SmartFarmer–IOT Enabled SmartFarming Application

USING PYTHON

A Project report submitted in partial fulfilment of 7th semester in degree of

BACHELOR OF ENGINEERING

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

Submitted by

Team ID : PNT2022TMID43969

Lavanya.V - 723619106008

Supriya.T.V - 723619106015

Sakthivel.M - 723619106012

Thenmozhi.A - 723619106017

Madhumitha - 723619106501

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEEERING

POLLACHI INSTITUTE OF ENGINEERING AND TECHNOLOGY
Pollachi - 642205

BONAFIDE CERTIFICATE

Certified that project report "SMARTFARMER-IOT Enabled SmartFarming Application" is the bonafide record work done by **Lavanya.V - 723619106008 , Supriya.T.V - 723619106015 , Sakthivel.M - 723619106012 , Thenmozhi.A - 723619106017 , Madhumitha -723619106501**forIBM–NALAIYATHIRAN in VII semester of B.E.degree course in Electronics and Communication Engineering branch during the academic year of 2022-2023.

Staff-Incharge **Evaluator**

MRS.NAGA SARATHA MR.BHARADWAJ

HeadoftheDepartment

MR.VIGNESH

ACKNOWLEDGEMENT

We are highly grateful to thank our project coordinator **MRS.NAGASARATHA** and our Project Evaluader **MR. BHARADWAJ** Department of Electronics and Communication Engineering,Pollachi Institute of Engineering and Technology ,Pollachi for the coordinating us throughout this project

We are very much indebted to thank all the faculty members of Department of Electronics and Communication Engineering in our institute,for their excellent moral support and suggestion sto complete our project work successfull

Lavanya V
Supriya TV
Sakthivel M
Thenmozhi A
Madhumitha

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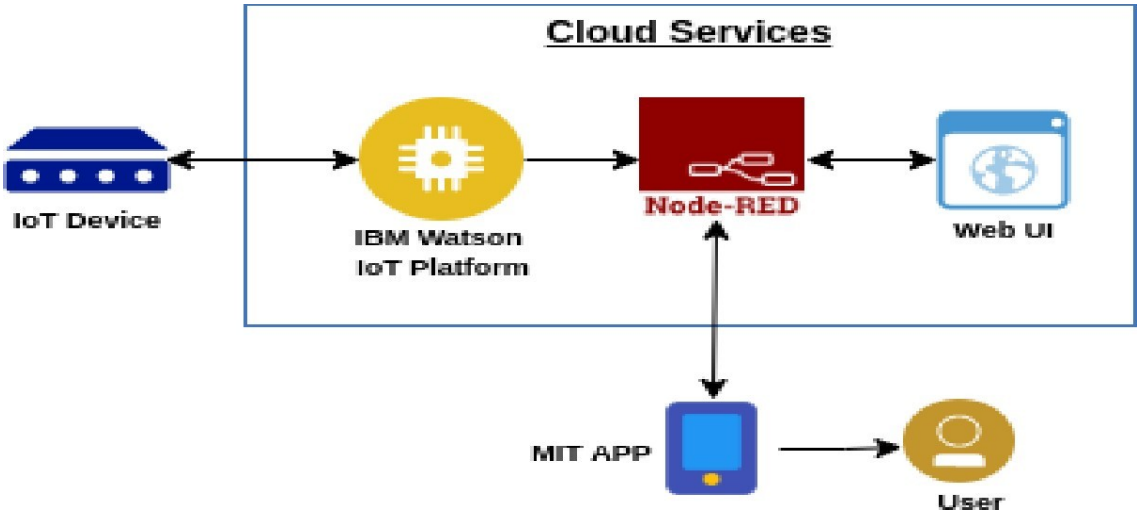
1.INDRIDUCTION

1.1 PROJECTOVERVIEW

Io T -based agriculture system helps the farmer in monitoring differentparameters of his field like soil moisture, Temperature, humidity using somesensors. Farmers can monitor all the sensor parameters by using a web or mobileapplication even if the farmer is not near his field. Watering the crop is one of theimportanttasksforthefarmers.Theycan makethedecisionwhethertowaterthecrop or postpone it by monitoring the sensor parameters and controlling themotorpumps from



1.2 PURPOSE

The smart agriculture model main aim **to avoid water wastage in theirrigation process**. It is low cost and efficient system Is shown below. It includesNodeMCU,Arduinonano,sensorslikesoilmoistureandDht11,solenoidvalves, relays.

2. LITERATURESURVEY

2.1 EXISTINGPROBLEM

The challenges of a smart agriculture system include the integration ofthese sensors and tying the sensor data to the analytics driving automation andresponse activities. When integrated, the use of data analytics can reduce theoverall cost of agriculture and contribute to higher production from the sameamountofareathroughprecisecontrolofwater,fertilizerandlight.Smartmethod s allow for farming on smaller and more distributed lands through remotemonitoring, whether indoor or outdoor. To successfully deploy a smart agriculturesystem,considersettingupacommunicationsnetworkthatcanintegrateali mited number of sensors across a large area of farmland. This will require third-party network provisioning or setting up a private network consisting of accesspoints and uplinks to a private backhaul network, which channels all the datatrafficto centralizedmonitoringsoftwareorananalyticshead-endsystem

- Itisnotasecuresystem.
- Thereis nomotiondetectionforprotectionofagriculture field.
- Automationis notavailable

2.2 REFERENCES

[1] ISSN No:-2456-2165 Volume 4, Issue 2 Feb – 2019: "Solars' Energy: - A safeand reliable, eco-friendly and sustainable Clean Energy Option for Future India: - AReview."[2]UniversalPaperofadvancedscienceandscienceandexplorationtechnol ogy.[2]GRDJournals-GlobalResearchandDevelopmentJournalforEngineering | Volume 4 | Issue 3 |February (2019) ISSN: 2455-5703 “Design andImplementation of an Advanced Security System for Farm Protection from WildAnimals”

[3] International Journal of Innovations in Engineering and Science, ImpactFactor Value 4.046 e ISSN: 2456-3463 Vol.4, No. 5, 2019 “Solar Powered SmartFencingSystemforAgricultureProtectionusingGSM&WirelessCamera”.

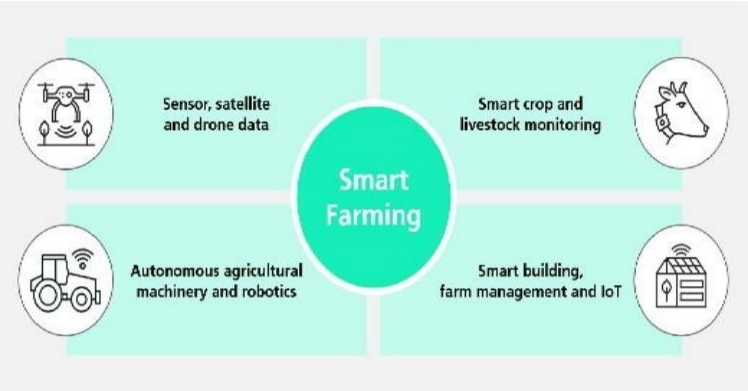
[4] International Journal of Management, Technology AndEngineering ISSNNO : 2249-7455Volume 8, Issue VII, JULY/2018”Protecting Crops From Birds, UsingSound Technology In Agriculture” [5] American Journal of Engineering Research(AJER)2018 e ISSN: 2320-0847 p ISSN : 2320- 0936 Volume-7, Issue-7, pp-326-330“MoistureSensingAutomaticPlantWatering SystemUsing ArduinoUno”.

2.3 PROBLEMSTATEMENTDEFINITION

The soil moisture sensor measures wetness content in the soil. The ArduinoUNO microcontroller used to receive input from a various sensors and it can becontrolled automatically. When soilmoisture sensor goes low thewater pumpwillbeonanditexceedsdefinedlevelsofthewatermotorwillturnoffautomaticall y. We can constantly monitor the growth of a crop using ultrasonicsensor. PIR sensor detects the motion or unusual movement in the agriculturalland.Thisdevicehisveryhelpfultotheformertomonitorandcontrolenviron mental parameters at their field. The farmers did not go to their field, theycanremotelymonitorandcontrolusingcloud

3. IDEATION&PROPOSEDSOLUTION

3.1 EMPATHYMAPCANVAS



3.2 IDEATIONANDBRAINSTORMING

Introduction on Internet of Things (IoT), application of IoT in agriculturalfieldto improve the yield and quality by reducing the cost is provided. The sensorswhichareusedinthearchitecturearediscussedbrieflyandtheprocessoftransmission 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 isbasically developed on an idea, where there are numerous things or objects - suchas Aruino, sensors, GSM models, LCD display, etc., that are connected with theInternet. Each of the objects has a different address and is able to interact withother items. The things or objects co-operate with each other to reach a commongoal.

We are going to construct a smart agricultural monitoring system which cancollect crucial agricultural data and send it to an IoT platform called Things peak inreal time where the data can be logged and analyzed. The logged data on Thingspeak is in graphical format, a botanist or a reasonably know ledged farmer cananalyze the data (from anywhere in the world) to make sensible changes in thesupplied resources (to crops)to obtainhighqualityyield.

Smartagriculturemonitoringsystemorsimplysmartfarmingisanemerging technology concept where data from several agricultural fields rangingfrom small to large scale and its surrounding are collected using smart electronicsensors. The collected data are analyzed by experts and local farmers to drawshort term and long-term conclusion on weather pattern, soil fertility, currentquality of crops, amount of water that will be required for next week to a monthetc.

We can take smart farming a step further by automating several parts offarming,forexamplesmartirrigationandwatermanagement.Wecanapplypredictive algorithms on micro controllers or So C to calculate the amount ofwater that will be required today for aparticular agriculture field. Say, if therewas 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 isgoingtobe less,sowater requiredwillbelessthannormal,thusreducingwater

S. No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To provide efficient decision support system using wireless sensor network which handle different activities of farm and gives useful information related to farm. Information related to Soil moisture, Temperature and Humidity content. Due to the weather condition, water level increasing Farmers get lot of distractions which is not good for Agriculture.
2.	Idea / Solution description	Smart Agricultural System solutions provide an integrated IoT platform in agriculture that allows farmers to leverage sensors, smart gateways and monitoring systems to collect information, control various parameters on their farms and analyze real-time data in order to make informed decisions.
3.	Novelty / Uniqueness	Various eminent researchers have been making efforts for smart farming by using IoT concepts in agriculture. But, a bouquet of unfolded challenges is still in a queue for their effective solution. This study makes some efforts to discuss past research and open challenges in IoT based agriculture.

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.
5.	Business Model (Revenue Model)	A monthly subscription is charged to farmers for prediction and suggesting the irrigation timing based on sensors parameters like temperature, humidity, soil moisture.
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.

3.4PROBLEMSOLUTIONFIT

<table>
<tr>
<td>1.Customer segments:-

Types of Customers who are going to this project are

• Large Scale Farmers
• Remote Farmers</td>
<td>6.Customer constrains:-

The customer needs a solution which will solve the problems in farming when he is in a remote location and that solution should fulfil the following needs.
• Cost efficient
• Low power consumption
• Time efficient</td>
<td>5. Available solutions :-

We can give solutions to this problem by using the Smart Farming Application which collects the Moisture level data from the field and operate in the basis of that moisture level.</td>
</tr>
<tr>
<td>2. Jobs to be done :-

The Customers want to automate the irrigation process, reduce cost of manual workers and minimize the power consumption</td>
<td>9. Problem route cause:-

The route cause for Smart farming Applica</td>
<td>7. Behavior:-

The customer needs to make a revolutionary change in farming by means of modern technologies.</td>
</tr>
<tr>
<td>3. Triggers:-

Farmers are facing many problems while farming in traditional manner. This triggers the Smart Farming Applications.

4. Emotions:-
Farmers feel very relaxed and feel stressless while working in field.</td>
<td>10. Solution:-

Our solution for this project is to give environment sustainable Product for the farming in modern era with reduced cost and with best efficiency</td>
<td>8.Channels of behaviour:-

The channels of behavior recombines the ration of the following
• Online
• Offline</td>
</tr>
</table>

4. REQUIREMENTANALYSIS

4.1FUNCTIONALREQUIREMENT

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

5.1 DATAFLOWDIAGRAMS

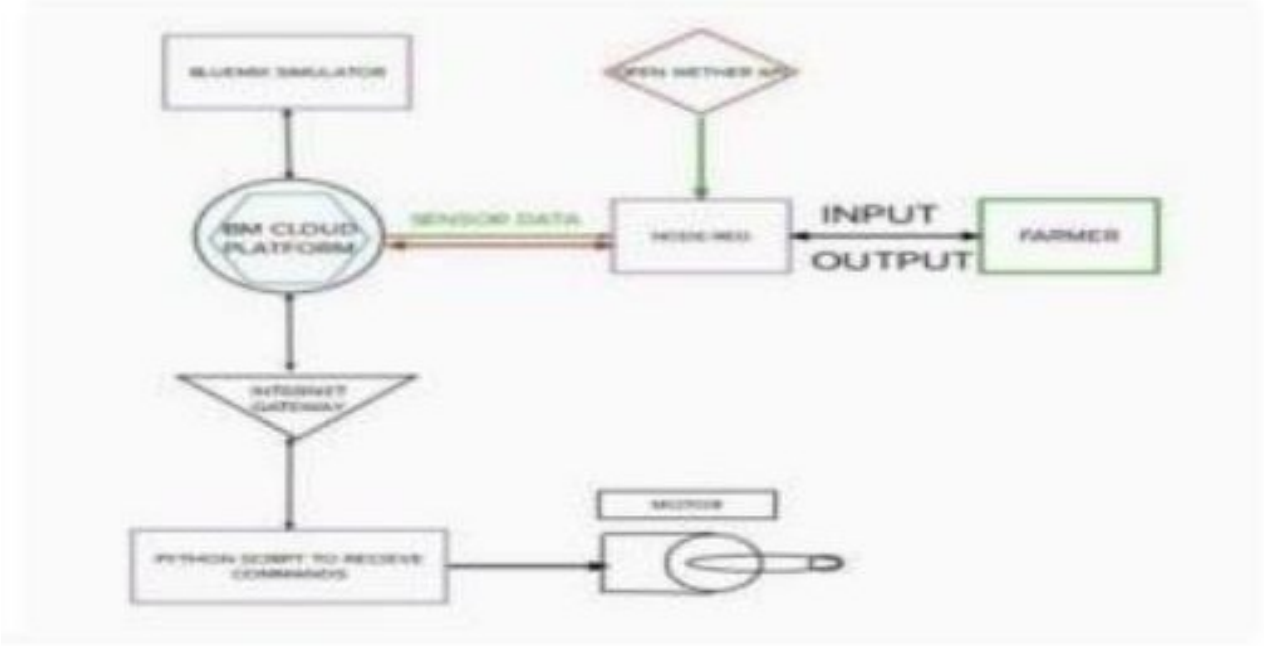
ADataFlowDiagram(DFD)isatraditionalvisualrepresentationoftheinformation flows with in a system. A neat and clear DFD can depict the rightamount of the system requirement graphically. It shows how data enters andleavesthesystem,whatchangestheinformation,andwheredataisstored.

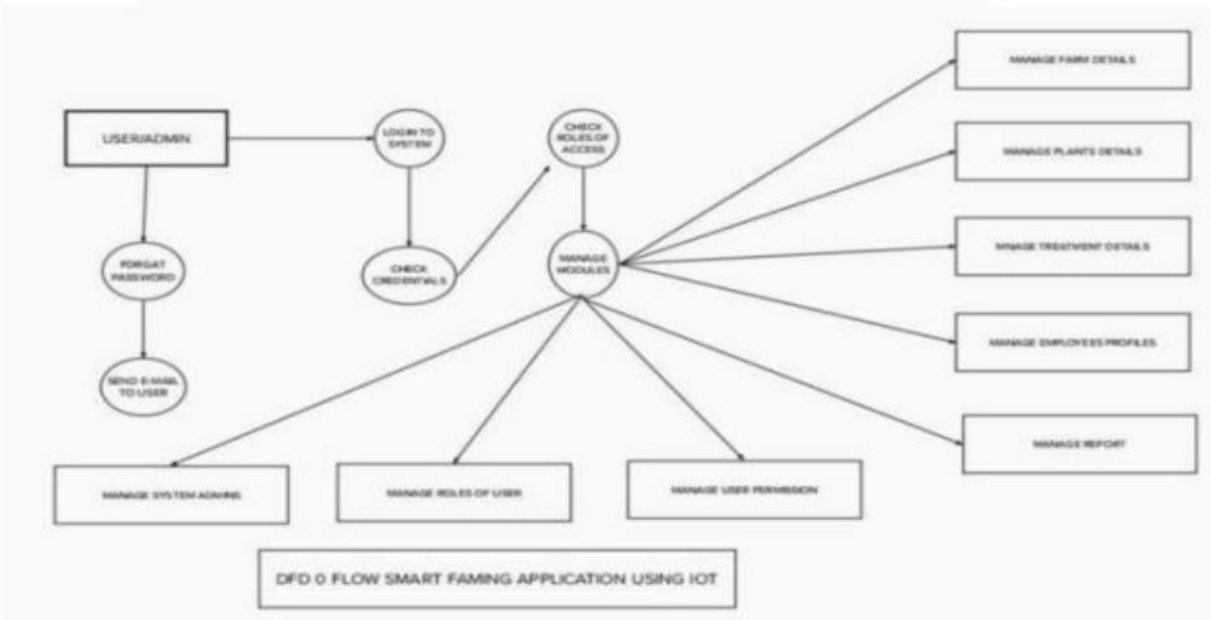
• Thedifferentsoilparameterstemperature,soilmoisturesandthenhumidityaresens edusingdifferent sensorsandobtainedvalueisstoredintheIBMcloud.

• ArduinoUNOisusedasaprocessingUnitthatprocessthe dataobtainedfromthesensorsandwhetherdatafromtheweatherAPI.

• NODE-REDis usedasaprogrammingtooltowritethe hardware,software,andAPIs. The MQTTprotocolisfollowedforthecommunication.

• Allthecollecteddataareprovidedtotheuserthrougha mobileapplicationthatwas 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 theapp theycanremotelyoperatetothemotorswitch.





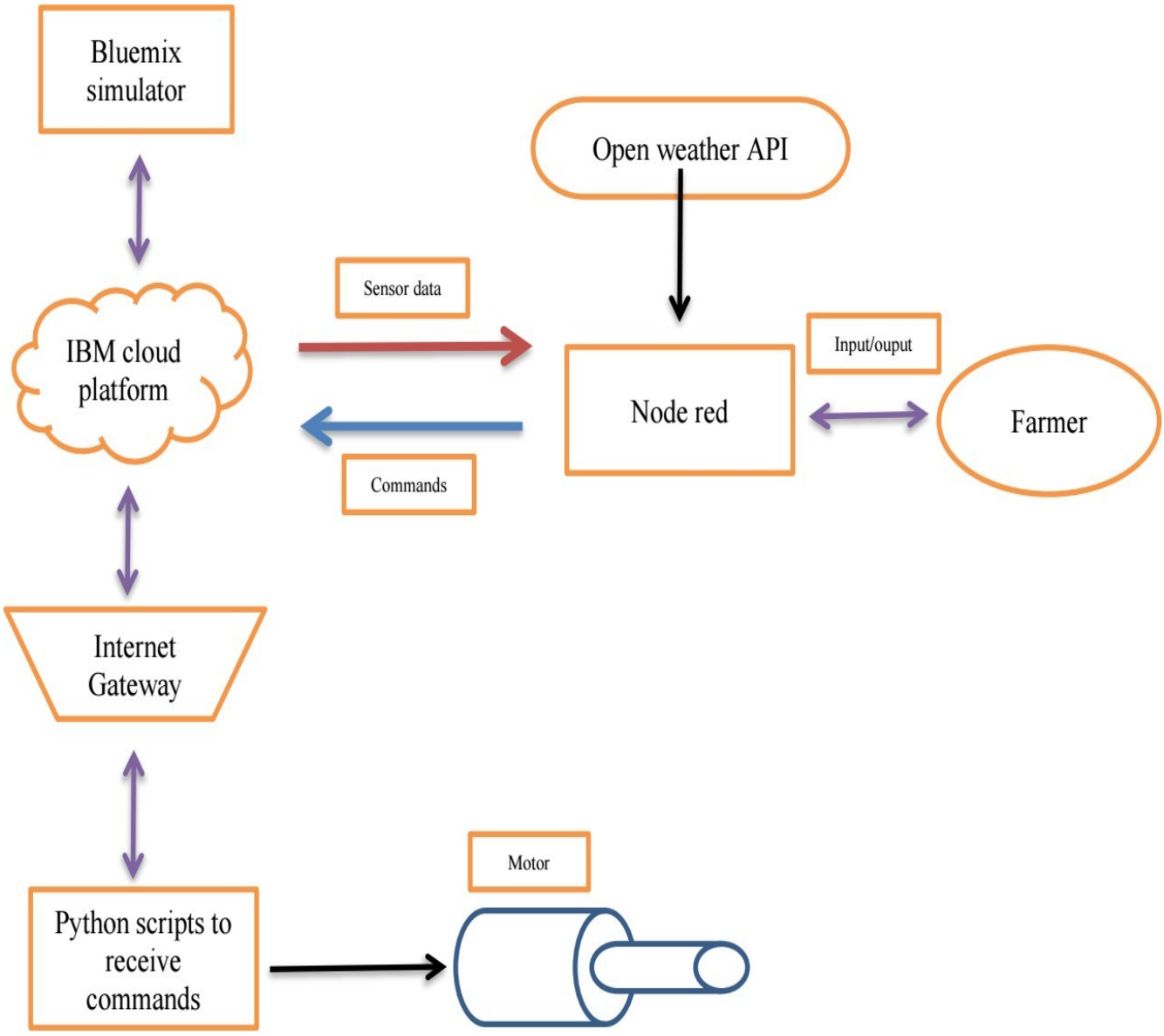
DFD 0 FLOW SMART FAMING APPLICATION USING IOT

5.2 SOLUTIONANDTECHNICALARCHITECTURE

I. The propsed system is based on the smart irrigation/ plant cultivationincorporating the IOT technology for the use of the farmerto get the livelyupdatesaboutthefarm.

II. The idea is to collect the information of the plant using sensors and thatdata usigiven to arduino from that the data is given to the cloud and it can beviewedusingtheApplication.

- **The different soil parameters temperature, soil moistures and thenhumidityaresensedusingdifferentsensorsandobtainedvalueisstoredintheIBM cloud**
- **ArduinoUNOisusedasaprocessingUnitthatprocessthedataobtainedfrom the sensorsand whetherdatafromtheweatherAPI.**
- **NODE-REDisusedasaprogrammingtooltowritethehardware,software,andAPIs. TheMQTTprotocolisfollowedforthecommunication.**
- **Allthecollecteddataareprovidedtotheuserthroughamobileapplication that was developed using the MIT app inventor. The usercoulddecidethroughanapp,weathertowaterthecropornotdependinguponthesensorvalues.Byusingtheapp,theycanremotely operatethemotorswitch.**


Bluemix simulator
Open weather API
Sensor data
IBM cloud platform
Input/ouput
Node red
Farmer
Commands
Internet Gateway
Motor
Python scripts to receive commands

6. PROJECTPLANNINGANDSHEDULING

6.1SprintPlanning,Schedule&Estimation

	Functional requirement	**User story Number**		**Points**	
Sprint 1	Simulation creation	USN 1	Connection of sensors to the Arduino board using the python code.	2	High
Sprint 2	Software	USN 2	Creating devices in the IBM watson IOT platform,workflow for IOT scenarios using node red.	2	High
Sprint 3	MIT app Inventor	USN 3	Developing an application for the farmer using MIT app inventor	2	High

Sprint			**User story/task**		**Priority**
Sprint 3	Dashboard	USN 3	Desinging the modules and testing the applications	2	High
Sprint 4	Web UI	USN 4	To make the user to interact with the software	2	High

7.1FEATURE

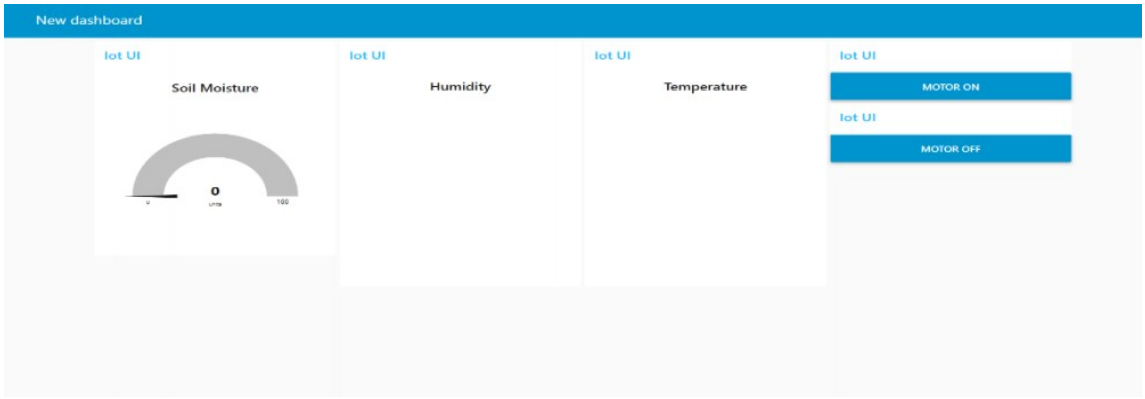
```
Importwiotp.sdk.devicei
mporttime
importosimport
datetimeimport
randommyConfi
g={
  "identity":{
       "orgId":"0hzydu",
       "typeId":
       "NodeMCU","deviceId
       ": "12345"
  },
  "auth": {
    "token":"12345678"
  }
}
client
=wiotp.sdk.device.DeviceClient(config=myConfig,logHandlers=None)client.conne
ct()
defmyCommandCallback(cmd):
    print("Messagereceived fromIBMIoTPlatform:%s"
%cmd.data['command'])
```

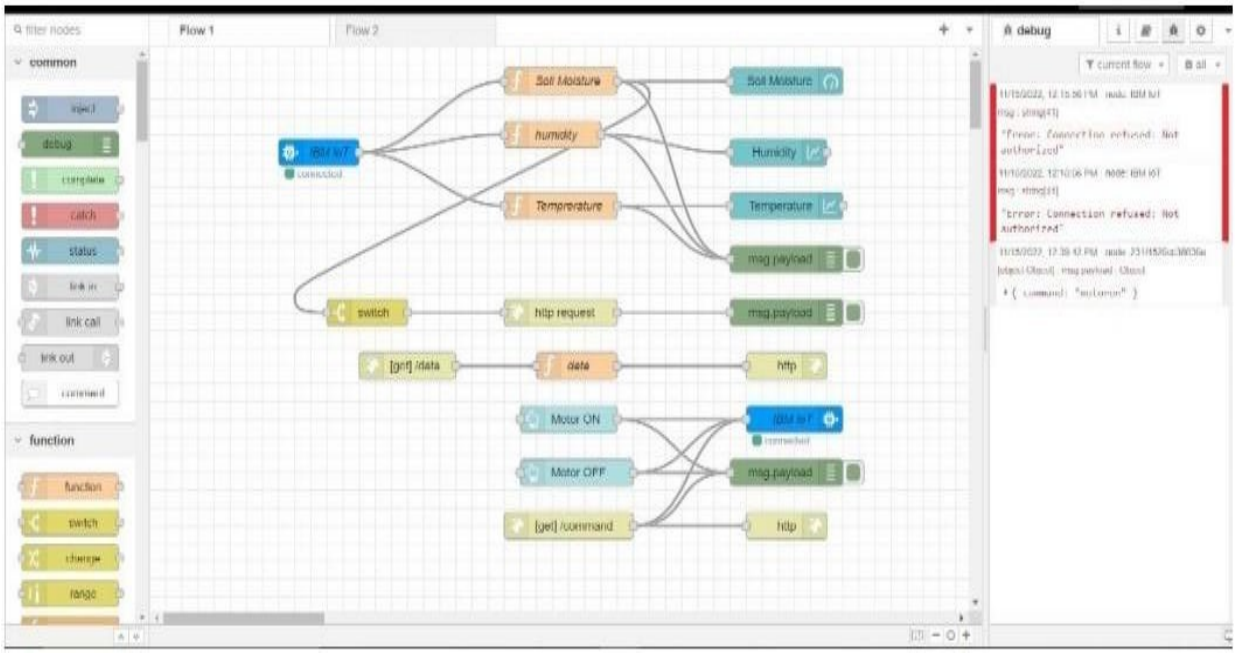
```
        m=cmd.data['command']
         if(m=="motoron"):
           print("Motorisswitchedon")
        elif(m=="motoroff"):
            print ("Motor is
        switchedOFF")print (" ")
    whileTrue:
        moist=random.randint(0,100)
        temp=random.randint(-20, 125)
        hum=random.randint (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
    =myCommandCallbackclient.disconnect()
```

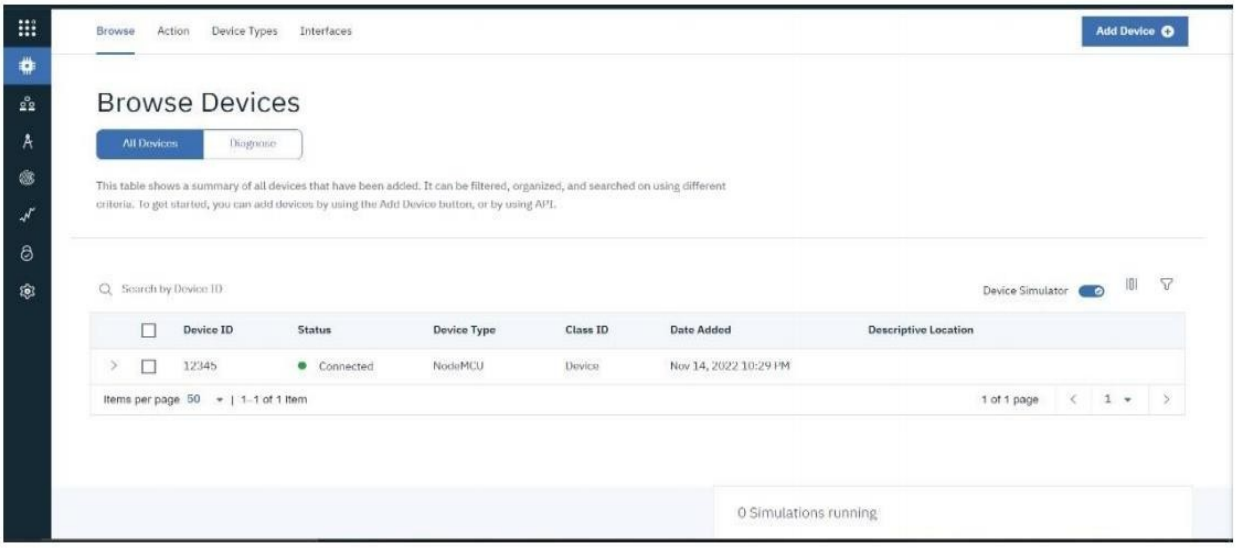
8. TESTING

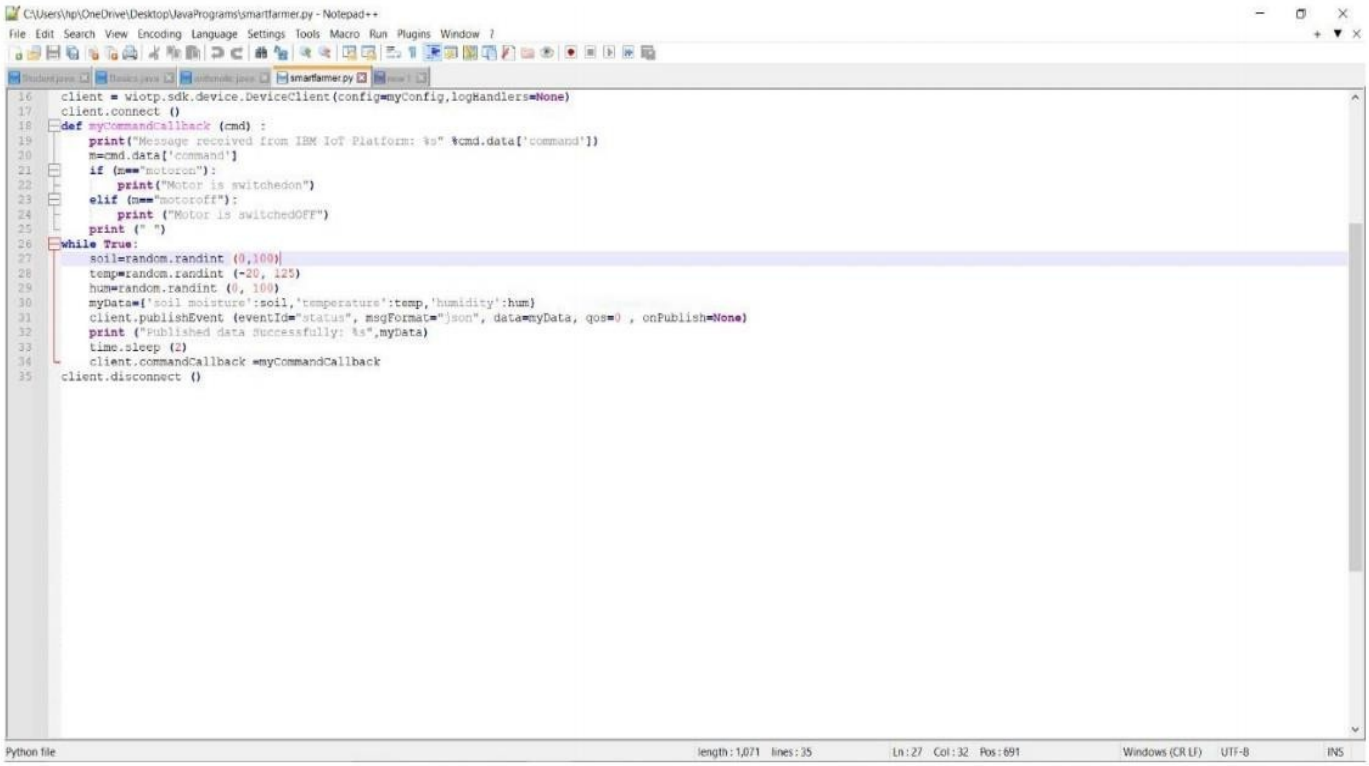
8..1TESTCASE

WebapplicationusingNodeRed

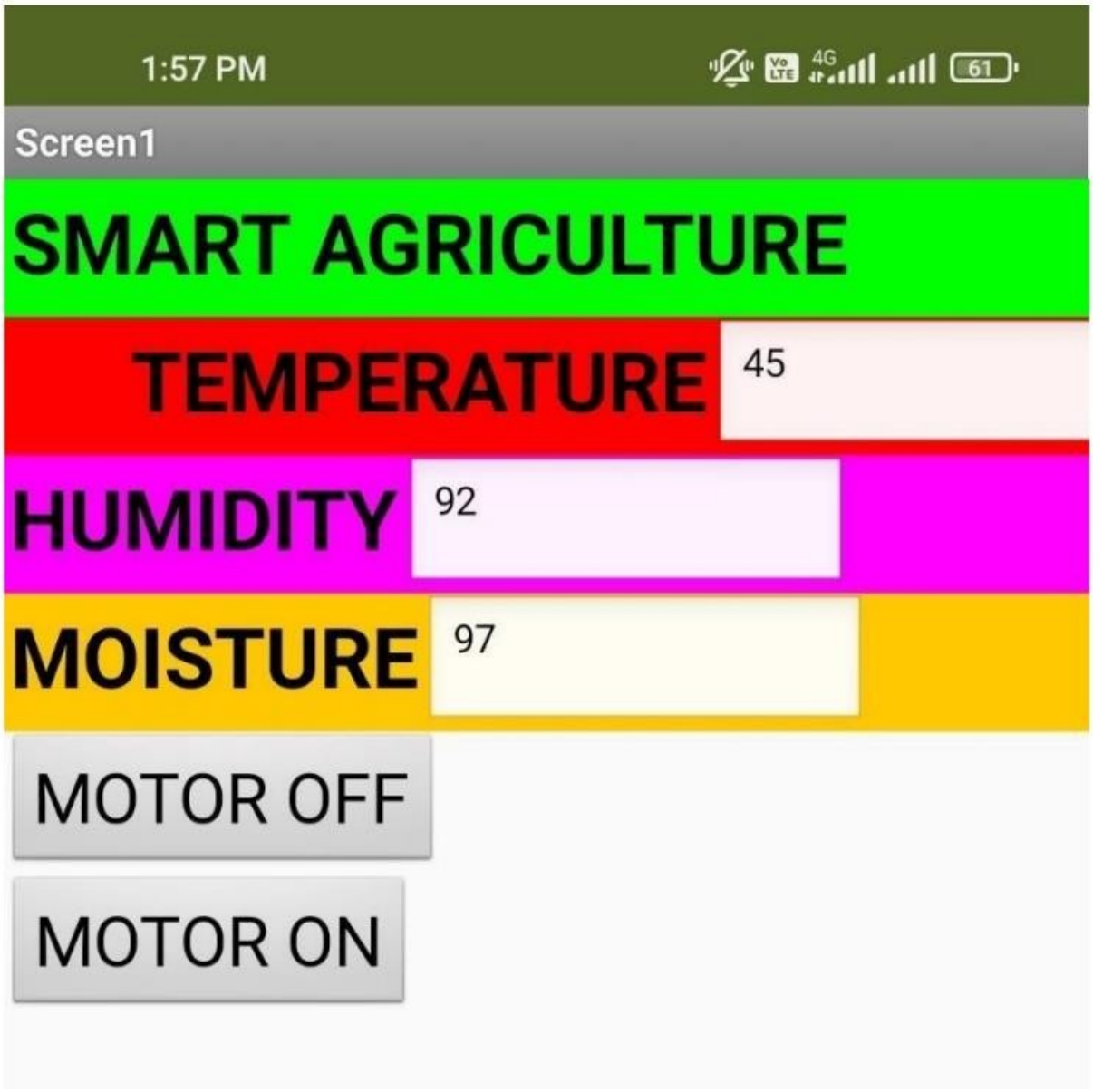





Browse
Action
Device Types
Interfaces
Add Device
Browse Devices
All Devices
Diagnose
This table shows a summary of all devices that have been added. It can be filtered, organized, and searched on using different criteria. To get started, you can add devices by using the Add Device button, or by using API.
Search by Device ID
Device Simulator
Device ID
Status
Device Type
Class ID
Date Added
Descriptive Location
12345
Connected
NodeMCU
Device
Nov 14, 2022 10:29 PM
Items per page 50
1 - 1 of 1 Item
1 of 1 page
1
0 Simulations running

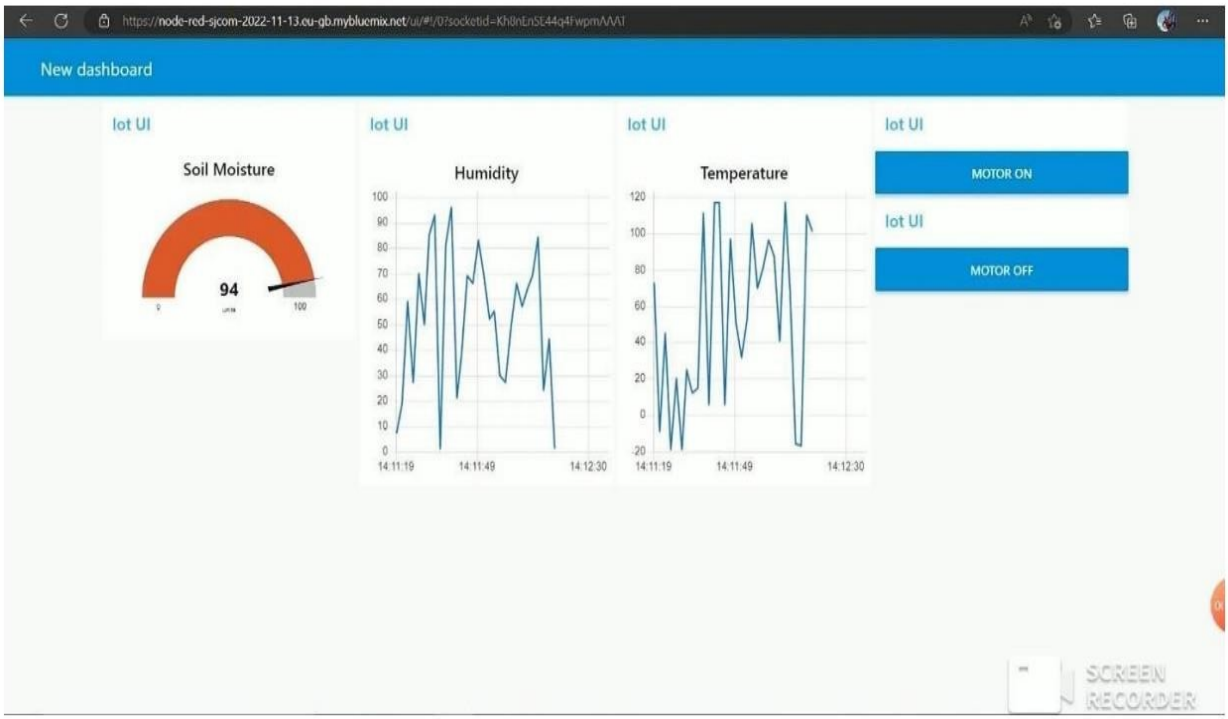

C:\Users\hp\OneDrive\Desktop\JavaPrograms\smartfarmer.py - Notepad++
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?
smartfarmer.py
client = wiotp.sdk.device.DeviceClient(config=myConfig,logHandlers=None)
client.connect ()
def myCommandCallback (cmd) :
print("Message 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

8.2USERACCEPTANCE TESTING



9. RESULTS

9.1PERFORMANCEMETRICS



10. ADVANTAGESANDDISADVANTAGES

ADVANTAGES:

g➢ Aremotecontrolsystemcanhelpinworkingirrigationsystemvalvesdependent on schedule. Irrigating remote farm properties can be exceptionallytroublesome and labor- intensive. It gets hard to comprehend when the valveswerestartedand whethertheidealmeasureofwaterwasdistributed.

➢ For situations where a quick reaction is required, manual valve actuation maynot be conceivable constantly. Thus, remote observing and control of irrigationsystems,generators orwindmachines or someothermotor-drivenhardwarebecomethenextlogicalstep.

➢ Various solutions are availabletomonitor enginestatistics and starting orstopping the engine. When the client chooses to begin or stop the motor, theprogram transmits a sign to the unit within seconds by means of a mobile phonesystem.

➢ Submersible weight sensors or ultrasonic sensors can screen the degree oftanks, lakes, wells and different kinds of fluid stock in like fuel and compost. Theproduct figures volume dependent on the tank or lake geometry after some time.Itconveysalarmsdependentonvariouscondition

DISADVANTAGES:

➢ The smart agriculture needs availability of internet continuously. Rural part ofmostofthedevelopingcountriesdonotfulfilthisrequirement.Moreoverinternetcon nectionis slower.

➢ The smart farming based equipment require farmers to understand and learntheuseoftechnology.Thisismajorchallengeinadoptingsmartagriculturefarming atlargescaleacross thecountries.

11. CONCLUSION

Farmers can benefit greatly from an IoT-based smart agriculture system. As aresultofthelackofirrigation,agriculturesuffers.Climatefactorssuchashumidity, temperature, andmoisture can be adjusted dependent on the localenvironmental variables. This technology also detects animal invasions, which area major cause of crop loss. This technology aids in the scheduling of irrigationbased on present data from the field and records from aclimate source. It helpsindecidingthefarmertowhethertodoirrigationornottodo.Continuousinternet 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. ByGSM,SMScanbesent tofarmers phone.

12FUTURE SCOPE

In the current project we have implemented the project that canprotectand maintainthecrop.Inthisprojectthefarmermonitorandcontrol the field remotely. In future we can add or update few morethingstothisproject

- Wecancreatefewmoremodelsofthesameproject,sothatthefarmercanhaveinformationofaentire.

- We can update the this project by using solar power mechanism. Sothat the power supply from electric poles can be replaced with solarpanels.Itreducesthepower linecost.Itwillbeaonetimeinvestment.Wecanaddsolarfencingtechnologytothisproject.

- WecanuseGSMtechnologytothisprojectso thatthefarmerscanget the information directly to his home through SMS. This helps thefarmertogetinformationifthereisainternetissues.

- Wecanaddcamerafeatureso thatthefarmercanmonitorhisfieldinrealtime. This helpsinavoidingthefts.