PROJECT REPORT

Project Name: SMARTFARMER- IOT ENABLED SMART FARMING APPLICATION

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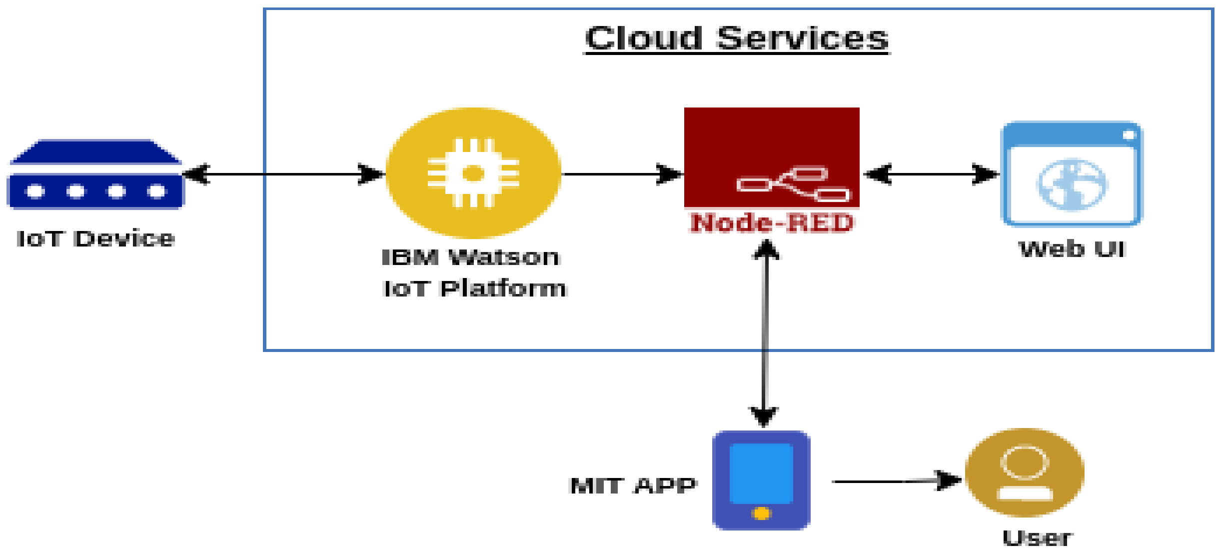
Saritha P

1. INTRODUCTION

1.1 Project Overview

IoT-based agriculture system helps the farmer in monitoring different parameters of his field like soil moisture, Temperature, 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.



1.2 PURPOSE

The smart agriculture model main aim **to avoid water wastage in the irrigation process**. It is low cost and efficient system Is shown below. It includes NodeMCU, Arduino Nano, sensors like soil moisture and Dht11, solenoid valves, relays.

2.LITERATURE SURVEY

2.2 Existing 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. When integrated, the use of data analytics can reduce the overall cost of agriculture and contribute to higher production from the same amount of area through precise control of water, fertilizer and light. Smart methods allow for farming on smaller and more distributed lands through remote monitoring, whether indoor or outdoor.

To successfully deploy a smart agriculture system, consider setting up a communications network that can integrate a limited number of sensors across a large area of farmland. This will require third-party network provisioning or setting up a private network consisting of access points and uplinks to a private backhaul network, which channels all the data traffic to centralized monitoring software or an analytics head-end system

• It is not a secure system.

• There is no motion detection for protection of agriculture field.

• Automation is not available.

2.2 References

[1] YemeserachMekonnen,LamarBurton,ArifSarwat,ShekharBhansali DepartmentofElectricalandComputerEngineering,FloridaInternationalUniversity, Miami,Email:{ymeko001,lburt004,asarwat,Sbhansa}@fiu.edu

[2]AN IOT BASED SMART AGRICULTURE SYSTEM
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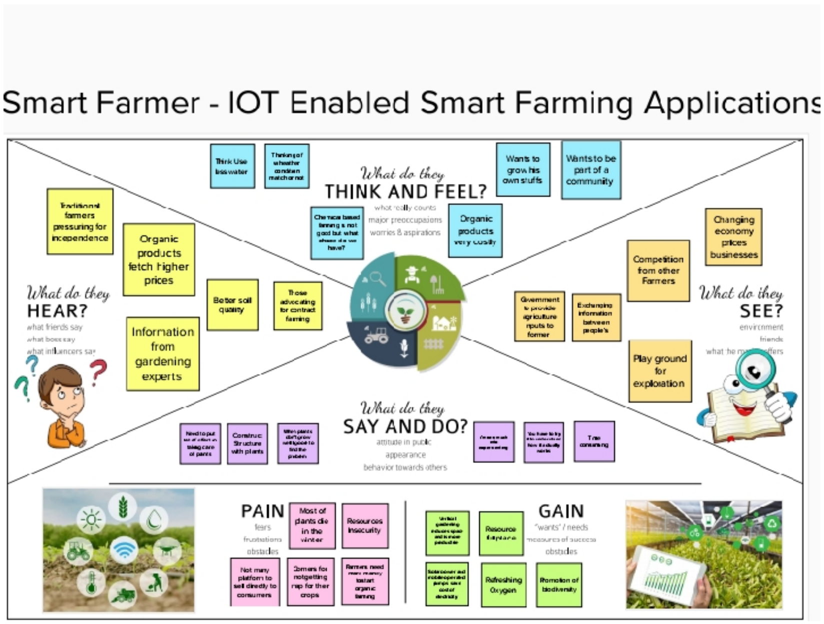
[4]Nikesh Gondchawar and R. S. Kawitkar, "IoT based Smart Agriculture", International Journal of Advanced Research in Computer and Communication Engineering, vol. 5, no. 6, pp. 2278-1021, June 2016

2.3 Problem Statement Definition

The soil moisture sensor measures wetness content in the soil. The Arduino UNO microcontroller used to receive input from a various sensors and it can be controlled automatically. When soil moisture sensor goes low the water pump will be on and it exceeds defined levels of the water motor will turn off automatically. We can constantly monitor the growth of a crop using ultrasonic sensor. PIR sensor detects the motion or unusual movement in the agricultural land. This device his very helpful to the former to monitor and control environmental parameters at their field. The farmers did not go to theirfield, they can remotely monitor and control using cloud.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2Ideation and Brainstorming

Introduction on Internet of Things (IoT), application of IoT in agricultural field to improve the yield and quality by reducing the cost is provided. The sensors which are used in the architecture are discussed briefly and the process of transmission of data from the agriculture field to the central system is explained. The proposed system advantages are included. In addition, open research issues, challenges, and future of IoT in agricultural field are highlighted. The concept is basically developed on an idea, where there are numerous things or objects - such as Arduino, sensors, GSM models, LCD display, etc., that are connected with the Internet. Each of the objects has a different address and is able to interact with other items. The things or objects co-operate with each other to reach a common goal.

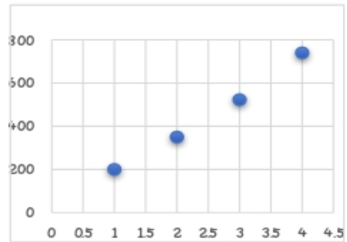
We are going to construct a smart agricultural monitoring system which can collect crucial agricultural data and send it to an IoT platform called Thingspeak in real time where the data can be logged and analyzed. The logged data on Thingspeak is in graphical format, a botanist or a reasonably knowledged farmer can analyze the data (from anywhere in the world) to make sensible changes in the supplied resources (to crops) to obtain high quality yield.

Smart agriculture monitoring system or simply smart farming is an emerging technology concept where data from several agricultural fields ranging from small to large scale and its surrounding are collected using smart electronic sensors. The collected data are analyzed by experts and local farmers to draw short term and long-term conclusion on weather pattern, soil fertility, current quality of crops, amount of water that will be required for next week to a month etc.

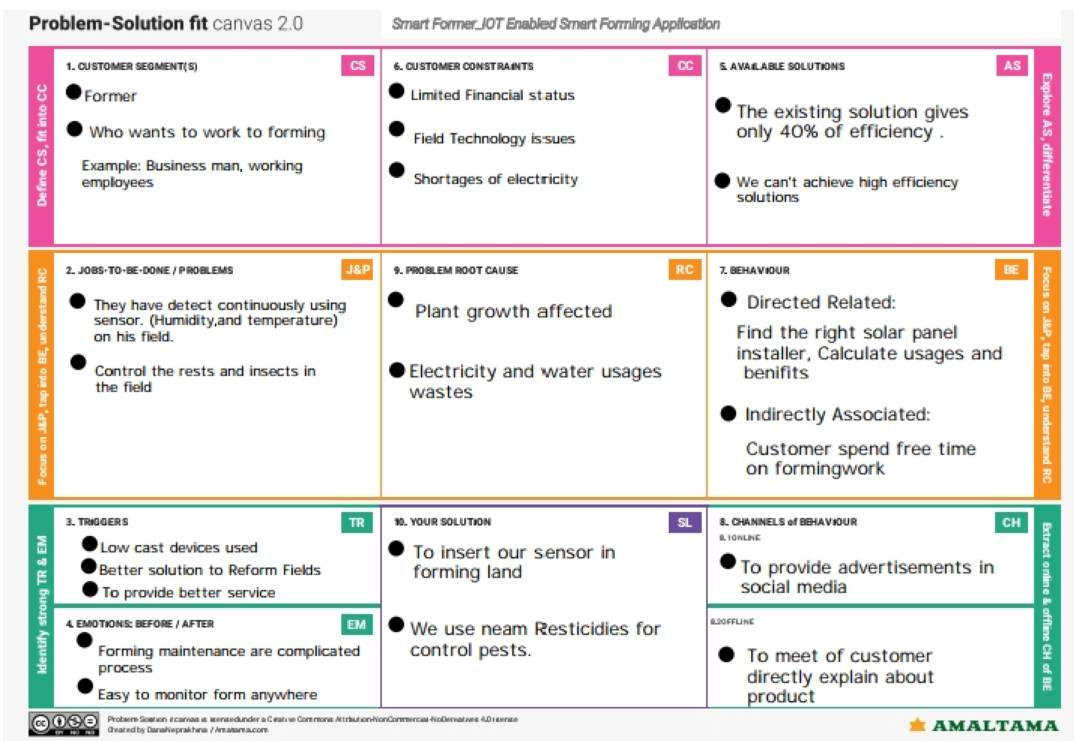
We can take smart farming a step further by automating several parts of farming, for example smart irrigation and water management. We can apply predictive algorithms on microcontrollers or SoC to calculate the amount of water that will be required today for a particular agriculture field. Say, if there was rain yesterday and the quantity of water required today is going to be less. Similarly, if humidity was high the evaporation of water at upper ground level is going to be less, so water required will be less than normal, thus reducing water usage.

3.3 Proposed Solution

S.No.	**Parameter**	**Description**
1.	Problem Statement (Problem to be solved)	• monitering the field is often, very difficult for the formers. • Watering the field is a difficult process,farmers have to wait in the field until the water covers the whole farm field. • Continuous monitering the soil moiture level,temperature level,and humidity levels are need for farmers, because it affects growth in plant and crop yield. • Power supply is one of the problems ,because in village side ,available electricity is very low.
2.	Idea / Solution description	• We can use sensors ,it collect the values of temperature,humidity and soil moiture.Through this increase the growth in plant and crop yield. • we can use time control systems for motor on&off . • To use drones ,it monitoring the crop condition.
3.	Novelty / Uniqueness	**Remote access:** • **It helps the farmers to monitor the field and operate the motor from anywhere.** **Allert messages:** • **IOT sensor nodes collect the information from the forming environment ,such as soil moiture, air humidity, temperature,pest images and water quality , then transmit collected data to IOT backhaul device.**

4.	Social Impact / Customer Satisfaction	• It saves the lot of times. • It reduces the wages for labours in agriculture field. • IOT can help improve customer relationship by enhancing the custormers overall experience. • Iot can also helps in e-commerce business and increase sales. • It makes a wealthy society.
5.	Business Model (Revenue Model)	Revenue (No. of Users vs Months) 
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



4.Requirement Analysis

4.1Functional Requirement

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Log in to system	Check Credentials Check Roles of Access.
FR-4	Manage Modules	Manage System Admins Manage Roles of User Manage User permission
FR-5	Check whether details	Temperature details Humidity details
FR-6	Log out	Exit

5.PRODUCT DESIGN

5.1Data flow diagrams

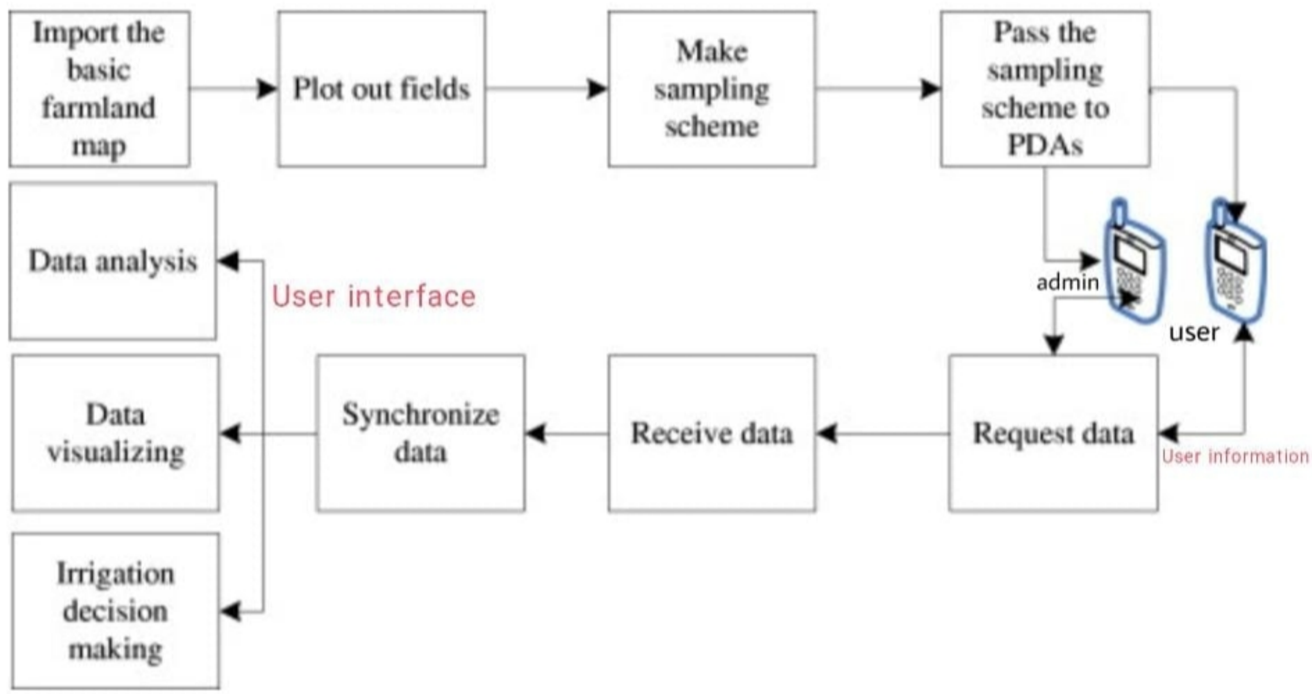
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

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

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

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

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



5.2Solution and Technical Architecture

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2 Guidelines:

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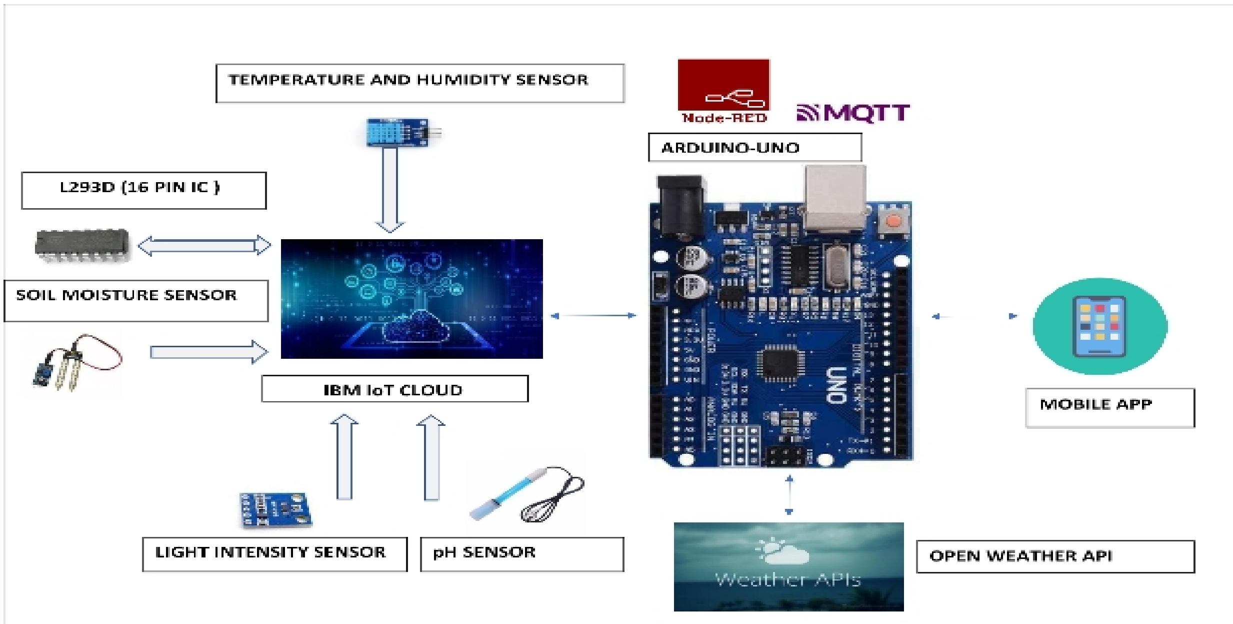


6.PROJECT PLANNING AND SCHEDULING

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Mobile/web user Registeration	USN-1	As a user I can register the application by entering my email, password so that feel good	10	High	Kabilan S
Sprint-1		USN-2	As a user I want confirmation mail forregistration	10	Medium	Hema malini S
Sprint-2	Mobile/web userLogin	USN-3	As a user I can login the application by entering my email and password so that am entering the application	10	High	AbarJitha.R
Sprint-2		USN-4	As a user I can login to the application by entering my phone number so can easily enterinto the dashboard	10	Low	Gayathri.C
Sprint-3	Monitoring and controlling	USN-5	As a user I want smart application sothat monitor the fields	2	High	Kabilan.S
Sprint-3		USN-6	As a user I want to know the temperature levelso that easily know irrigation timing	5	High	Saritha P
Sprint-3		USN-7	As a user I want to check the humidity sothat helpful to put water	5	Low	AbarJitha.R
Sprint-3		USN-8	As a user I wants smart application sothat monitor anywhere at anytime	3	Low	Gayathri.C
Sprint-3		USN-9	As a user I want motor control so thatstop water wastage	5	High	Kabilan.S

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-4	Software connection	USN-10	As a admin I want to satisfy their users sothat connect & store in Ibm iot	5	Medium	Abar,jitha.R
Sprint-4		USN-11	As a admin I want to make software (node red,ibm Watson) connection so that simulate the values	5	Medium	Kabilan.S
Sprint-4		USN-12	As a admin I want to test the application sothat know it's work or not	10	High	Hema malini S

7.CODING AND SOLUTIONING

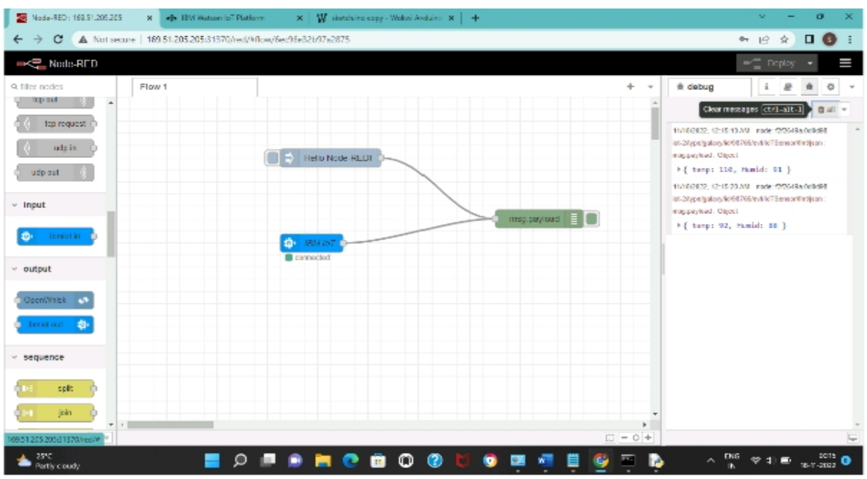
7.1 Feature

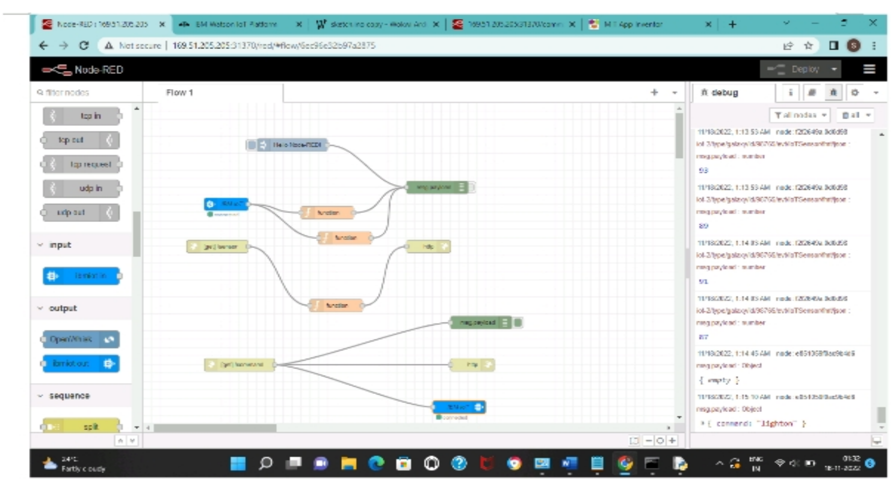
```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random


#Provide your IBM Watson Device Credentials
organization = "hde0t6"
deviceType = "galaxy"
deviceId = "98765"
authMethod = "token"
authToken = "987654321"


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


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


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


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


while True:
        #Get Sensor Data from DHT11

        temp=random.randint(90,110)
        Humid=random.randint(60,100)

        data = { 'temp' : temp, 'Humid': Humid }
        #print data
        def myOnPublishCallback():
            print ("Published Temperature = %s C" % temp, "Humidity = %s %%" % Humid, "to
IBM Watson")


        success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0, on_publish=
myOnPublishCallback)
        if not success:
            print("Not connected to IoTF")
        time.sleep(10)

        deviceCli.commandCallback = myCommandCallback


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

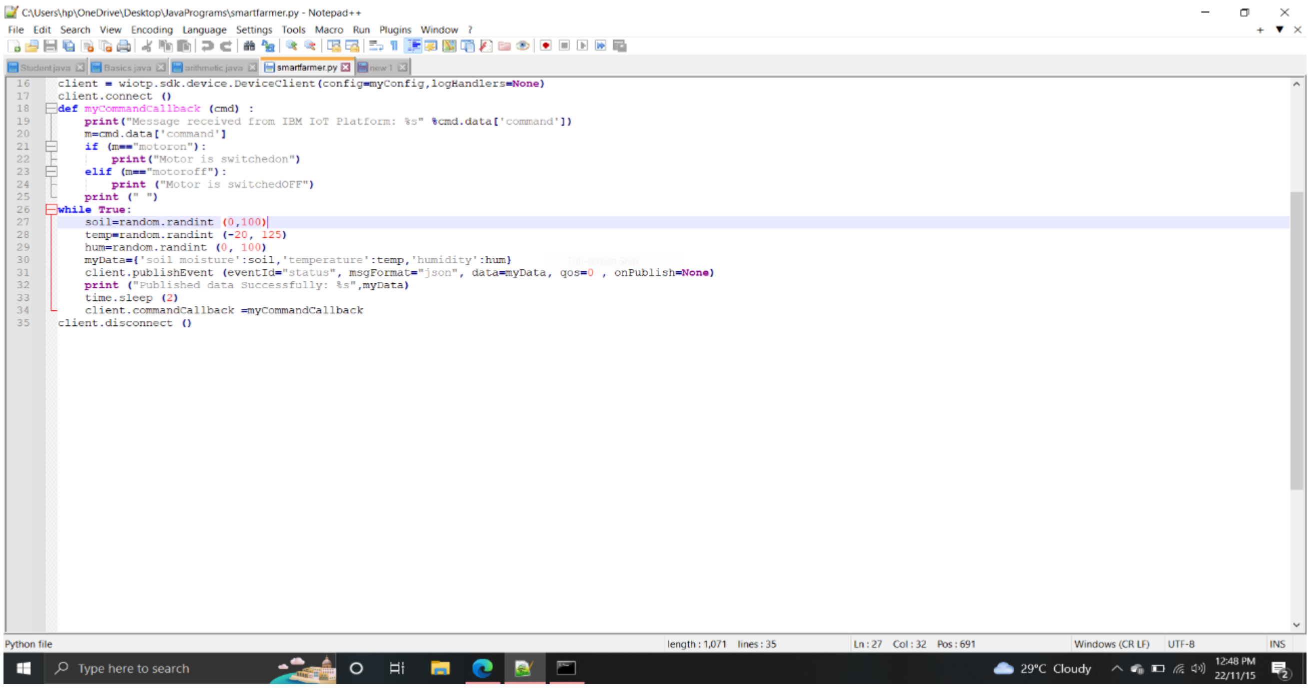
8.TESTING

8.1 Test case

Web application using Node Red







C:\Users\hp\OneDrive\Desktop\JavaPrograms\smartfarmer.py - Notepad++
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?
Student.java
Basics.java
arithmetic.java
smartfarmer.py
new 1
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 switchedon")
    elif (m=="motoroff"):
        print ("Motor is switchedOFF")
    print (" ")
while True:
    soil=random.randint (0,100)
    temp=random.randint (-20, 125)
    hum=random.randint (0, 100)
    myData={'soil moisture':soil,'temperature':temp,'humidity':hum}
    client.publishEvent (eventId="status", msgFormat="json", data=myData, qos=0 , onPublish=None)
    print ("Published data Successfully: %s",myData)
    time.sleep (2)
    client.commandCallback =myCommandCallback
client.disconnect ()
Python file
length : 1,071 lines : 35
Ln : 27 Col : 32 Pos : 691
Windows (CR LF) UTF-8 INS
Type here to search
29°C Cloudy
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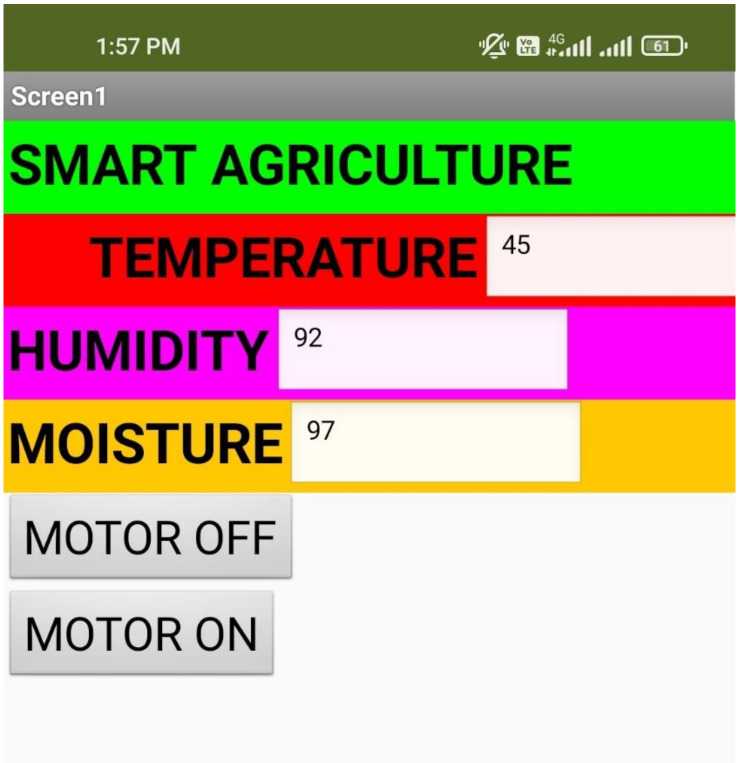
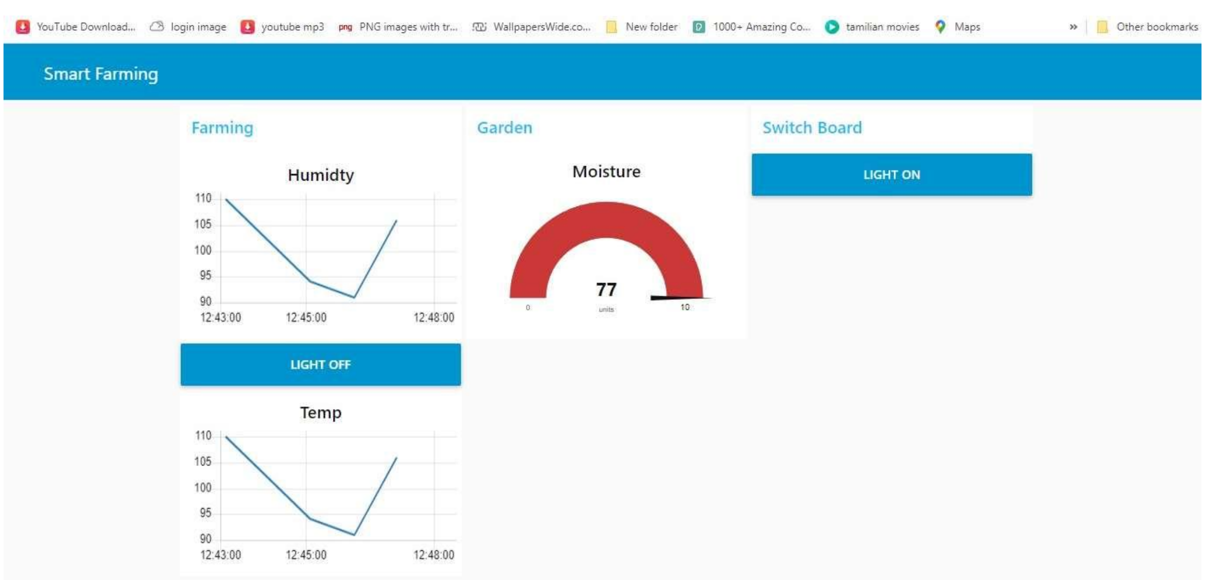
8.2 User Acceptance Testing



9.RESULTS

9.1 Performance Metrics



10.Advantages and disadvantages

Advantages:

- A remote control system can help in working irrigation system valves dependent on schedule. Irrigating remote farm properties can be exceptionally troublesome and labor-intensive. It gets hard to comprehend when the valves were started and whether the ideal measure of water was distributed.
- For situations where a quick reaction is required, manual valve actuation may not be conceivable constantly. Thus, remote observing and control of irrigation systems, generators or wind machines or some other motor-driven hardware become the next logical step.
- Various solutions are available to monitor engine statistics and starting or stopping the engine. When the client chooses to begin or stop the motor, the program transmits a sign to the unit within seconds by means of a mobile phone system.
- Submersible weight sensors or ultrasonic sensors can screen the degree of tanks, lakes, wells and different kinds of fluid stockpiling like fuel and compost. The product figures volume dependent on the tank or lake geometry after some time. It conveys alarms dependent on various conditions.

Disadvantages:

- The smart agriculture needs availability of internet continuously. Rural part of most of the developing countries do not fulfil this requirement. Moreover internet connection is slower.
- The smart farming based equipment require farmers to understand and learn the use of technology. This is major challenge in adopting smart agriculture farming at large scale across the countries.

11.CONCLUSION

Farmers can benefit greatly from an IoT-based smart agriculture system. As a result of the lack of irrigation, agriculture suffers. Climate factors such as humidity, temperature, and moisture can be adjusted dependent on the local environmental variables. This technology also detects animal invasions, which are a major cause of crop loss. This technology aids in the scheduling of irrigation based on present data from the field and records from a climate source. It helps in deciding the farmer to whether to do irrigation or not to do. Continuous internet connectivity is required for continuous monitoring of data from sensors. This also can be overcome by using GSM unit as an alternative of mobile app. By GSM, SMS can be sent to farmers phone.

12.Future scope

In the current project we have implemented the project that can protect and maintain the the crop. In this project the farmer monitor and control the field remotely. In future we can add or update few more things to this project

. • We can create few more models of the same project ,so that the farmer can have information of a entire.

• We can update the this project by using solar power mechanism. So that the power supply from electric poles can be replaced with solar panels. It reduces the power line cost. It will be a one time investment. We can add solar fencing technology to this project.

• We can use GSM technology to this project so that the farmers can get the information directly to his home through SMS. This helps the farmer to get information if there is a internet issues.

• We can add camera feature so that the farmer can monitor his field in real time. This helps in avoiding thefts.

13.Appendix

Source Code

```
import wiotp.sdk.device
import time
import os
import datetime
import random
myConfig ={
  "identity": {
      "orgId": "0hzydu",
      "typeId": "NodeMCU",
      "deviceId": "12345"
  },
  "auth": {
    "token": "12345678"
  }
}
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 switchedon")
  elif (m=="motoroff"):
    print ("Motor is switchedOFF")
  print (" ")
while True:
  moist =random.randint (0,100)
  temp=random.randint (-20, 125)
  hum=random.randint (0, 100)
```

```
    myData={'moisture':moist,'temperature':temp,'humidity':hum}
    client.publishEvent (eventId="status", msgFormat="json", data=myData, qos=0 ,
onPublish=None)
    print ("Published data Successfully: %s",myData)
    time.sleep (2)
    client.commandCallback =myCommandCallback
client.disconnect ()
```

Github link: https://github.com/IBM-EPBL/IBM-Project-5909-1658819746