IOT BASED SMART CROP PROTECTION SYSTEM FOR AGRICULTURE

Team ID : PNT2022TMID02415

Team Members

Kirthiga S
Jogan Daniel A
Hari S
Keerthana L R

INTRODUCTION

A system using sensors that monitor different conditions of environment like humidity, temperature etc., the processor and GUI module is used. The field condition is sent to the farmer via mobile text messages. With this system Soil moisture, humidity and energy efficiency are managed. A system is proposed for intelligent agriculture monitoring system based on IOT technology. The main aim of this project is to help farmers to automate their farms by providing them with a Web App through which they can monitor the parameters of the field like Temperature, humidity etc. and control the equipment like water motor and other devices remotely via internet without their actual presence in the field.

Crops in the farms are many times devastated by the wild as well as domestic animals and low productivity of crops is one of the reasons for this. It is not possible to stay 24 hours in the farm to sentinel the crops. So to surmount this issue an automated perspicacious crop aegis system is proposed utilizing Internet of Things (IOT). The system consists of esp8266 (node MCU), soil moisture sensor, dihydrogen monoxide sensor, GPRS and GSM module, servo motor, dihydrogen monoxide pump, etc. to obtain the required output. As soon as any kineticism is detected the system will engender an alarm to be taken and the lights will glow up implemented at every corner of the farm. This will not harm any animal and the crops will stay forfended.

PROJECT OVREVIEW:

This project is based on Internet Of Things (IoT), that can measure soil moisture, Humidity and temperature conditions for agriculture and crop protection using Watson IoT services. IoT is network that connects physical objects or things embedded with electronics, software and sensors through network connectivity that collects and transfers data using cloud for communication. Data is transferred through internet without human to human or human to computer interaction.

In this project we have not used any hardware. Instead of real soil moisture, Humidity and Temperature data obtained from sensors we make use of IBM IoT Simulator which can transmit these parameters as required.

PURPOSE:

An intelligent crop protection system helps the farmers in protecting the crop from the animals and birds which destroy the crop. This system also helps farmers to monitor the soil moisture levels in the field and also the temperature and humidity values near the field. The motors and sprinklers in the field can be controlled using the mobile application.

LITERATURE SURVEY

EXISTING PROBLEM:

1. Agriculture is a field which forms the basis of our economy. Yet it faces a lot of problems in terms of availability of resources, Irrigation, increasing rate of Pesticides, Climatic disasters, Insects which ruin the crops and makes a huge loss this sector.

2. In agriculture water is needed for the crops for their growth. If the Soil gets dry it is necessary to supply water. But sometime if the farmer doesn't visit the field it is not possible to know the condition of soil.

3. Sometimes over supply of water or less supply of water affects the growth of crops.

4. Sometimes if the weather/temperature changes suddenly it is necessary to take certain actions.

5. Specific crops grow better in specific conditions, they may get damaged due to bad weather.

REFERENCES:

i. Mr.Pranav shitap, Mr.Jayesh redij, Mr.Shikhar Singh,Mr.Durvesh Zagade, Dr. Sharada Chougule. Department of ELECTRONICS AND TELECOMMUNICATION ENGINEERING, Finolex Academy of Management and technology, ratangiri, India.

ii. N.Penchalaiah, D.Pavithra, B.Bhargavi, D.P.Madhurai, K.EliyasShaik,S.Md.sohaib.Assitant Professor, Department of CSE,AITS, Rajampet,India UG Student, Department of CSE,AITS,Rajampet, India.

iii. Mr.P.Venkateswara Rao, Mr.Ch Shiva Krishna ,MR M Samba Siva ReddyLBRCE,LBRCE,LBRCE.

iv. Mohit Korche,Sarthak Tokse, ShubhamShirbhate, Vaibhav Thakre,S. P. Jolhe(HOD). Students , Final Year,Dept.of Electrical engineering,Government College of engineering,Nagpur head of dept.,Electrical engineering,Government College of engineering,Nagpur.

PROBLEM STATEMENT DEFINITION STATEMENT:

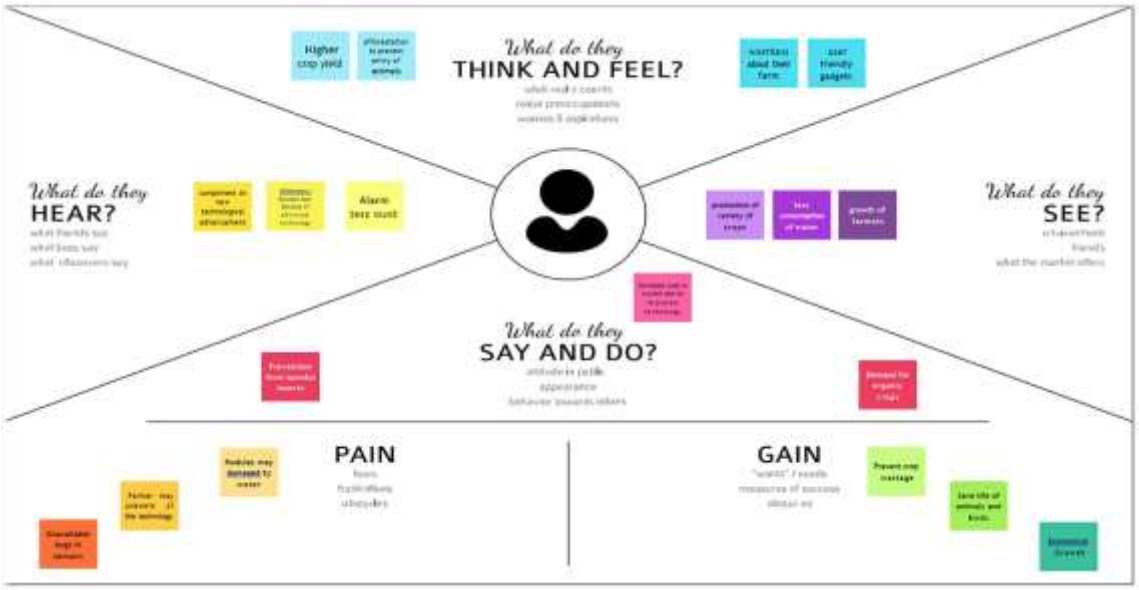
The majority of farmers plant crops without knowing the ideal temperature and humidity. So, using sensors, this crop system displaysthe temperature and humidity. It would also suggest which crops are best suited to that temperature. Moreover, most of the time, animals and birds damage the crops. This crop system assists farmers in protecting their crops from animals and birds that prey on them.

In the world economy of many Country dependent upon the agriculture. In spite of economic development agriculture is the backbone of the economy. Crops in forms are many times ravaged by local animals like buffaloes, cows, goats, birds and fire etc. this leads to huge loss for the farmers.it is not possible for farmers to blockade to entire fields or stay 24 hours and guard it. Agriculture meetsfood requirements of the people and produces several raw materials for industries. But because of animal interference and fire in agricultural lands, there will be huge loss of crops. Crops will be totally getting destroyed.

IDEATION AND PROPOSED SOLUTION

EMPATHY MAP CANVAS:

a.



IDEATION AND BRAINSTORMING:

1.Preventing pests and animals:

Crops in farms are many times ravaged by local animals like buffaloes, cows, goats etc. This leads to huge losses for the farmers. It is not possible for farmers to barricade entire fields or stay on field 24 hours and guard it. So here we propose automatic crop protection system which alerts the farmer or the owner when an animal has entered the farm.

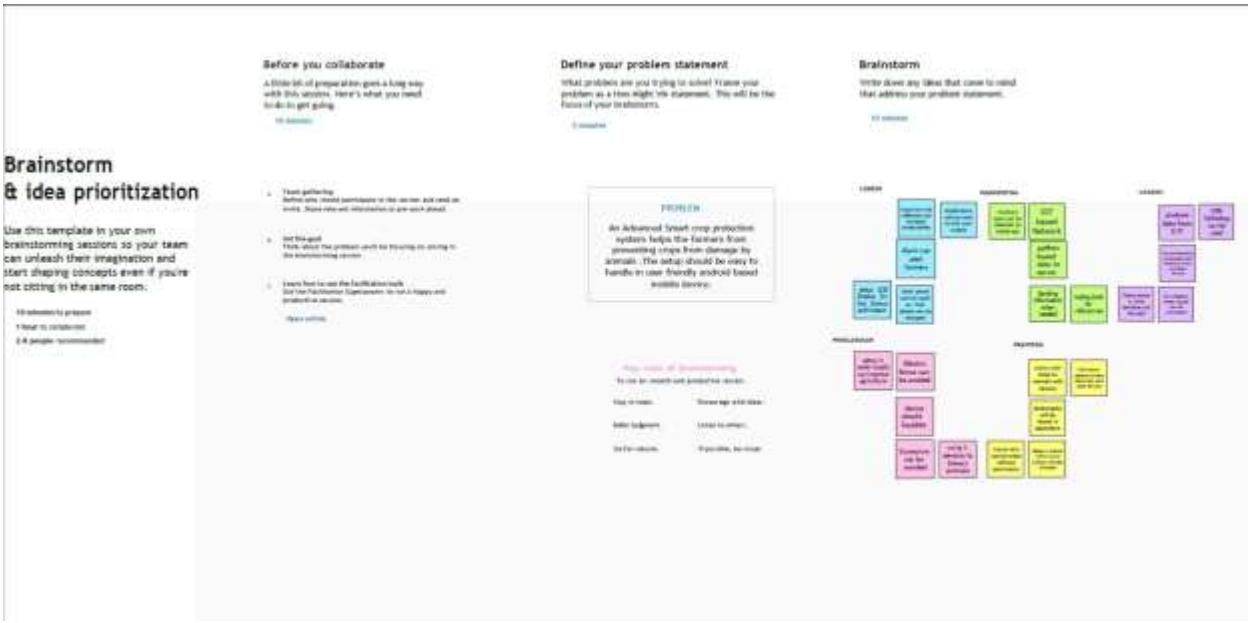
2.Irrigation control in the field:

Many crops can only survive in a specific range of humidity and temperature. In our proposed design the humidity and temperature are monitored and it alerts when there is a need of water to the crops.

3.Seasonal agriculture:

Nowadays the climatic changes are so unpredictable. Our proposed model can sense the change in climatic conditions and suggest which crops are suitable to that climatic condition.

This can also help in sowing and harvesting of crops.



Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

PROPOSED SOLUTION:

S.No.	Parameter	Description
1.	Problem Statement	The majority of farmers plant crops without knowing the ideal temperature and humidity. So, using sensors, this crop system displays the temperature and humidity. It would also suggest which crops are best suited to that temperature. Moreover, most of the time, animals and birds damage the crops. This crop system assists farmers in protecting their crops from animals and birds that prey on them.
2.	Idea description	The Dth11 sensor is used in our project to detect temperature and humidity. The ground sensor detects soil moisture and recommends which crop is best suited to that temperature via an LCD display. Crops in farms are frequently ravaged by local animals such as buffaloes, cows, goats, birds, and so on. Farmers suffer huge losses asa result of this. Farmers cannot barricade entire fields or stay on the field 24 hours a day, seven days a week. As a result, we propose an automatic crop protection system against animals. This is a microcontroller-based arduino Uno system. A motion sensor is used in this system to detect wild animals approaching the field. In this case, the sensor instructs the microcontroller to act. The microcontroller nowsounds an alarm to entice the animals away from the field, so that the farmer is aware of the problem and can respond.

S.No.	Parameter	Description
3.	Novelty	The crop system measures humidity and temperature. It is distinctive in that it uses an LCD display to suggest the crop that is most appropriate for that temperature.
4.	Customer Satisfaction	The farmers benefit greatly from automatic temperature and humidity detection. It also cut down on time because farmers didn't have to spend hours protecting crops from animals and birds.
5.	Business Model	With the use of sensors (humidity, temperature, soil moisture, etc.) and irrigation system automation, this crop protection system hasallowed farmers to increase output. Furthermore, farmers may check on the state of their fields from anywhere with the aid of these sensors. When compared to the traditional method, crop protection systems based on the Internet of Things are far more effective. Intelligent agriculture uses are not limited to conventional, large-scale farming. With operations, but there may also be new levers to support other emerging or well-established agricultural trends, such as organicfarming, family farming (complex or constrained spaces, specific cattle and/or cultures, preservation of particular or high-quality varieties, etc.), and enhancement of highly transparent farming.

S.No.	Parameter	Description
6.	Scalability of the Solution	In the future, if any update is required either on the hardware or software side, it can be easily implemented. The hardware components can be directly interfaced with the microcontroller and small modifications can be made in the programming of the existing product. In case of the software, the website application has to be updated with the additional functionality by creating a new section for the updated hardware. So this will not affect the existing functionality of the product and new functionality can be easily integrated.

PROBLEM SOLUTION FIT:

1. CUSTOMER SEGMENT(S) All farmers	**6.** CUSTOMER CONSTRAINTS When we have a large amount of data, the speed is not always consistent. Also it costs very much	5. AVAILABLE SOLUTIONS This crop system displays the temperature and humidity using sensors. It would also recommend which crops might thrive at that temperature. Furthermore, animals and birds frequently cause crop damage.This crop system supports farmers in safeguarding their crops against predation by animals and birds.
2. PROBLEMS/PAINS Most farmers grow crops without understanding what the appropriate temperature and humidity are. This crop system displays the temperatureand humidity using sensors. It would also recommend which crops might thrive at that temperature. Furthermore,animals and birds frequently cause crop damage. This crop system supports farmers in safeguarding their crops against predation by animals and birds.	9. PROBLEM ROOT CAUSE If temperature and humidity have a substantial impact on the environment. Farmers' profits will suffer as a result of lower production. Farmers are also impacted by animals and birds, whichcause agricultural damage.	7. BEHAVIOUR This crop system measures temperature and humidity. It would also propose which crop is appropriate for that temperature and humidity. This crop system supports farmers in Safe guarding their crops from animals and birds that feed on them.
3. TRIGGERS TO ACT TR Changes and modification of working methods, products and farm systems, as well as increase or modification of existing knowledge are become triggers.	**1**0. YOUR SOLUTION The Dth11 sensor measures temperature and humidity. The ground sensor monitors soil moisture and, using an LCD display, suggests which crop is most suited to that temperature. This technology employs a motion sensor to detect wild animals approaching the field. The sensor directs the microcontroller to operate in this instance. The microcontroller now emits an alarm to attract the animals away from the field, alerting the farmer to the situation and allowing him to respond.	8.CHANNELS OF BEHAVIOUR In this project, all the process are happened in offline

4. EMOTIONS: BEFORE / AFTER

BEFORE: Farmers' main issue is that they produce crops without understanding the optimum temperature and humidity. They cannot constantly keep animals and birds away from their crops.

AFTER

The farmer is overjoyed since this cropprotection system has tremendously benefited him. It measures temperature and humidity. It also saved farmers time because they didn't have to spend hours preserving their crops from animals and birds.

REQUIREMENT ANALYSIS

FUNCTIONAL REQUIREMENT:

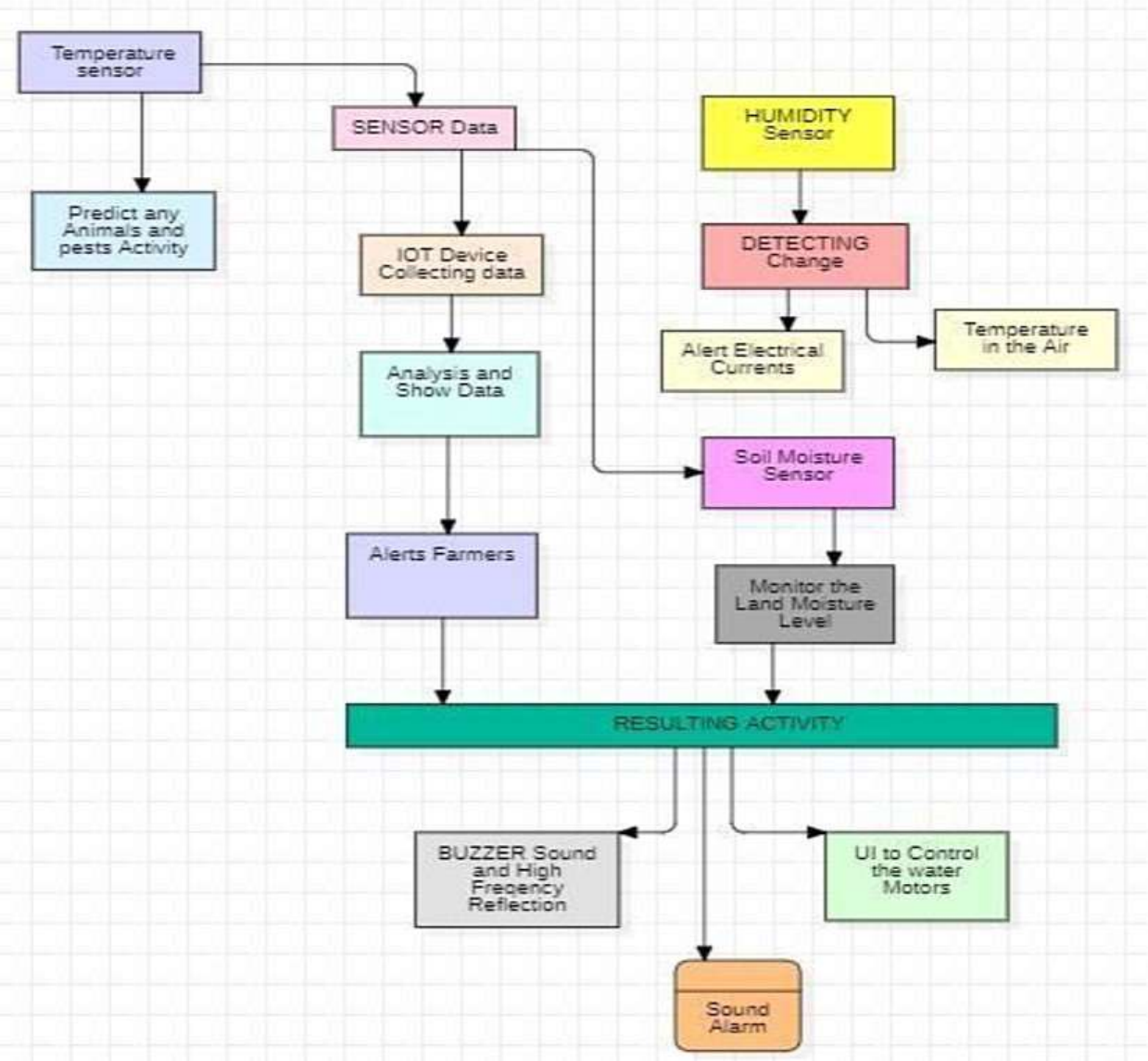
S.NO.	Functional Requirement.	Sub Requirement.
1.	User Visibility	Sense animals nearing the crop field & sounds alarm to woo them away as well as sends SMS to farmer using cloud service.
2.	User Reception	The Data like values of Temperature, Humidity, Soil moisture Sensors are received via SMS.
3.	User Understanding	Based on the sensor data value to get the information about the present of farming land.
4.	User Action	The User needs take action like destruction of crop residues, deep plowing, crop rotation, fertilizers, strip cropping, scheduled planting operations.

NON FUNCTINAL REQUIREMENT:

S.NO.	Non-Functional Requirement.	Description.
1.	Usability	Mobile Support Users must be able to interact in the same roles & tasks on computers & mobile devices where practical, given mobile capabilities.
2.	Security	Data requires secure access to must register and communicate securely on devices and authorized users of the system who exchange information must be able to do.
3.	Reliability	It has a capacity to recognize the disturbance near the field and doesn't give a false caution signal.
4.	Performance	Must provide acceptable response times to users regardless of the volume of data that is stored and the analytics that occurs in background. Bidirectional, near real-time communications must be supported. This requirement is related to the requirement to support industrial and device protocols at the edge.
5.	Availability	IOT Solutions and domains demand highly available systems for 24 x 7 operations. Isn't a critical production application, which means that operations or productiondon't go down if the IOT solution is down.
6.	Scalability	System must handle expanding load & data retention needs that are based on the upscaling of the solution scope, such as extra manufacturing facilities and extra buildings.

PROJECT DESIGN

DATA FLOW DIAGRAM:



SOLUTION AND TECHNICAL ARCHITECTURE:

a.

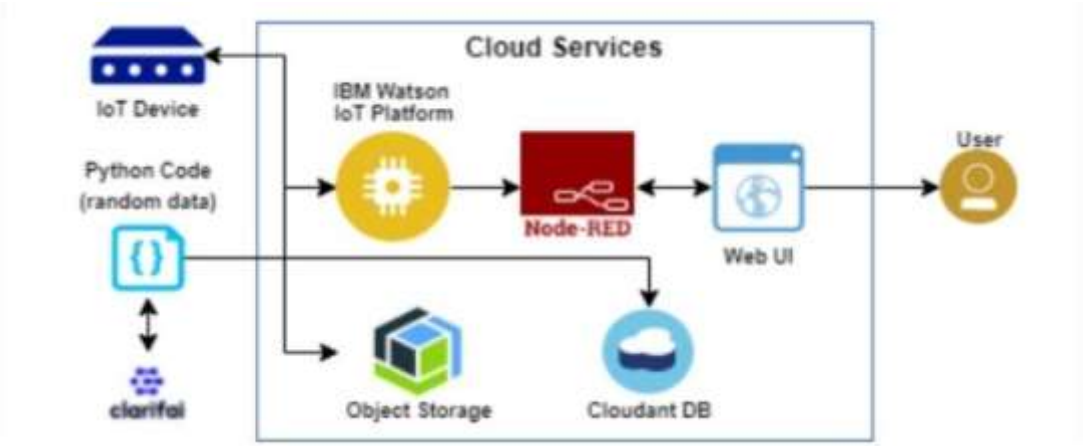


TABLE-1:

sno	components	description	Technology
1	User interface	Interacts with iot device	Html,css,angular js etc..
2	Application logic-1	Logic for a process in the application	Python
3	Application logic-2	Logic for process in the application	Clarifai
4	Application logic-3	Logic for process in the application	IBM Waston Iot platform
5	Application logic-4	logic for the process	Node red app service
6	User friendly	Easily manage the net screen appliance	Web ul

TABLE-2: APPLICATION AND CHARACTERISTICS

sno	Characteristics	Description	Technology
1	Open source framework	Open source framework used	Python
2	Security implementations	Authentication using encryption	Encryptions
3	Scalable architecture	The scalability of architecture consists of 3 models	Web UI Application server-python, clarifai Database server-ibm cloud services.
4	Availability	It is increased by cloudant database	IBM cloud services

USER STORIES:

SPRINT	FUNCTIONAL REQUIREMENT	USER STORY NUMBER	USER STORY/TASK	STORY POINTS	PRIORITY
Sprint-1		US-1	Create the IBM Cloud services which are being used in this project.	7	high
Sprint-1		US-2	Create the IBM Cloud services which are being used in this project.	7	high
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
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	6	high
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
Sprint-3		US-3	Create a Node-RED service	8	high
Sprint-3		US-2	Develop a python script to publish random sensor data such as temperature, moisture, soil and humidity to the IBM IoT platform	6	medium
Sprint-3		US-1	After developing python code, commands are received just print the statements which represent the control of the devices.	8	high
Sprint-4		US-3	Publish Data to The IBM Cloud	5	high
Sprint-4		US-2	Create Web UI in Node- Red	8	high
Sprint-4		US-1	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	6	high

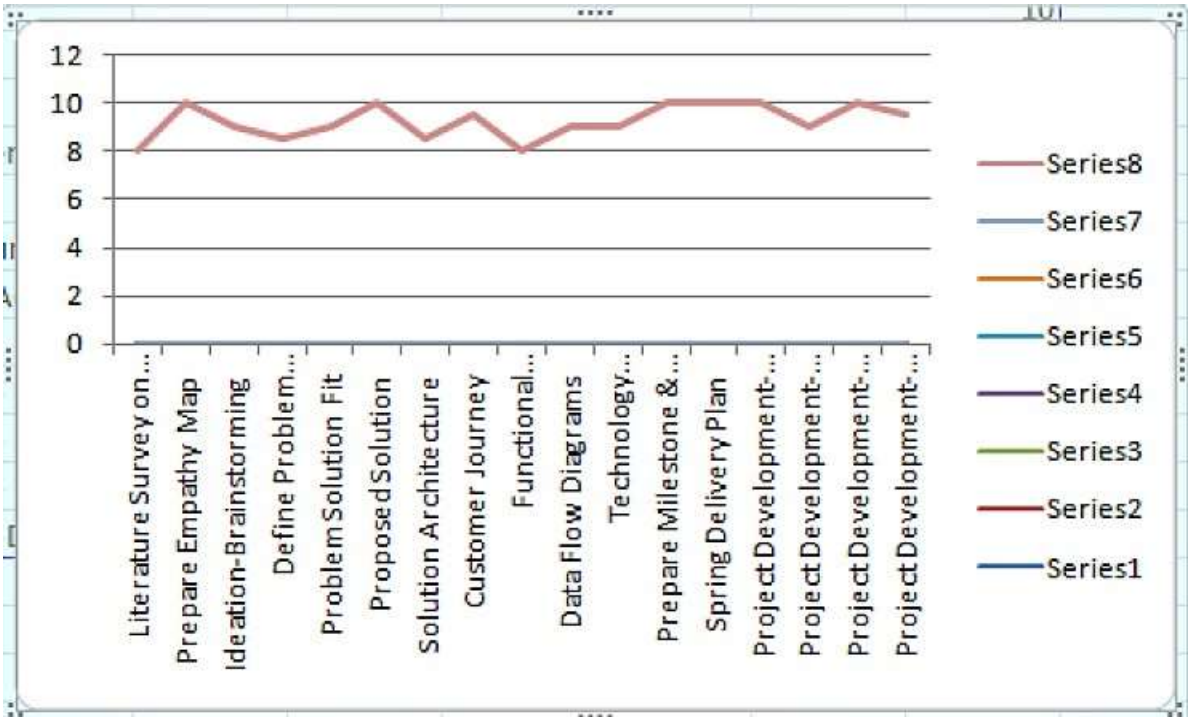
PROJECT PLANNINGAND SCHEDULING

SPRINT PLANNINGAND ESTIMATION:

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	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity:
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$



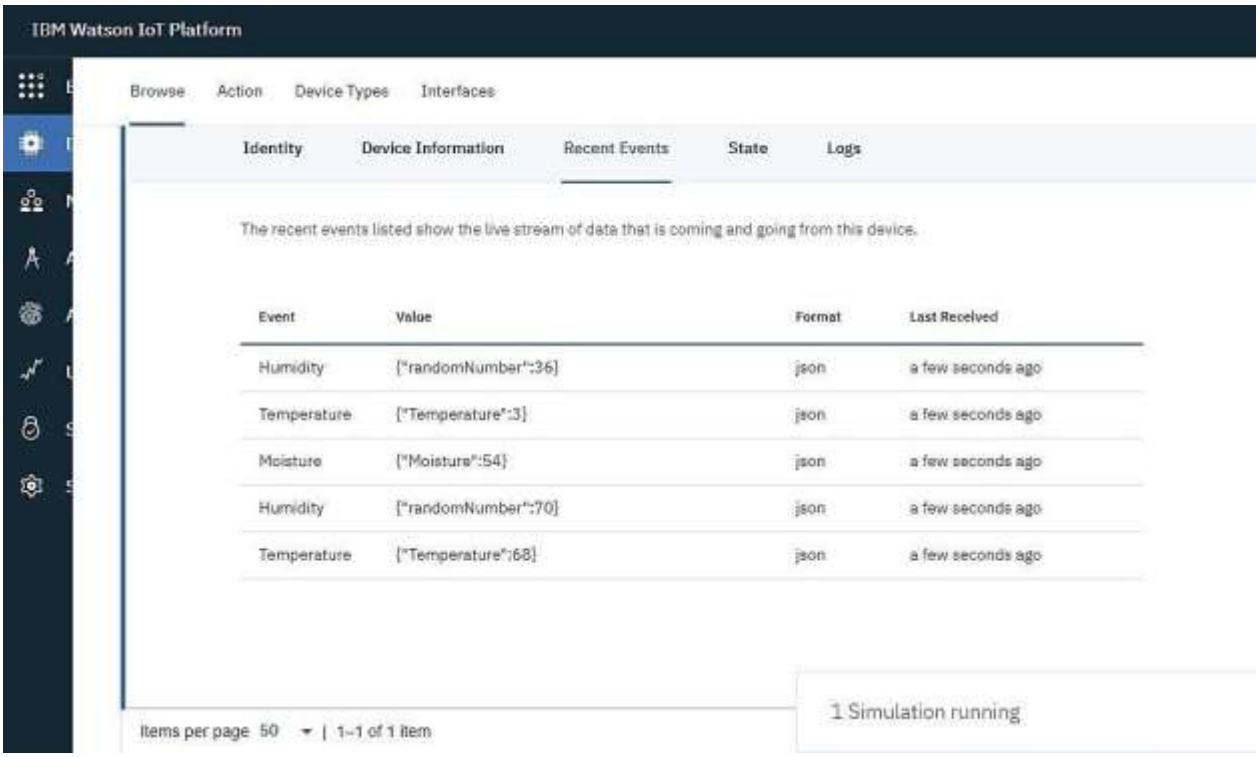
CODING AND SOLUTIONING

FEATURE-1

```
  import random
  import ibmiotf.application
  import ibmiotf.device
  from time import sleep
  import sys
  #IBM Watson Device Credentials.
  organization = "op701j"
  deviceType = "Lokesh"
  deviceId = "Lokesh89"
  authMethod = "token"
  authToken = "1223334444"
  def myCommandCallback(cmd):
   print("Command received: %s" % cmd.data['command'])
   status=cmd.data['command']
   if status=="sprinkler_on":
     print ("sprinkler is ON")
   else :
     print ("sprinkler is OFF")
   #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 = round( random.uniform(0,80),2)
   PH_sensor = round(random.uniform(1,14),3)
   camera = ["Detected","Not Detected","Not Detected","Not Detected","Not Detected","Not Detected",]
   camera_reading = random.choice(camera)
   flame = ["Detected","Not Detected","Not Detected","Not Detected","Not Detected","Not Detected",]
   flame_reading = random.choice(flame)
   moist_level = round(random.uniform(0,100),2)
   water_level = round(random.uniform(0,30),2)


  #storing the sensor data to send in json format to cloud.

   temp_data = { 'Temperature' : temp_sensor }
   PH_data = { 'PH Level' : PH_sensor }
   camera_data = { 'Animal attack' : camera_reading}
   flame_data = { 'Flame' : flame_reading }
   moist_data = { 'Moisture Level' : moist_level}
   water_data = { 'Water Level' : water_level}
```

```
# publishing Sensor data to IBM Watson for every 5-10 seconds.
    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")

    success = deviceCli.publishEvent("PH sensor", "json", PH_data, qos=0)
    sleep(1)
    if success:
      print ("Published PH Level = %s" % PH_sensor, "to IBM Watson")

    success = deviceCli.publishEvent("camera", "json", camera_data, qos=0)
    sleep(1)
    if success:
      print ("Published Animal attack %s " % camera_reading, "to IBM Watson")
    success = deviceCli.publishEvent("Flame sensor", "json", flame_data, qos=0)
    sleep(1)
    if success:
      print ("Published Flame %s " % flame_reading, "to IBM Watson")

    success = deviceCli.publishEvent("Moisture sensor", "json", moist_data, qos=0)
    sleep(1)
    if success:
       print ("Published Moisture Level = %s " % moist_level, "to IBM Watson")
    #Automation to control sprinklers by present temperature an to send alert message to IBM Watson.

    if (temp_sensor > 35):
      print("sprinkler-1 is ON")
    success = deviceCli.publishEvent("Alert1", "json",{ 'alert1' : "Temperature(%s) is high, sprinkerlers are turned ON" %temp_sensor }
   , qos=0)
    sleep(1)
    if success:
      print( 'Published alert1 : ', "Temperature(%s) is high, sprinkerlers are turned ON" %temp_sensor,"to IBM Watson")
    print("")
   else:
    print("sprinkler-1 is OFF")
    print("")

    #To send alert message if farmer uses the unsafe fertilizer to crops.

    if (PH_sensor > 7.5 or PH_sensor < 5.5):
      success = deviceCli.publishEvent("Alert2", "json",{ 'alert2' : "Fertilizer PH level(%s) is not safe,use other fertilizer" %PH_sensor } ,
   qos=0)
    sleep(1)
    if success:
      print('Published alert2 : ' , "Fertilizer PH level(%s) is not safe,use other fertilizer" %PH_sensor,"to IBM Watson")
    print("")

    #To send alert message to farmer that animal attack on crops.

    if (camera_reading == "Detected"):
      success = deviceCli.publishEvent("Alert3", "json", { 'alert3' : "Animal attack on crops detected" }, qos=0)
    sleep(1)
    if success:
      print('Published alert3 : ' , "Animal attack on crops detected","to IBM Watson","to IBM Watson")
    print("")
```

```
#To send alert message if flame detected on crop land and turn ON the splinkers to take immediate action.

    if (flame_reading == "Detected"):
      print("sprinkler-2 is ON")
    success = deviceCli.publishEvent("Alert4", "json", { 'alert4' : "Flame is detected crops are in danger,sprinklers turned ON" }, qos=0)
    sleep(1)
    if success:
      print( 'Published alert4 : ' , "Flame is detected crops are in danger,sprinklers turned ON","to IBM Watson")

    #To send alert message if Moisture level is LOW and to Turn ON Motor-1 for irrigation.
    if (moist_level < 20):
      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 success:
      print('Published alert5 : ' , "Moisture level(%s) is low, Irrigation started" %moist_level,"to IBM Watson" )
    print("")
    #To send alert message if Water level is HIGH and to Turn ON Motor-2 to take water out.

if (water_level > 20):
      print("Motor-2 is ON")
    success = deviceCli.publishEvent("Alert6", "json", { 'alert6' : "Water level(%s) is high, so motor is ON to take water out "
   %water_level }, qos=0)
    sleep(1)
    if success:
      print('Published alert6 : ' , "water level(%s) is high, so motor is ON to take water out " %water_level,"to IBM Watson" )
      print("")
    #command recived by farmer
   deviceCli.commandCallback = myCommandCallback
   # Disconnect the device and application from the cloud
   deviceCli.disconnect()
```



Features

Output: Digital pulse high (3V) when triggered (motion detected) digital low when idle (no motion detected). Pulse lengths are determined by resistors and capacitors on the PCB and differ from sensor to sensor. Power supply: 5V-12V input voltage for most modules (they have a3.3V regulator),but 5V is ideal in case the regulator has different specs.

BUZZER

Specifications

- RatedVoltage : 6V DC
- Operating Voltage : 4 to 8V DC

- Rated Current*: ≤30mA

- SoundOutput at 10cm* : ≥85dB
- Resonant Frequency : 2300 ±300Hz

- Tone: Continuous A buzzer is a loud noise maker.

Most modern ones are civil defense or air- raid sirens, tornado sirens, or the sirens on emergency service vehiclessuch as ambulances, police cars and fire trucks. There are two general types, pneumatic and electronic.

FEATURE-2:

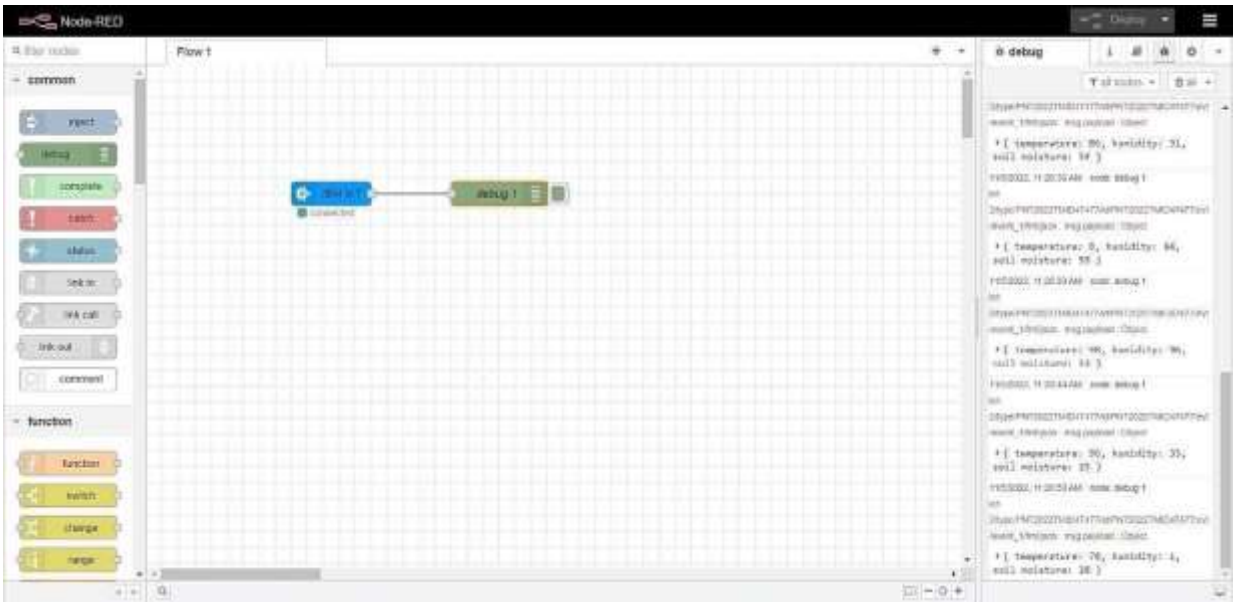
i. Goodsensitivity to Combustible gas in wide range .
ii. Highsensitivity to LPG, Propane and Hydrogen .
iii. Longlife and low cost.
iv. Simpledrive circuit.

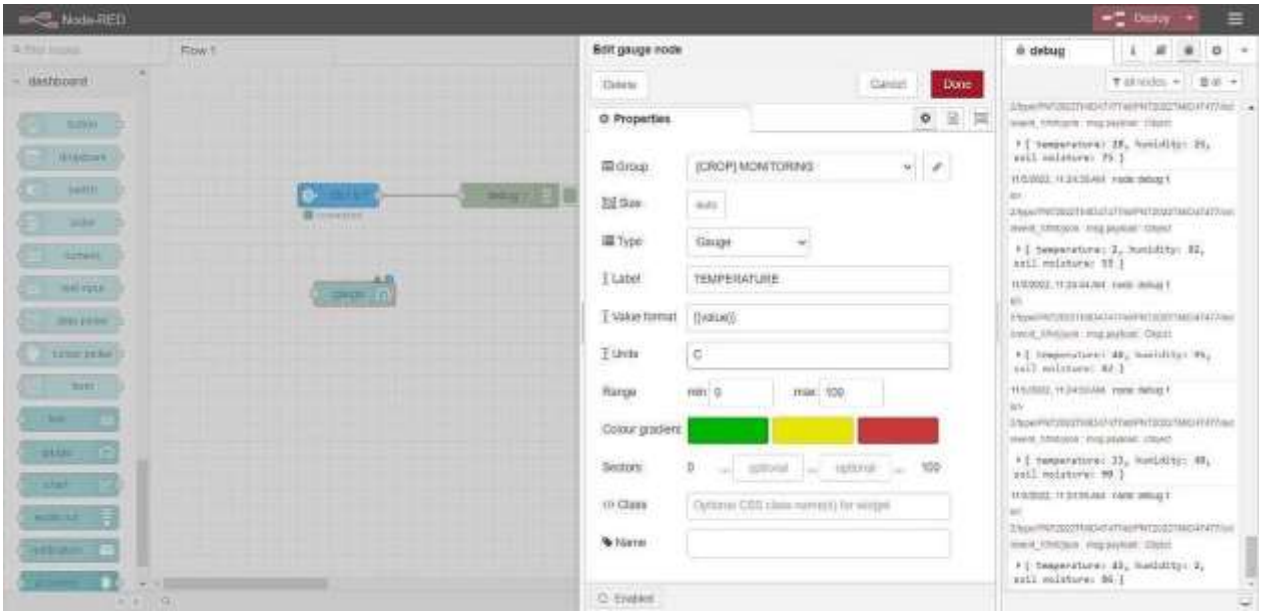
TESTING

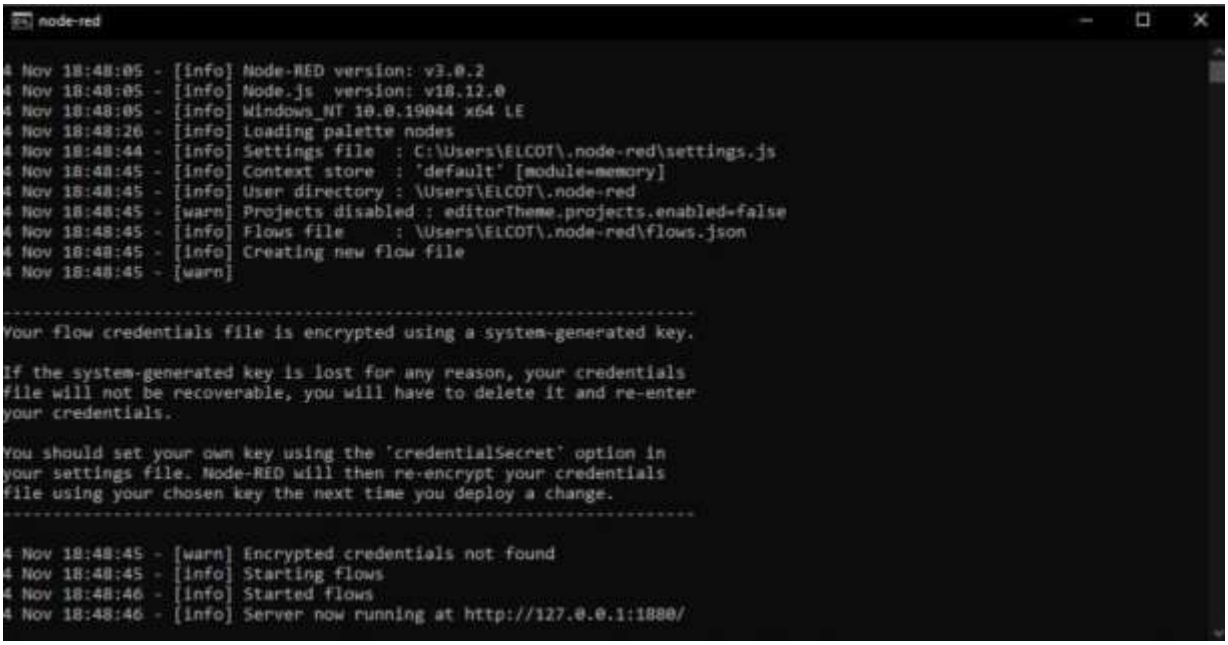
TEST CASES:

sno	parameter	Values	Screenshot
1	Model summary	-	
2	accuracy	Training accuracy-95% Validation accuracy-72%	
3	Confidence score	Class detected-80% Confidence score-80%	

User Acceptance Testing:




Node-RED
Deploy
Flow 1
dashboard
Edit gauge node
Delete
Cancel
Done
Properties
Group
[CROP] MONITORING
Size
Type
Gauge
Label
TEMPERATURE
Value format
{{value}}
Units
C
Range
min 0
max 100
Colour gradient
Sectors
0
100
Class
Name
Enabled
debug


node-red
4 Nov 18:48:05 - [info] Node-RED version: v3.0.2
4 Nov 18:48:05 - [info] Node.js version: v18.12.0
4 Nov 18:48:05 - [info] Windows_NT 10.0.19044 x64 LE
4 Nov 18:48:26 - [info] Loading palette nodes
4 Nov 18:48:44 - [info] Settings file : C:\Users\ELCOT\.node-red\settings.js
4 Nov 18:48:45 - [info] Context store : 'default' [module=memory]
4 Nov 18:48:45 - [info] User directory : \Users\ELCOT\.node-red
4 Nov 18:48:45 - [warn] Projects disabled : editorTheme.projects.enabled=false
4 Nov 18:48:45 - [info] Flows file : \Users\ELCOT\.node-red\flows.json
4 Nov 18:48:45 - [info] Creating new flow file
4 Nov 18:48:45 - [warn]
Your flow credentials file is encrypted using a system-generated key.
If the system-generated key is lost for any reason, your credentials
file will not be recoverable, you will have to delete it and re-enter
your credentials.
You should set your own key using the 'credentialSecret' option in
your settings file. Node-RED will then re-encrypt your credentials
file using your chosen key the next time you deploy a change.
4 Nov 18:48:45 - [warn] Encrypted credentials not found
4 Nov 18:48:45 - [info] Starting flows
4 Nov 18:48:46 - [info] Started flows
4 Nov 18:48:46 - [info] Server now running at http://127.0.0.1:1880/

RESULTS

The problem of crop vandalization by wild animals andfire has become a major social problem in current time. It requires urgent attention as no effective solution existstill date for this problem. Thus this project carries a greatsocial relevance as it aims to address this problem. This project willhelp farmers in protecting their orchards and fields and save them from significant financial losses andwill save them from the unproductive efforts that they endure for the protection their fields. This will also helpthem in achievingbetter crop yields thus leading to theireconomic wellbeing.

ADVANTAGES AND DISADVANTAGES

Advantage:

Controllable food supply. you might have droughts or floods, but ifyou are growing the crops and breeding them to be hardier, you have a better chanceof not straving. It allows farmers to maximize yields using minimum resources such as water,fertilizers.

Disadvantage:

The main disadvantage is the time it can take to process the information.in order to keep feeding people as the population grows you have to radically change theenvironment of the planet

CONCLUSION:

A IoT Web Application is built for smart agricultural system using Watson IoT platform, Watsonsimulator, IBM cloud and Node-RED

FUTURE SCOPE

In the future, there will be very large scope, this project can be made based on Image processing in which wild animaland fire can be detectedby cameras and if it comes towards farmthen system will be directly activated through wireless networks. Wild animals can also be detected by using wireless networks such as laser wireless sensors and by sensingthis laser or sensor’s security system will beactivated.

APPENDIX

SOURCE CODE

```
import time importsys import ibmiotf.application # toinstallpip
install ibmiotf importibmiotf.device


# Provide your IBM Watson Device Credentials organization = "8gyz7t" #
replace the ORG ID deviceType = "weather_monitor" #replace the Device
type deviceId = "b827ebd607b5" # replace Device ID authMethod = "token"
authToken = "LWVpQPaVQ166HWN48f" # Replace the authtoken


def myCommandCallback(cmd):  # function for Callbackif


    cm.data['command'] == 'motoron':


print("MOTOR ON IS RECEIVED")

elif cmd.data['command'] == 'motoroff':print("MOTOR OFF IS RECEIVED")

if cmd.command == "setInterval":


else:

if 'interval' not in cmd.data:
    print("Error - command is missing requiredinformation: 'interval'")


    interval = cmd.data['interval']

elif cmd.command == "print":
if 'message' not in cmd.data:
            print("Error - commandis missing requiredinformation: 'message'")
            else:output = cmd.data['message']
            print(output)
```

```
try:

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


exceptException 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 oftype "greeting"
    10 times
deviceCli.connect()


while True:
        deviceCli.commandCallback = myCommandCallback


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

SENSOR.PY

```
    import time import
    sysimport
    ibmiotf.application
    importibmiotf.device
import random


    # Provide your IBM Watson Device Credentials organization = "8gyz7t" #
    replace the ORG ID deviceType = "weather_monitor" #replace the Device
    type deviceId = "b827ebd607b5" # replace Device ID authMethod = "token"
    authToken = "LWVpQPaVQ166HWN48f" # Replace the authtoken
```

```
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)
                #.....................................


exceptException 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 oftype "greeting"
    10 times
deviceCli.connect()


while True:
          temp=random.randint(0,1
    00)
    pulse=random.randint(0,100)
          soil=random.randint(0,100)


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


          success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
    on_publish=myOnPublishCallback)                    if not success:
    print("Not connected to
          IoTF")time.sleep(1)
```

deviceCli.commandCallback = myCommandCallback

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

Node-RED FLOW :

[
{
"id":"625574ead9839b34
",
"type":"ibmiotout", "z":"630c8601c5ac3295",
"authentication":"apiKey",
"apiKey":"ef745d48e395ccc0",
"outputType":"cmd",
"deviceId":"b827ebd607b5",
"deviceType":"weather_monitor",
"eventCommandType":"data",
"format":"json",
"data":"data",
"qos":0,
"name":"IBM IoT",
"service":"registere
d","x":680,
"y":220,
"wires":[]
},
{
"id":"4cff18c3274cccc4","type":"ui_button",
"z":"630c8601c5ac3295",
"name":"",
"group":"716e956.00eed6c",
"order":2,
"width":"0",
"height":"0",

"passthru":false,
"label":"MotorON",
"tooltip":"",
"color":"",
"bgcolor":"",
"className":"",
"icon":"",
"payload":"{\"command\":\"motoron\"}",
"payloadType":"str",
"topic":"motoron",
"topicType":"s
tr","x":360,
"y":160, "wires":[["625574ead9839b34"]]},
{
"id":"659589baceb4e0b0",
"type":"ui_button", "z":"630c8601c5ac3295",
"name":"",
"group":"716e956.00eed6c",
"order":3,
"width":"0",
"height":"0",
"passthru":true,
"label":"MotorOF
F",
"tooltip":"",
"color":"",
"bgcolor":"",
"className":"",
"icon":"",
"payload":"{\"command\":\"motoroff\"}",
"payloadType":"str",
"topic":"motoroff",
"topicType":"s
tr","x":350,

"y":220, "wires":[["625574ead9839b34"]]},

{"id":"ef745d48e395ccc0","type":"ibmiot",
"name":"weather_monitor","keepalive":"60",
"serverName":"",
"cleansession":true,
"appId":"",
"shared":false},
{"id":"716e956.00eed6c",
"type":"ui_group",
"name":"Form",
"tab":"7e62365e.b7e6b8
","order":1,
"disp":true,
"width":"6",
"collapse":fal
se},
{"id":"7e62365e.b7e6b8",
"type":"ui_tab",
"name":"contorl",
"icon":"dashboard
","order":1,
"disabled":false,
"hidden":false}
]

[
{
"id":"b42b5519fee73ee2", "type":"ibmiotin",
"z":"03acb6ae05a0c712",
"authentication":"apiKey",
"apiKey":"ef745d48e395ccc0",

"inputType":"evt",
"logicalInterface":"",
"ruleId":"",
"deviceId":"b827ebd607b5",
"applicationId":"",
"deviceType":"weather_monitor",

```
"eventType":"+",
"commandType":"",
"format":"json",
"name":"IBMIoT",
"service":"registered",
"allDevices":"",
"allApplications":"",
"allDeviceTypes":"",
"allLogicalInterfaces":"",
"allEvents":true,
"allCommands":"",
"allFormats
":"",
"qos":0,
"x":270,
"y":180,
  "wires":[["50b13e02170d73fc","d7da6c2f5302ffaf","a949797028158f3f","a71f164bc3 78bcf1"]]
},
{
"id":"50b13e02170d73fc
",
"type":"function",
"z":"03acb6ae05a0c712
","name":"Soil
Moisture",
  "func":"msg.payload = msg.payload.soil;\nglobal.set('s',msg.payload);\nreturn msg;",
  "outputs":1,
"noerr":
0,
"initialize
":"",
"finalize":"",
"libs":[],

"x":490,
"y":120,
"wires":[["a949797028158f3f","ba98e701f55f04fe"]]
},
```

```
{
"id":"d7da6c2f5302ffaf","type":"function",
"z":"03acb6ae05a0c712",
"name":"Humidity",
   "func":"msg.payload = msg.payload.pulse;\nglobal.set('p',msg.payload)\nreturn msg;",
   "outputs":1,
"noerr":
0,
"initialize
":"",
"finalize":"",
"li
bs
":[
],
"x
":
48
0,
"y":260, "wires":[["a949797028158f3f","70a5b076eeb80b70"]]
},
{
"id":"a949797028158f3f
",
"type":"debug",
"z":"03acb6ae05a0c712
","name":"IBMo/p",
"active":true,
"tosidebar":true,
"console":false,
"tostatus":false,
"complete":"payload",
"targetType":"msg",
"statusVal":"",
"statusType":"auto",
"x":780,
"y":180,
"wires":[]
},
```

```
{
"id":"70a5b076eeb80b70",
"type":"ui_gauge",
"z":"03acb6ae05a0c712",
"name":"",
"group":"f4cb8513b95c98a4",
"order":6,
"width":"0",
"height":"0",
"gtype":"gage",
"title":"Humidity",
"label":"Percentage(%)",
"format":"{{value}}
","min":0,
"max":"100",
"colors":["#00b500","#e6e600","#ca3838"], "seg1":"",
"seg2":"",
"className
":"","x":86
0,
"y":260,
"wires":[]
},
{
"id":"a71f164bc378bcf1","type":"function",
"z":"03acb6ae05a0c712",
"name":"Temperature",
  "func":"msg.payload=msg.payload.temp;\nglobal.set('t',msg.payload);\nreturn msg;","outputs":1,
"noerr":
0,
"initialize
":"",
"finalize":"",
"li
bs
":[
],
```

```
"x
":
49
0,
"y":360,

"wires":[["8e8b63b110c5ec2d","a949797028158f3f"]]
},
{
"id":"8e8b63b110c5ec2d",
"type":"ui_gauge",
"z":"03acb6ae05a0c712",
"name":"",
"group":"f4cb8513b95c98a4",
"order":11,
"width":"0",
"height":"0",
"gtype":"gage",
"title":"Temperature",
"label":"DegreeCelcius",
"format":"{{value}}",
"min":0,
"max":"100",
"colors":["#00b500","#e6e600","#ca3838"],"seg1":"",
"seg2":"",
"className
":"",
"x":790,
"y":360,
"wires":[]
},
{
"id":"ba98e701f55f04fe",
"type":"ui_gauge",
"z":"03acb6ae05a0c712",
"name":"",
"group":"f4cb8513b95c98a4",
"order":1,
```

"width":"0",
"height":"0",
"gtype":"gage",

"title":"Soil Moisture",
"label":"Percentage(%)",
"format":"{{value}}
","min":0,
"max":"100",
"colors":["#00b500","#e6e600","#ca3838"],"seg1":"",
"seg2":"",
"classNam
e
":"",
"x":790,
"y":120,
"wires":[]
},
{
"id":"a259673baf5f0f98
","type":"httpin",
"z":"03acb6ae05a0c712
","name":"",
"url":"/sensor",
"method":"ge
t",
"upload":fals
e,
"swaggerDoc"
:"","x":370,
"y":500,
"wires":[["18a8cdbf7943d27a"]]
},
{
"id":"18a8cdbf7943d27a","type":"function",
"z":"03acb6ae05a0c712",
"name":"httpfunction",
"func":"msg.payload{\"pulse\":global.get('p'),\"temp\":global.get('t'),\"soil\":global.get('s')};\nreturn
msg;",

```
"outputs":1,
"noerr":0,

"initialize":"",
"finalize":"",
"li
bs
":[
],
"x
":
63
0,
"y":500, "wires":[["5c7996d53a445412"]]
},
{
"id":"5c7996d53a445412
",
"type":"httpresponse",
"z":"03acb6ae05a0c712
","name":"",
"statusCode":"",
"header
s":{},
"x":870,
"y":500,
"wires":[]
},
{
"id":"ef745d48e395ccc0",
"type":"ibmiot",
"name":"weather_monitor",
"keepalive":"60",
"serverName":"",
"cleansession":true,
"appId":"",
"shared":false},
{
```

"id":"f4cb8513b95c98a4","type":"ui_group",
"name":"monitor",
"tab":"1f4cb829.2fdee8
","order":2,
"disp":
true,
"width
":"6",

"collapse":f
alse,
"className
":""
},
{
"id":"1f4cb829.2fdee8",
"type":"ui_tab",
"name":"Home",
"icon":"dashboard
","order":3,
"disabled":false,
"hidden":false }