PROJECT REPORT

Project Name: SMART FARMER- IOT ENABLED SMART FARMINGAPPLICATION

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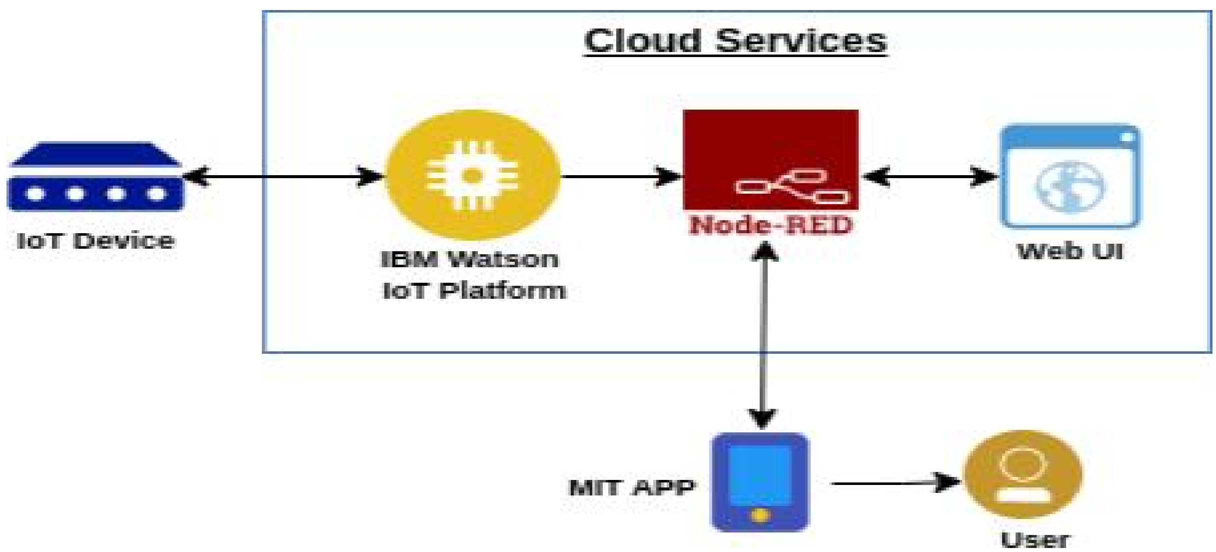
DEVI.K

NARMATHA.

1. INTRODUCTION

1.1 Project Overview

IoT-based agriculture system helps the farmer in monitoring different parameters of his fieldlike soil moisture, Temperature, humidity using some sensors. Farmers can monitor all the sensorparameters by using a web or mobile application even if the farmer is not near his field. Wateringthe 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 aim/objective of this report is to purpose 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 testeded Live Agriculture Fields giving high accuracy over 98%in data feeds.

2.LITERATURE SURVEY

2.1 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] I. Lee and K. Lee, ‘‘The Internet of Things (IoT): Applications, investments, and challenges for enterprises,’’ Bus. Horizons, vol. 58, no. 4, pp. 431–40, 2015.

[2] J. Gubbi, R. Buyya, S. Marusic, and M. Palaniswami, ‘‘Internet of Things (IoT): A
vision, architectural elements, and future directions,’’ Future Gener. Comput. Syst., vol. 29, no. 7, pp. 1645–660, 2013.

[3] Dunkels, F. Osterlind, N. Tsiftes, and Z. He, “Software-based on-line energy estimation for sensor nodes,” in Proc. 4th Workshop Embedded Netw. Sensors, 2007, pp. 28–2.

[4] H. Gupta, A. V. Dastjerdi, S. K. Ghosh, and R. Buyya, “iFogSim: A toolkit for modeling and simulation of resource management techniques in the Internet of Things, edge and fog computing environments,” Softw. Pract. Exp., vol. 47, no. 9, pp. 1275–296, 2017.

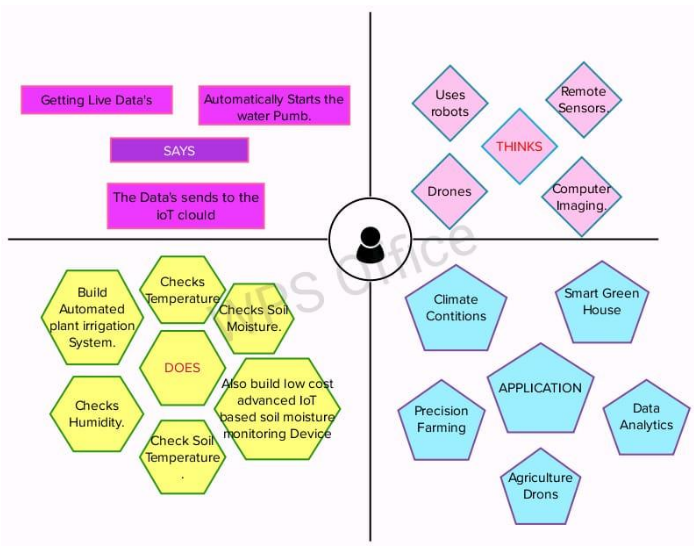
[5] L. Qin, S. Feng, and H. Zhu, ‘‘Research on the technological architectural design of geological hazard monitoring and rescue-after-disaster system based on cloud computing and Internet of things,’’ Int. J. Syst. Assurance Eng. Manage., vol. 9, no. 3, pp. 684–95, 2018.

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



3.2 Ideation 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 Thing speak 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 amonth etc.

We can take smart farming a step further by automating several parts of farming, forexample 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 requiredtoday 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)	Our project will be give the problem statement in Smart farming application using IOT. History-based soil health parameters like soil moisture, pHlevel, temperature etc.
2.	Idea / Solution description	The most frequently used applications of IoT in agriculture are drones for monitoring fields and spraying crops, health assessment of livestock and irrigation.
3.	Novelty / Uniqueness	Smart farming, which involves the application of sensors and automated irrigation practices, can help monitor agricultural land, temperature, soil moisture, etc. This would enable farmers to monitor crops from anywhere
4.	Social Impact / Customer Satisfaction	Increased production: the optimisation of all the processes related to agriculture and livestock-rearing increases production rates. Water saving: weather forecasts and sensors that measure soil moisture mean watering only when necessary and for the right length of time
5.	Business Model (Revenue Model)	Climate-smart agriculture is a pathway towards development and food security built on three pillars: increasing productivity and incomes, enhancing resilience of livelihoods and ecosystems and reducing and removing greenhouse gas emissions from the atmosphere
6.	Scalability of the Solution	Smart Farming systems uses modern technology to increase the quantity and quality of agricultural products. Livestock tracking and Geo fencing. Smart logistics and warehousing. Smart pest management. Smart Greenhouses

3.4 Problem solution fit

4.Requirement Analysis

4.1 Functional Requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	As a user Registration through Gmail
FR-2	User Confirmation	As a user Confirmation via Email then generate the Confirmation via OTP
FR-3	Log in to system	Once confirmation message received after login the system and Check Credentials
FR-4	Check Credentials	Once check the credentials after go to the Manage modules.
FR-5	Manage modules	In this manage modules described the below functions like Manage System Admins Manage Roles of User Manage User permission and etc...
FR-6	Logout	Then check Temperature, humidity and moisture after then logout or exist the application.

5.PRODUCT DESIGN

5.1 Data flow diagrams

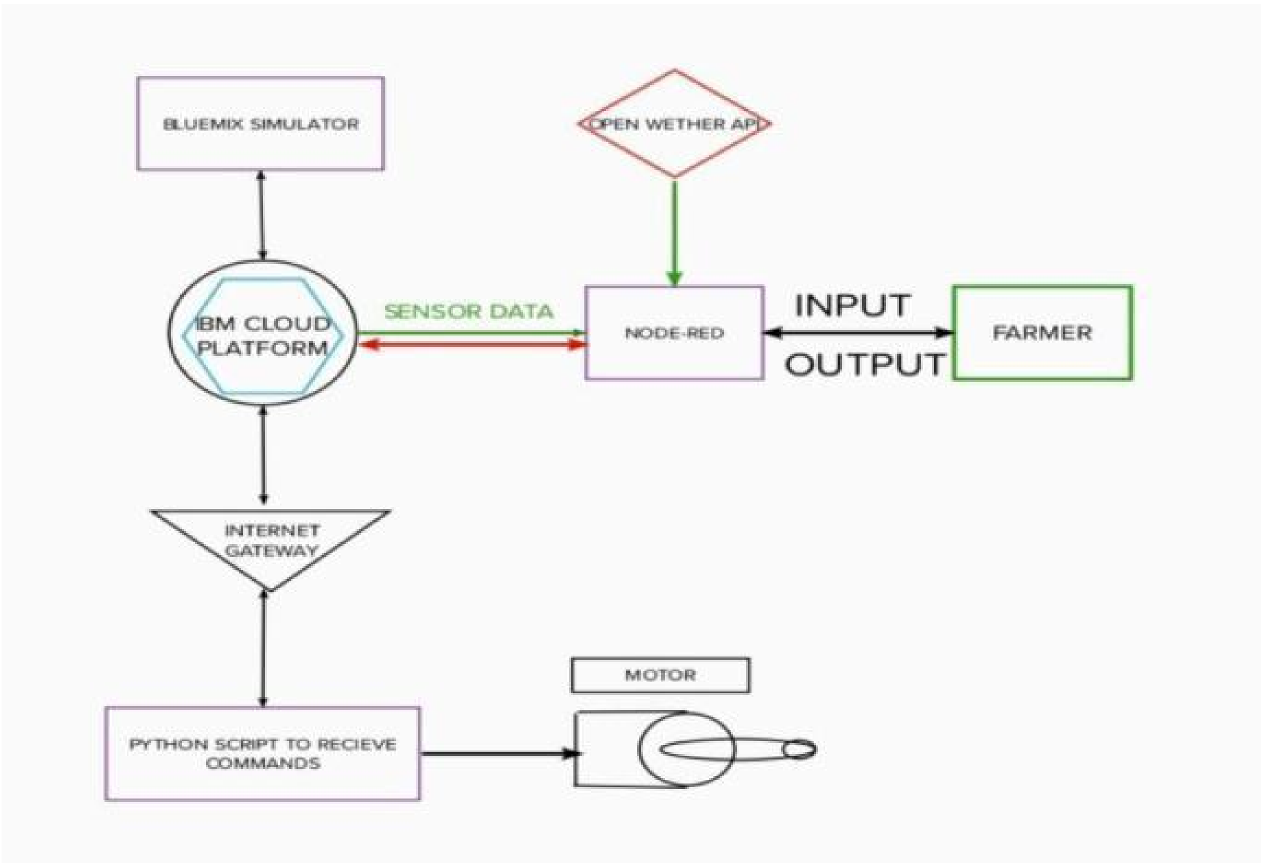
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

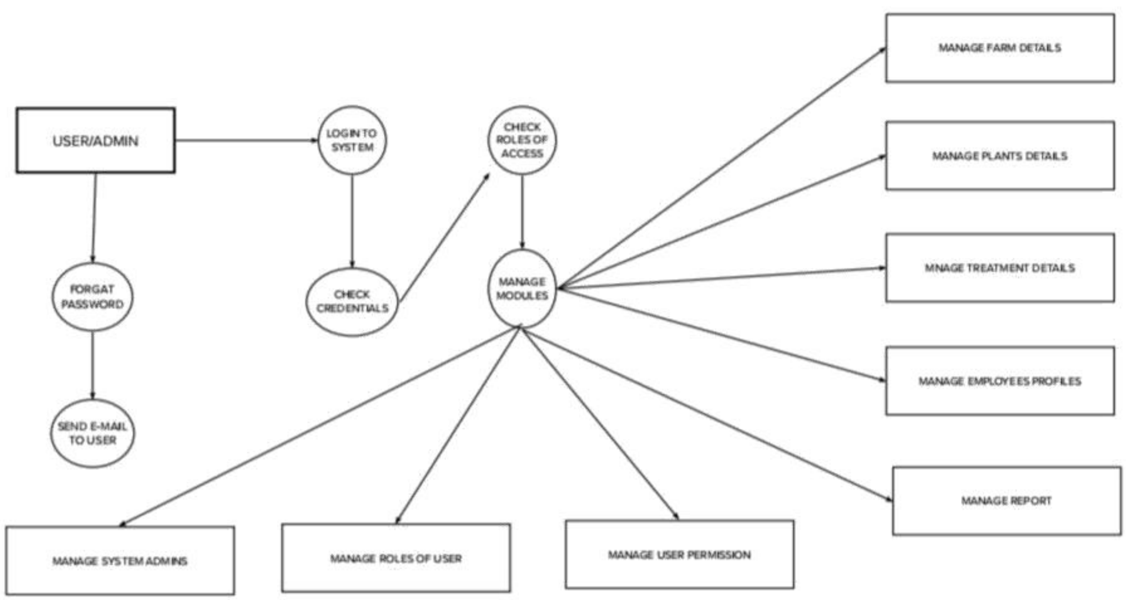
• The different soil parameters temperature, soil moistures and then humidity are sensed using different sensors and obtained value is stored in the IBM cloud.

• 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 operateto the motor switch.





DFD 0 FLOW SMART FAMING APPLICATION USING IOT

5.2 Solution and Technical Architecture

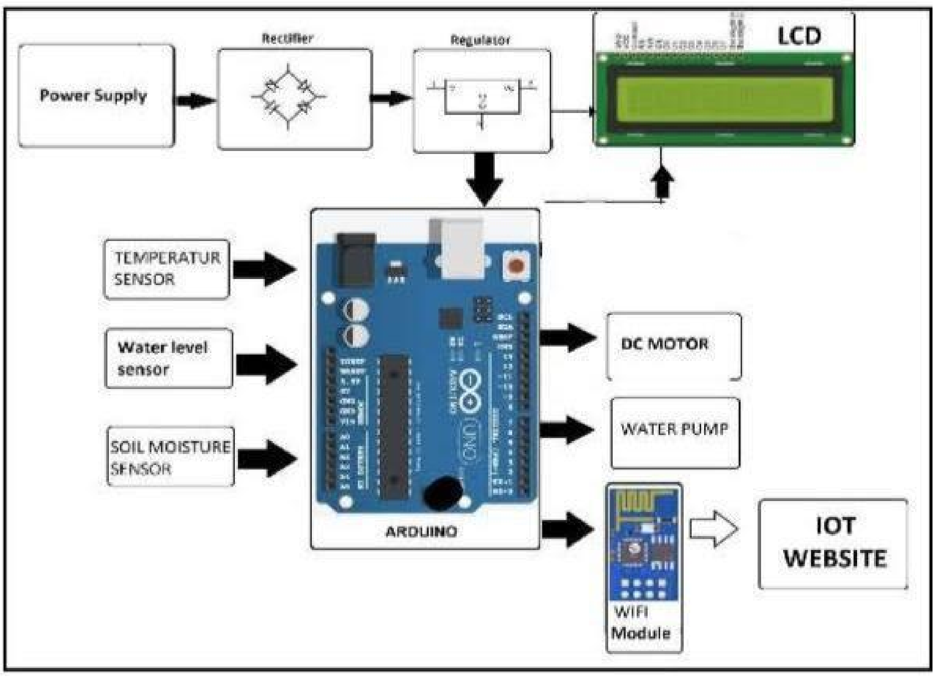
Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

• Find the best tech solution to solve existing business problems.

• Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.

• Define features, development phases, and solution requirements.

• Provide specifications according to which the solution is defined, managed, and delivered.



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6.PROJECT PLANNING AND SCHEDULING

Sprint	Functional Requiremen t(Epic)	User Story Number	User Story /Task	Story Point s	Priority	Team Member
Sprint-1	Registration (Farmer Mobile User)	UNS-1	As a user, I can registerfor the application by entering my email, password, and confirming my password.	2	High	G.Brindha (Leader)
Sprint-1	Login	UNS-2	As a user, I will receiveconfirmation email once I have registered for the application	1	High	A.Narmatha (Member 1)
Sprint-2	User Interface	UNS-3	As a user, I can registerfor the application through Facebook	3	Low	K.Devi (Member 2)
Sprint-1	Data Visualizatio n	UNS-4	As a user, I can register for the application through GMAIL	2	Medium	A.Narmatha (Member 1)
Sprint-3	Registration (Farmer - WebUser)	USN - 1	As a user, I can log intothe application by entering email and password	3	High	G.Brindha (Leader)
Sprint - 2	Login	USN - 2	As a registered user, I need to easily login loginto my registered account via the web page in minimum time	3	High	A.Narmatha (Member 1)
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	K.Devi (Member 2)

Sprint - 1	Registration (Chemical Manufacturer -Web user)	USN - 1	As a new user, I want tofirst register using my organization email and create a password for the account.	2	High	G.Brindha (Member 3)

7.CODING AND SOLUTIONING

7.1 Feature

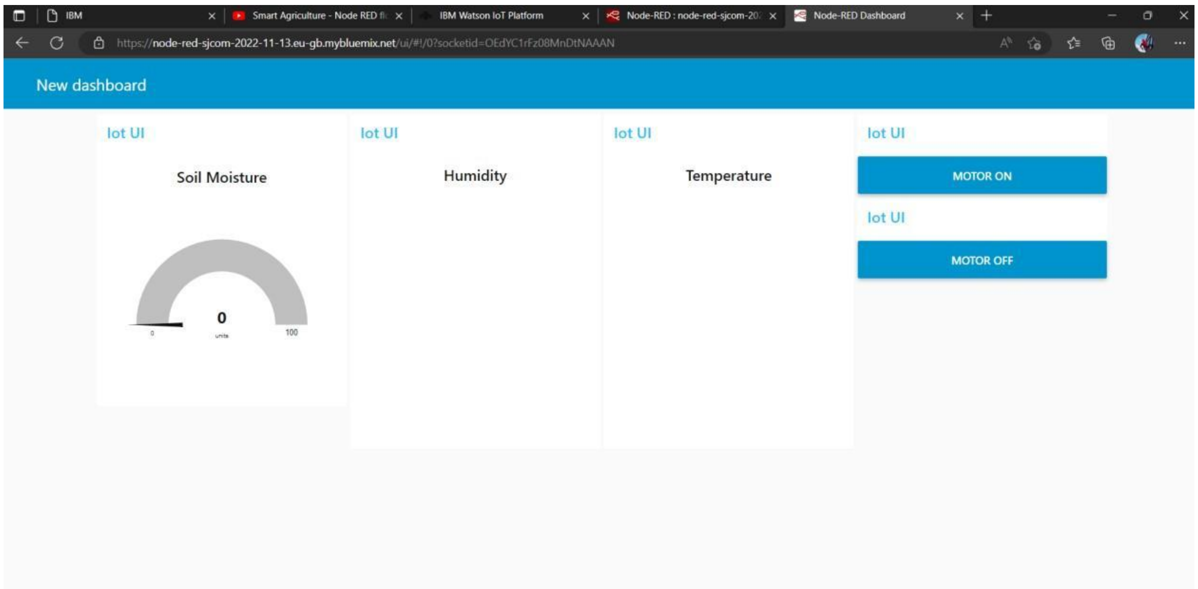
```
import
wiotp.sdk.device
import time
import os
import
datetime
import
random
myConfig ={
   "identity": {
       "orgId": "0hzydu",
       "typeId":
       "NodeMCU",
       "deviceId":
       "12345"
   },
   "auth": {
     "token": "12345678"
   }
}
client =
wiotp.sdk.device.DeviceClient(config=myConfig,logHandlers=No
ne)client.connect ()
def myCommandCallback (cmd) :
   print("Message received from IBM IoT
   Platform: %s" %cmd.data['command'])m=cmd.data['command']
```

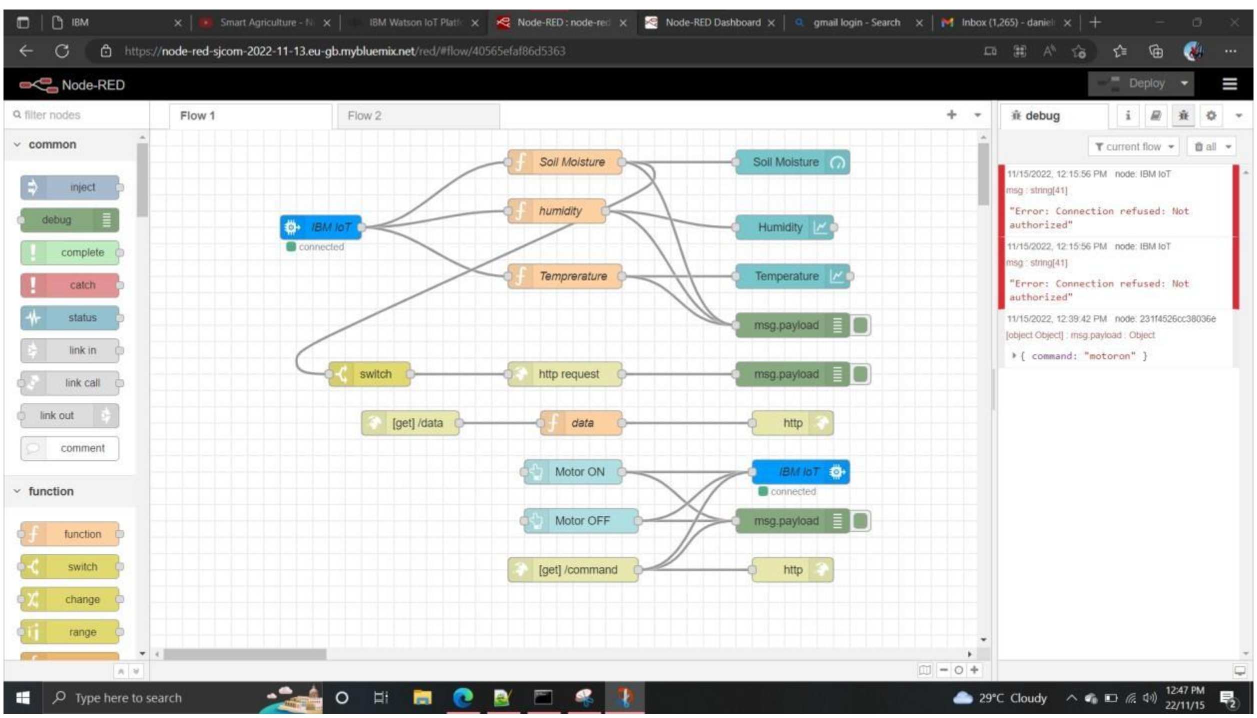
```
    if (m=="motoron"):
        print("Motor is
        switchedon")
    elif (m=="motoroff"):
        print ("Motor is
    switchedOFF")print (" ")
while True:
    moist =random.randint (0,100)
   temp=random.randint (-20, 125)
    hum=random.randint (0, 100)
    myData={'moisture':moist,'temperature':temp,'humidity':hum}
    client.publishEvent (eventId="status", msgFormat="json",
    data=myData, qos=0 ,
onPublish=None)
    print ("Published data
    Successfully: %s",myData)time.sleep (2)
    client.commandCallback
=myCommandCallbackclient.disconnect ()
```

8.TESTING

8.1 Test case

Web application using Node Red

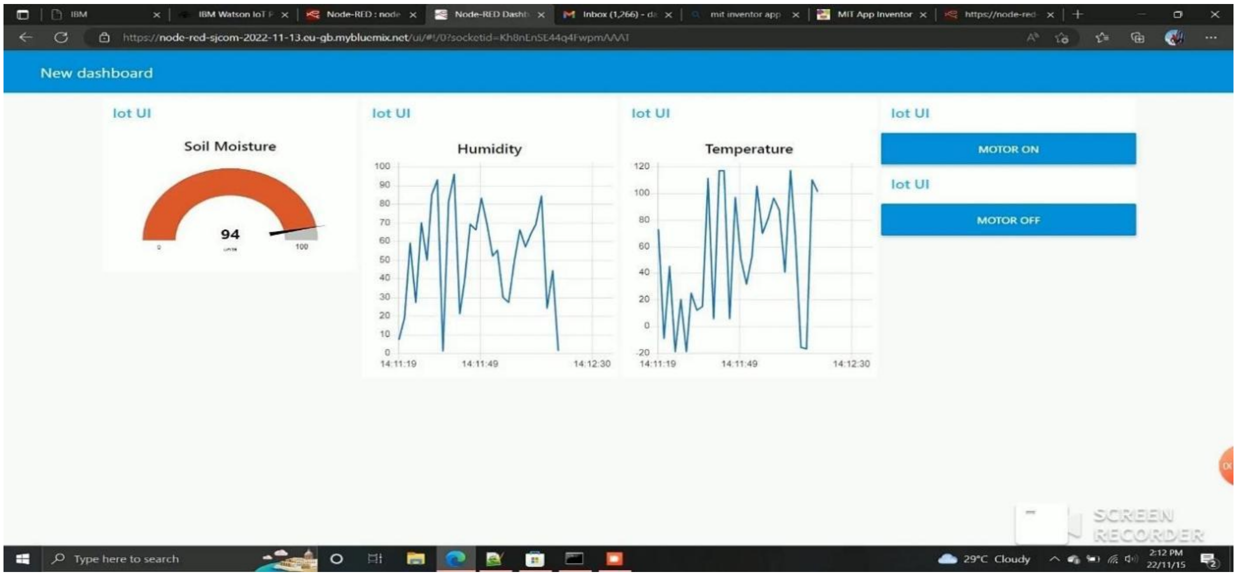




8.2 User Acceptance Testing

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 scaleacross the countries.

11.CONCLUSION

IoT based SMART FARMING SYSTEM for Live Monitoring of Temperature and Soil Moisture has been proposed using Arduino and Cloud Computing . The System has high efficiency and accuracy in fetching the live data of temperature and soil moisture. The IoT based smart farming System being proposed via this report will assist farmers in increasing the agriculture yield and take efficient care of food production as the System will always provide helping hand to farmers for getting accurate live feed of environmental temperature and soil moisture with more than 99% accurate results.

12.Future scope

Future work would be focused more on increasing sensors on this system to fetch more data especially with regard to Pest Control and by also integrating GPS module in this system to enhance this Agriculture IoT Technology to full-fledged Agriculture Precision ready product.

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=No
ne)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
=myCommandCallbackclient.disconnect ()
```

Github link: https://github.com/IBM-EPBL/IBM-Project-15582-1659601123