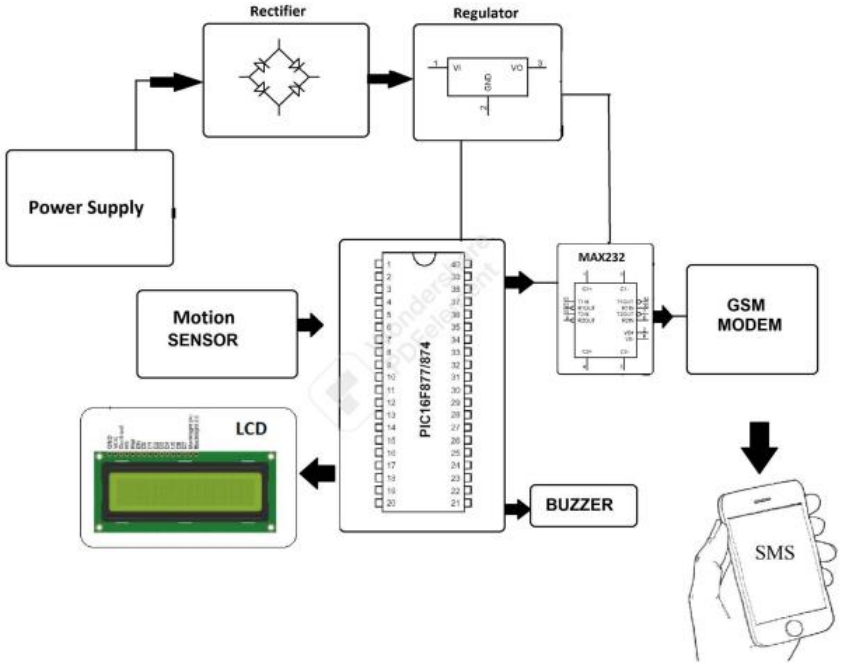
5. PROJECT DESIGN:

5.1 DATA FLOW DIAGRAMS:

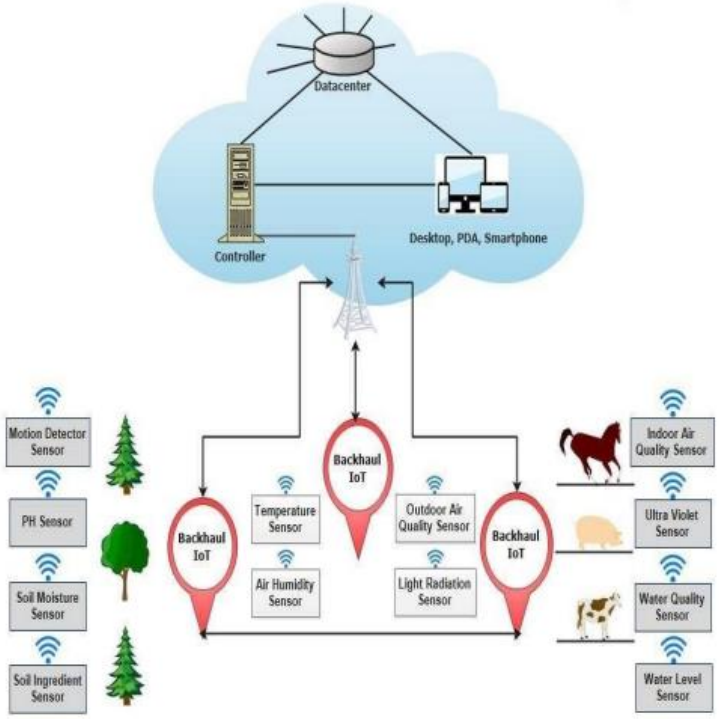


5.2 **SOLUTION & TECHINICAL ARCHITECTURE:**

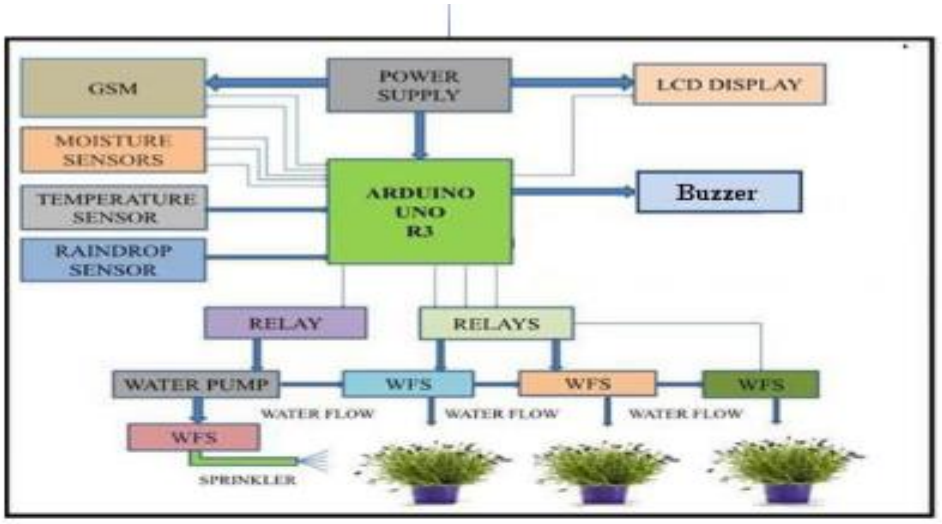
Solution Architecture Diagram:



Technical Architecture:



5.3 USER STORIES:



User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Farmer		USN-1	As a farmer have care on water level in the field.	So to monitor the water level in the field to protect the crop.	High	Sprint-1
		USN-2	As a farmer, he will receive notification regarding the water level in the field.	I can receive the notification regarding the water level.	High	Sprint-1
Customer		USN-3	As a user, he can know the water level wherever he is being.	I can know and monitor water level.	High	Sprint-1
		USN-4	As a user, I will receive the notification via GSM.	I can receive notification.	High	Sprint-1

6. PROJECT PLANING & SCHEDULING:

6.1 SPRINT DELIVERY SCHEDULE:

ProductBacklog,SprintSchedule,andEstimation

Usethebelowtemplate to createproductbacklogandsprintschedule

Sprint	FunctionalRequirement(Epic)	User StoryNumber	UserStory/Task	StoryPoints	Priority	TeamMembers
Sprint-1		US-1	Create the IBM Cloud services which are being used in this project.	6	High	Thiyagarajan R Vignesh R Praveenkumar K Santhosh M
Sprint-1		US-2	Configure the IBM Cloud services which are being used in completing this project.	4	Medium	Thiyagarajan R Vignesh R Praveenkumar K Santhosh M
Sprint-2		US-3	IBM Watson IoT platform acts as the mediator to connect the web application to IoT devices, so create the IBM Watson IoT platform.	5	Medium	Thiyagarajan R Vignesh R Praveenkumar K Santhosh M
Sprint-2		US-4	In order to connect the IoT device to the IBM cloud, create a device in the IBM Watson IoT platform and get the device credentials..	5	High	Thiyagarajan R Vignesh R Praveenkumar K Santhosh M
Sprint-3		US-1	Configure the connection security and create API keys that are used in the Node-RED service for accessing the IBM IoT Platform.	10	High	Thiyagarajan R Vignesh R Praveenkumar K Santhosh M

Sprint - 3		US - 2	Create a Node -RED service.	10	High	Thiyagarajan R Vignesh R Praveenkumar K Santhosh M
Sprint-3		US-1	Develop a python script to publish random sensor data such as temperature, moisture, soil and humidity to the IBM IoT platform	7	High	Thiyagarajan R Vignesh R Praveenkumar K Santhosh M
Sprint-3		US-2	After developing python code, commands are received just print the statements which represent the control of the devices..	5	Medium	Thiyagarajan R Vignesh R Praveenkumar K Santhosh M
Sprint-4		US-3	Publish Data to The IBM Cloud.	8	High	Thiyagarajan R Vignesh R Praveenkumar K Santhosh M
Sprint-4		US-1	Create Web UI in Node - Red	10	High	Thiyagarajan R Vignesh R Praveenkumar K Santhosh M
Sprint-4		US-2	Configure the Node -RED flow to receive data from the IBM IoT platform and also use Cloudant DB nodes to store the received sensor data in the cloudant DB.	10	High	Thiyagarajan R Vignesh R Praveenkumar K Santhosh M

ProjectTracker,Velocity&BurndownChart:

Sprint	Total StoryPoints	Duration	SprintStart Date	SprintEndDate(Planned)	Story PointsCompleted (as onPlannedEndDate)	Sprint Release Date(Actual)
Sprint-1	20	6Days	25 Oct2022	30 Oct 2022	20	30 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov2022	20	05 Nov2022
Sprint-3	20	6 Days	09 Nov2022	14 Nov2022	20	14 Nov2022
Sprint-4	20	6 Days	16 Nov 2022	21 Nov2022	20	21 Nov2022

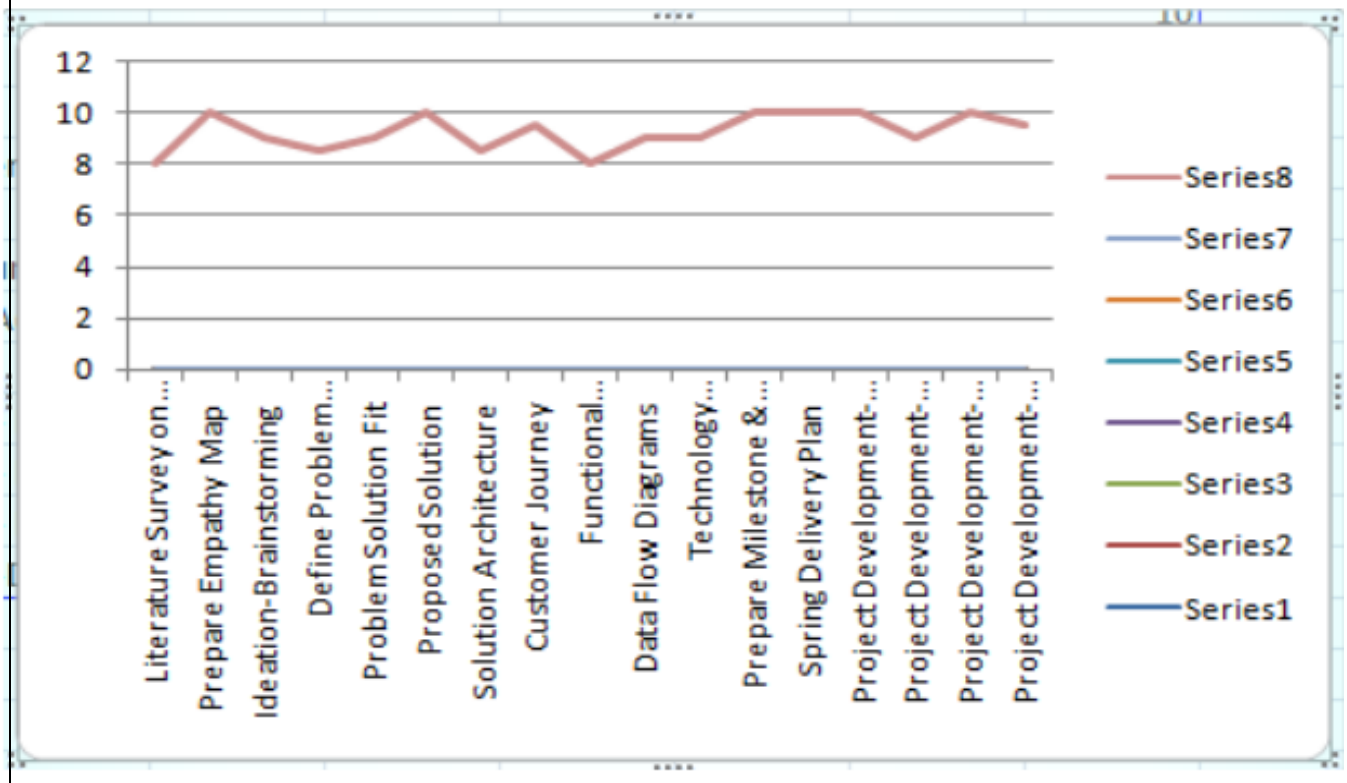
Velocity:

Imaginewehavea5-daysprint duration,andthevelocityoftheteam
Is20(pointspersprint).Let'scalculatetheteam'saveragevelocity(AV)periterationunit(storypointsperday)

AV=SprintDuration/Velocity= 20/10 = 2

BurndownChart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies suchas Scrum.However,burndownchartscanbeappliedtoanyprojectcontainingmeasurable progress overtime.

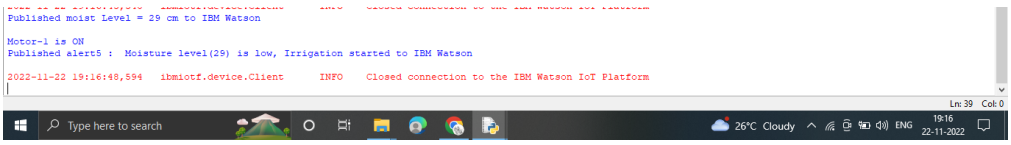


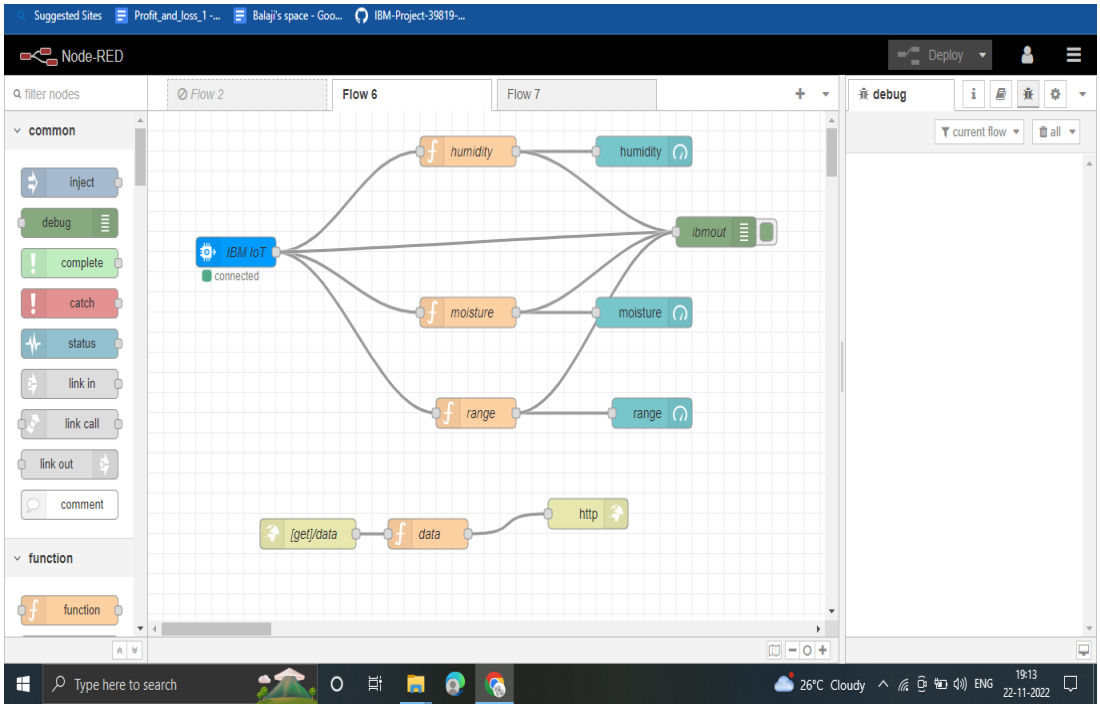
7. CODING & SOLUTIONING

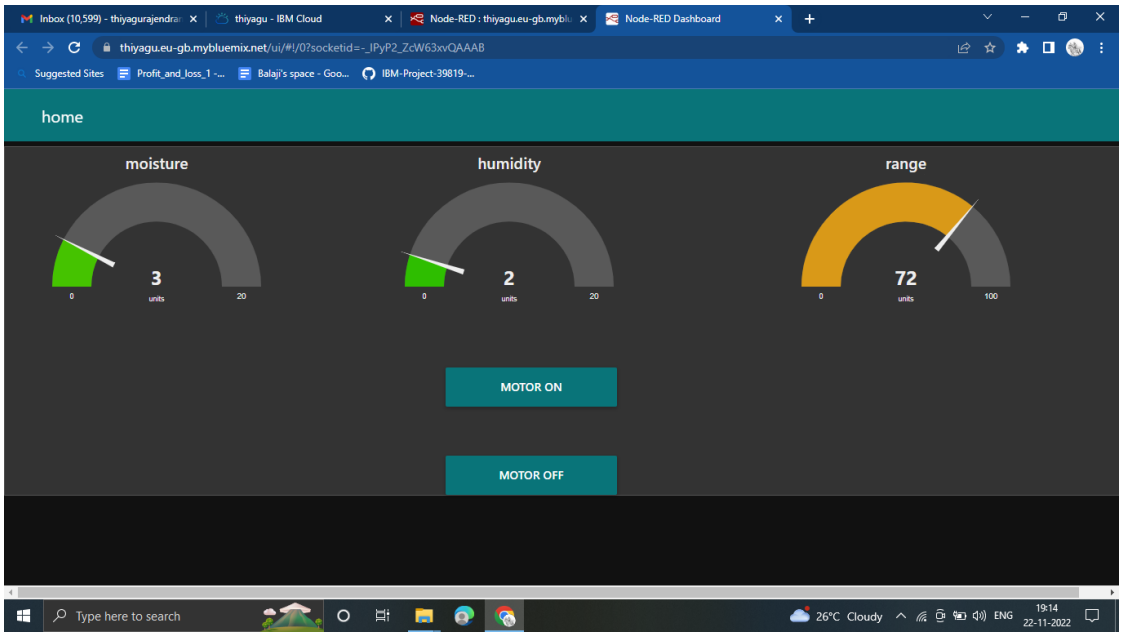
```
import random
import ibmiotf.application
import ibmiotf.device
from time import sleep
import sys
organization = "nkmios"
deviceType = "thiyagu_1"
deviceId = "6382894739"
authMethod = "token"
authToken = "Yf7itNpC@hSU2naWmA"
def myCommandCallback(cmd):
   print("Command received: %s" % cmd.data['command'])
   print(cmd)
try:
deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-method":
authMethod, "auth-token": authToken}
deviceCli = ibmiotf.device.Client(deviceOptions)
except Exception as e:
    print("Caught exception connecting device: %s" % str(e))
    sys.exit()
#Connecting to IBM watson.
deviceCli.connect()
while True:
#Getting values from sensors.
temp_sensor =  random.randint(0,80)

 moist_level = random.randint(0,100)
 humidity_level = random.randint(0,30)

 temp_data = { 'Temperature' : temp_sensor }

 moist_data = { 'Moisture Level' : moist_level}
 humidity_data = { 'Humidity level' : humidity_level}
 success = deviceCli.publishEvent("Temperature sensor", "json", temp_data, qos=0)
 sleep(1)
 if success :
    print (" ....................publish ok..... ")
```

```
    print ("Published Temperature = %s C" % temp_sensor, "to IBM Watson")
  if success:
    print ("Published Moisture Level = %s " % moist_level, "to IBM Watson")

  success = deviceCli.publishEvent("moist_level", "json", moist_data, qos=0)
  sleep(1)
  if not success:
     print ("Published moist Level = %s cm" % moist_level, "to IBM Watson")
     print ("")  #To send alert message if Moisture level is LOW and to Turn ON Motor-1 for
irrigation.
     if (moist_level <30):
       print("Motor-1 is ON")
       success = deviceCli.publishEvent("Alert5", "json", { 'alert5' : "Moisture level(%s) is low
Irrigation started" %moist_level }, qos=0)
       sleep(1)
       if not success:
        print('Published alert5 : ' , "Moisture level(%s) is low, Irrigation started" %moist_level,"to
IBM Watson" )
        print("")
     else:
       print("Motor-1 is OFF")
       print("")

#command recived by farmer
  deviceCli.commandCallback = myCommandCallback
# Disconnect the device and application from the cloud
  deviceCli.disconnect()
```

8.Testing







9. Results:

- Over irrigation of field can be reduced.
- Need not schedule time for irrigation.
- We can irrigate the anywhere in the globe.

10.AdvantagesandDisadvantages

Advantages:

- Using this device farmer can monitor the field at remote.
- So, it reduces the time considerably.
- It prevents the plant from over irrigation.

Disadvantages:

- Illiterate farmers can't access the device without proper guidance.
- Sensors may get affected due to animals.

11.Conclusion

In this way we have design our smart crop protections system using IOT These different components are helps us to build the mythology of this project and improve the more feature with the help of IOT devices. This project will help farmers in protecting their orchards and fields and save them from significant financial losses and will save them from the unproductive efforts that they endure for the protection of their fields. This will help them in achieving better crop yieldsmart thus leading to their economic wellbeing.

12.Future Scope

The Internet of Things is a huge opportunity for farmers to monitor crops and increase productivity. Satellites, drones, wireless sensor networks,analytical farming devices systems, farm management systems, big data applied to the farm and food management chain are all examples of IoT and smart farming.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.IoT smart agriculture products are designed to help monitor crop fields using sensors and by automating irrigation systems. As a result, farmers and associated brands can easily monitor the field conditions from anywhere without any hassle.

demo link: https://drive.google.com/file/d/1_5Nlf8_PtruRIWJ1UWVevJ4WKGZ0yWcZ/view?usp=drivesdk