Project Development Phase

Sprint -2

Date	17 November 2022
Team ID	PNT2022TMID34928
Project Name	IOT BASED SMART CROP PROTECTION SYSTEM

Python Code:

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
import cv2
import numpy as np
threatlst=["elephant","bear","tiger","horse","monkey"]
n=len(threatlst)
#Provide your IBM Watson Device Credentials
organization = "2ldaf5"
deviceType1 = "Sensor"
deviceId1 = "DHT"
authMethod = "token"
authToken1 = "NeVIAy2K16H)d9sXvz"


deviceType2 = "Sensor1"
deviceId2 = "Soil_moisture"
authToken2= "zwr247qk1Xca0w?QEs"
```

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deviceType3 = "Actuator"
deviceId3 = "Water_pump"
authToken3= "Pze?D!@FjZeAtfMB4q"

deviceType4= "Sensor2"
deviceId4= "PIR"
authToken4= "i-yXXf?FnB011nEycG"

deviceType5= "Sensor3"
deviceId5="Ultrasonic"
authToken5="e&QzDxiHpQ4GaRyPGJ"

deviceType6="Detector"
deviceId6="Camera"
authToken6="f7LMx6-a(uhdnDcKa-"

deviceType7="Output"
deviceId7="LED"
authToken7="qJIBVJHP9@Ihl8@CK3"

deviceType8="Actuator"
deviceId8="Speaker"
authToken8="TitkHSlzaTy_gxEtve"

# Initialize GPIO
def myCommandCallback(cmd):
    print("Command received: %s \n" % cmd.data['command'])
    status=cmd.data['command']
    if status=="ON":
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        print ("Water Pump is turned ON \n")
    else :
        print ("Water Pump is turned OFF \n")
def myCommandCallback1(cmd):
    print("Command received: %s \n" % cmd.data['command1'])
    status=cmd.data['command1']
    if status=="ON":
        print ("LED is turned ON \n")
    else :
        print ("LED is turned OFF \n")
def myCommandCallback2(cmd):
    print("Command received: %s \n" % cmd.data['command2'])
    status=cmd.data['command2']
    if status=="ON":
        print ("Speaker is turned ON \n")
    else :
        print ("Speaker is turned OFF \n")
#Automatically turning on/off led and speaker
def threat(x):
    print("LED is turned ON")
    print("Speaker is turned ON")
    data8= {'Threat' : str(x)}
    def myOnPublishCallback8():
        print ("Threat allert is send to IBM Watson")
    success8 = deviceCli8.publishEvent("Threat status", "json", data8, qos=0,
on_publish=myOnPublishCallback8)
    if not success8:
        print("Not connected to IoTF")
    time.sleep(1)
```

```
def cam():


net=cv2.dnn.readNet('C:/Users/hp/OneDrive/Desktop/opencvtrial/yolov3.weights','C:/User
s/hp/OneDrive/Desktop/opencvtrial/yolov3.cfg.txt')
  classes=[]
  with open('C:/Users/hp/OneDrive/Desktop/opencvtrial/coco.names','r') as f:
     classes=f.read().splitlines()
  cap=cv2.VideoCapture('blackbear.mp4')
  for i in range(50):
     _,img=cap.read()
     height,width,_=img.shape
     blob=cv2.dnn.blobFromImage(img,1/255,(416,416),(0,0,0),swapRB=True,crop=False)
#(img,reduction the pixels size,size of the image,rgb colour)
     net.setInput(blob)
     output_layers_names=net.getUnconnectedOutLayersNames()
     layeroutput=net.forward(output_layers_names)
     boxes=[]
     confidences=[]
     class_ids=[]
     for output in layeroutput:
        for detection in output:
           scores=detection[5:]
           class_id=np.argmax(scores)
           confidence=scores[class_id]
           if confidence > 0.5:
              center_x=int(detection[0]*width)
              center_y =int(detection[1]*height)
              w=int(detection[2]*width)
              h=int(detection[3]*height)
              x=int(center_x - w/2)
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                y=int(center_y - h/2)
                boxes.append([x,y,w,h])
                confidences.append((float(confidence)))
                class_ids.append(class_id)
                animal=classes[class_id]

    indexes=cv2.dnn.NMSBoxes(boxes,confidences,0.5,0.4)
    font=cv2.FONT_HERSHEY_COMPLEX
    colors=np.random.uniform(0,255,size=(len(boxes),3))
    for i in indexes.flatten():
        x,y,w,h=boxes[i]
        label=str(classes[class_ids[i]])
        confidence=str(round(confidences[i],2))
        color=colors[i]
        cv2.rectangle(img,(x,y),(x+w ,y+h),color,2)
        cv2.putText(img,label + " "+confidence,(x,y+20),font,2,(255,255,0),2)
    cv2.imshow('Target Image',img)
    key=cv2.waitKey(1)
    if key ==ord('q'):
        break
print("Alert! detected animal is "+str(animal))
for x in threatlst :
   if animal==x :
      status1="YES"
      threat(status1)
cap.release()
cv2.destroyAllWindows()
data6 = { 'Intruded_Animal' :  str(animal) }
def myOnPublishCallback6():
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      print ("Published Intruded Animal is "+str(animal) ,"to IBM Watson")

   success6 = deviceCli6.publishEvent("Allert", "json", data6, qos=0,
on_publish=myOnPublishCallback6)

   if not success6:

      print("Not connected to IoTF")

   time.sleep(1)


try:

   deviceOptions1 = {"org": organization, "type": deviceType1, "id": deviceId1, "auth-
method": authMethod, "auth-token": authToken1}

   deviceCli1 = ibmiotf.device.Client(deviceOptions1)

   #.....................................

   deviceOptions2 = {"org": organization, "type": deviceType2, "id": deviceId2, "auth-
method": authMethod, "auth-token": authToken2}

   deviceCli2 = ibmiotf.device.Client(deviceOptions2)

   #.....................................

   deviceOptions3 = {"org": organization, "type": deviceType3, "id": deviceId3, "auth-
method": authMethod, "auth-token": authToken3}

   deviceCli3 = ibmiotf.device.Client(deviceOptions3)

   #.....................................

   deviceOptions4 = {"org": organization, "type": deviceType4, "id": deviceId4, "auth-
method": authMethod, "auth-token": authToken4}

   deviceCli4 = ibmiotf.device.Client(deviceOptions4)

   #.....................................

   deviceOptions5 = {"org": organization, "type": deviceType5, "id": deviceId5, "auth-
method": authMethod, "auth-token": authToken5}

   deviceCli5 = ibmiotf.device.Client(deviceOptions5)

   #.....................................

   deviceOptions6 = {"org": organization, "type": deviceType6, "id": deviceId6, "auth-
method": authMethod, "auth-token": authToken6}

   deviceCli6 = ibmiotf.device.Client(deviceOptions6)

   #.....................................
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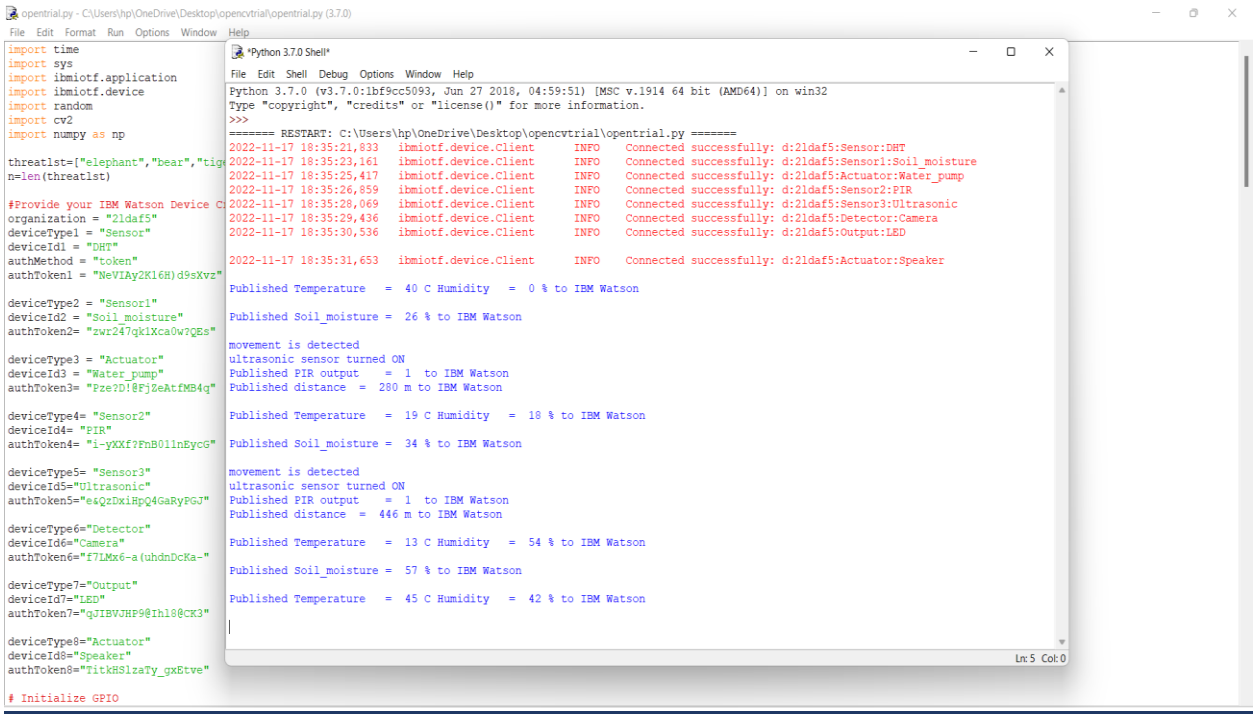
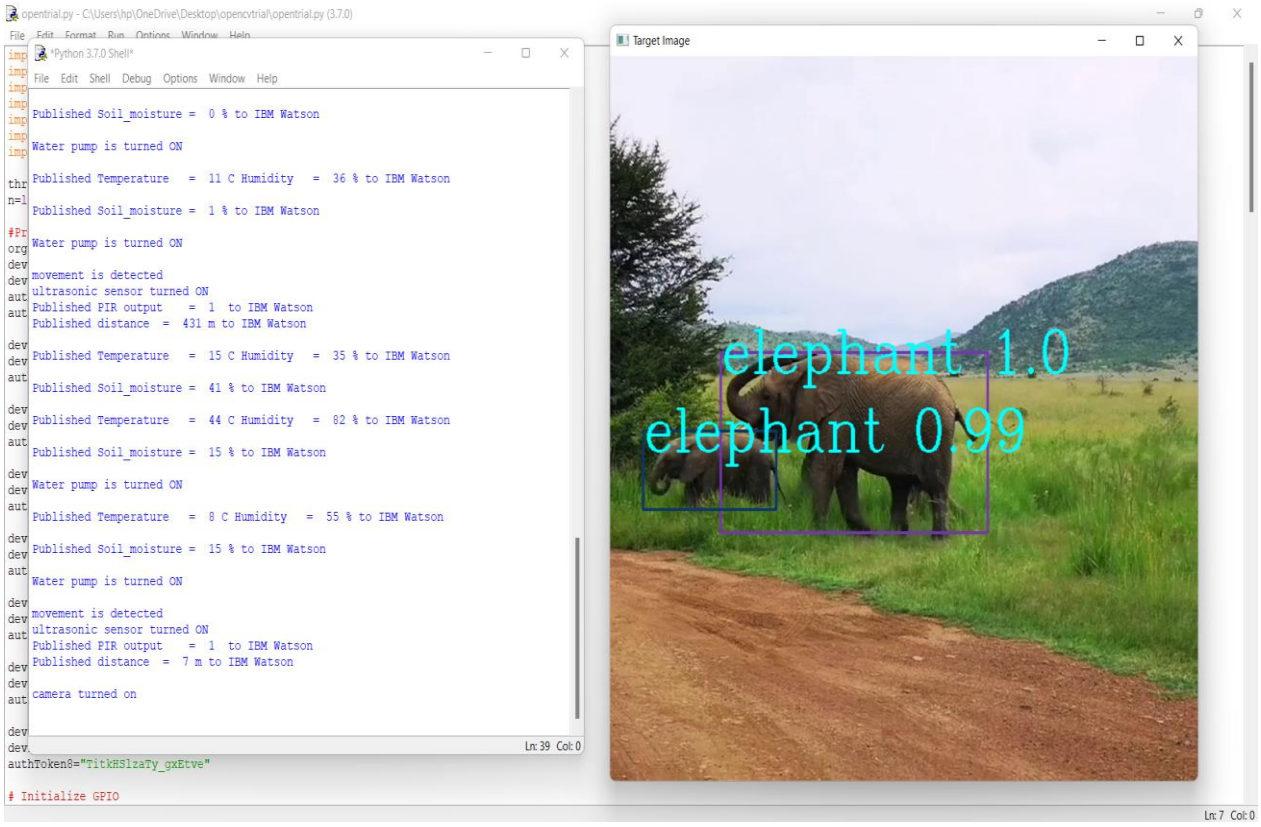
    deviceOptions7 = {"org": organization, "type": deviceType7, "id": deviceId7, "auth-method": authMethod, "auth-token": authToken7}
    deviceCli7 = ibmiotf.device.Client(deviceOptions7)
    #.....................................
    deviceOptions8 = {"org": organization, "type": deviceType8, "id": deviceId8, "auth-method": authMethod, "auth-token": authToken8}
    deviceCli8 = ibmiotf.device.Client(deviceOptions8)
    #.....................................
except Exception as e:
        print("Caught exception connecting device: %s" % str(e))
        sys.exit()
deviceCli1.connect()
deviceCli2.connect()
deviceCli3.connect()
deviceCli4.connect()
deviceCli5.connect()
deviceCli6.connect()
deviceCli7.connect()
deviceCli8.connect()
print("\n")
while (True):
    #Get Sensor Data from DHT11
    temp=random.randint(0,45)
    Humid=random.randint(0,100)
    data1 = { 'Temperature' : temp , 'Humidity': Humid}
    def myOnPublishCallback1():
      print ("Published Temperature  = %s C" % temp, "Humidity  = %s %%" % Humid, "to IBM Watson\n")
    success1 = deviceCli1.publishEvent("DHT Sensor", "json", data1, qos=0, on_publish=myOnPublishCallback1)
    if not success1:
```

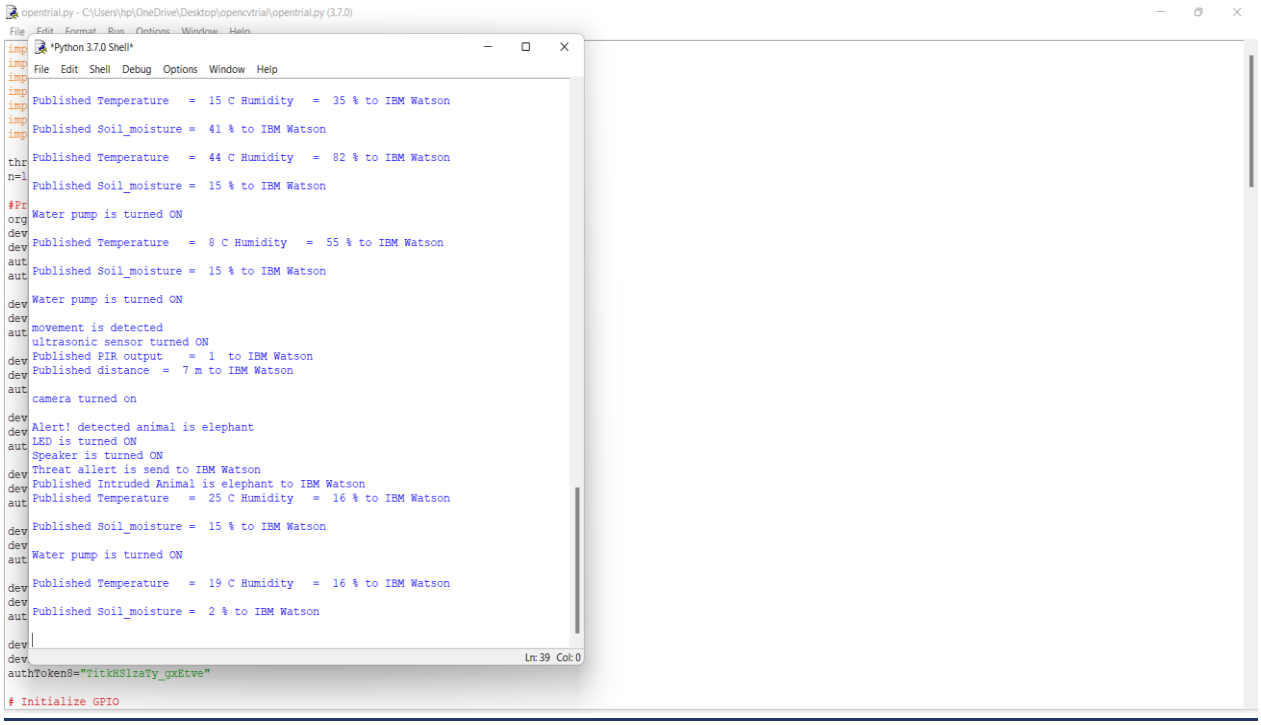
```
        print("Not connected to IoTF\n")
    time.sleep(1)
    #Get Sensor Data from SOIL Moisture
    Soil_moisture=random.randint(0,100)
    data2 = { 'Soil_moisture' : Soil_moisture}
    def myOnPublishCallback2():
        print ("Published Soil_moisture =  %s %%" % Soil_moisture, "to IBM Watson\n")
    success2 = deviceCli2.publishEvent("Soil Moisture Sensor", "json", data2, qos=0,
on_publish=myOnPublishCallback2)
    if not success2:
        print("Not connected to IoTF")
    time.sleep(1)
    #Automatically turning on/off water pump
    if Soil_moisture <= 20:
      print("Water pump is turned ON\n")
    deviceCli3.commandCallback = myCommandCallback
    #Get Sensor Data from PIR
    pir=random.randint(0,1)
    data4 = { 'PIR_output' : pir}
    #Movement detection by PIR
    if(pir==1):
        print("movement is detected\nultrasonic sensor turned ON")
        def myOnPublishCallback4():
            print ("Published PIR output    =  %s " % pir, "to IBM Watson")
        success4 = deviceCli4.publishEvent("PIR Sensor", "json", data4, qos=0,
on_publish=myOnPublishCallback4)
        if not success4:
            print("Not connected to IoTF")
        time.sleep(1)
        #Get Sensor data from ultrasonic sensor
```

```
        distance=random.randint(0,500)
        data5 = { 'Distance:' : distance}
        def myOnPublishCallback5():
          print ("Published distance  =  %s m" % distance, "to IBM Watson\n")
        success5 = deviceCli5.publishEvent("Ultrasonic Sensor", "json", data5, qos=0,
on_publish=myOnPublishCallback5)
        if not success5:
          print("Not connected to IoTF")
        time.sleep(1)
        #turning on camera
        if(distance<=200):
          print("camera turned on\n")
          cam()
      deviceCli7.commandCallback = myCommandCallback1
      deviceCli8.commandCallback = myCommandCallback2
deviceCli1.disconnect()
deviceCli2.disconnect()
deviceCli4.disconnect()
deviceCli5.disconnect()
deviceCli6.disconnect()
```

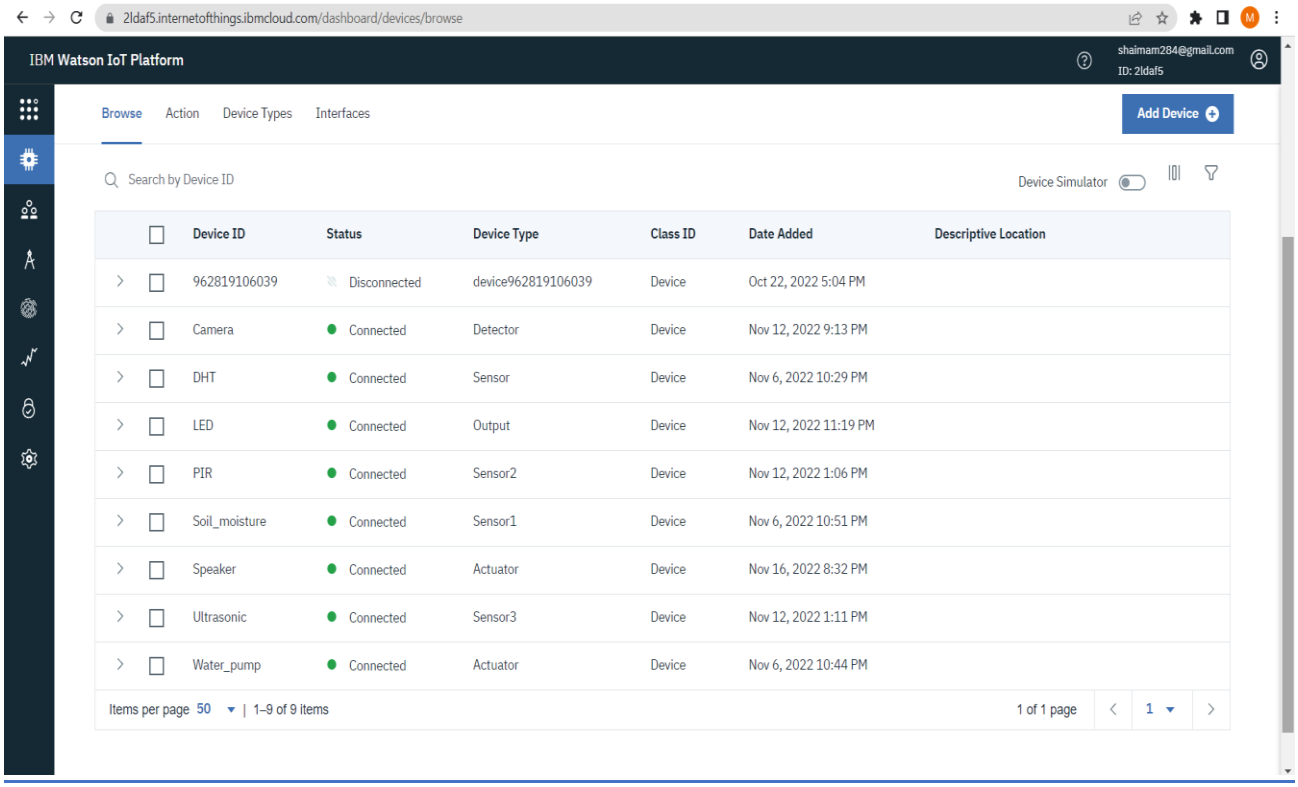
Python Output :



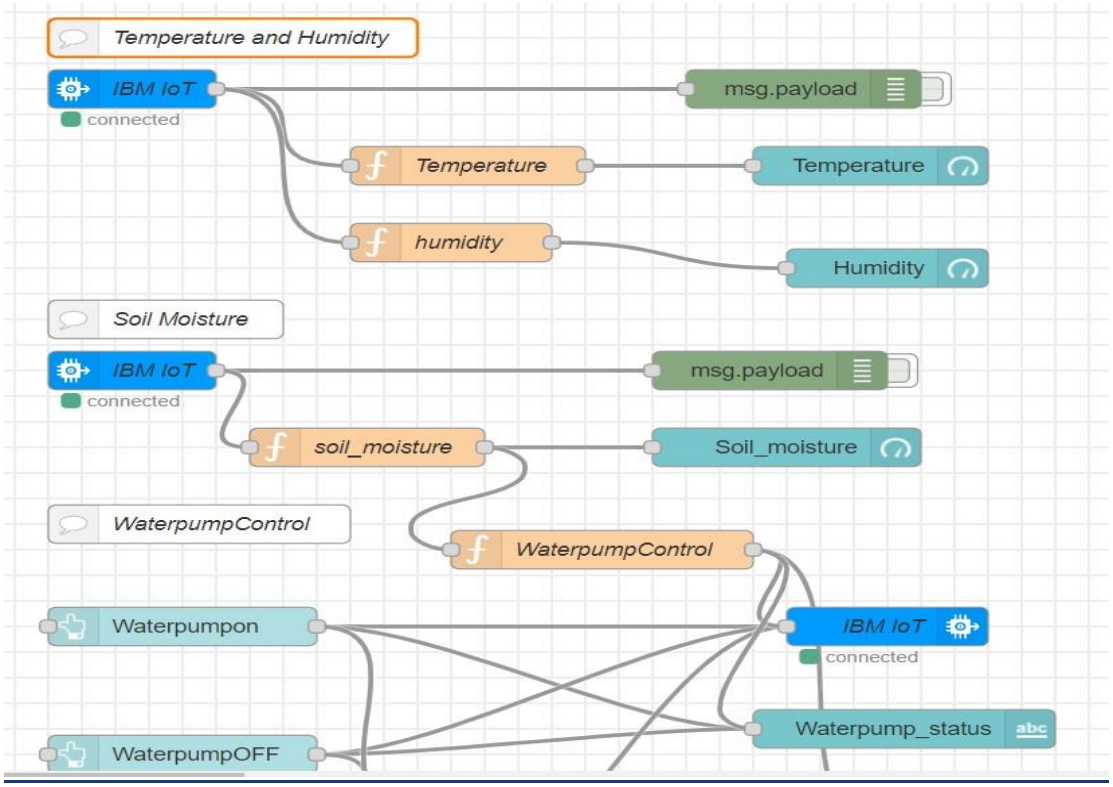


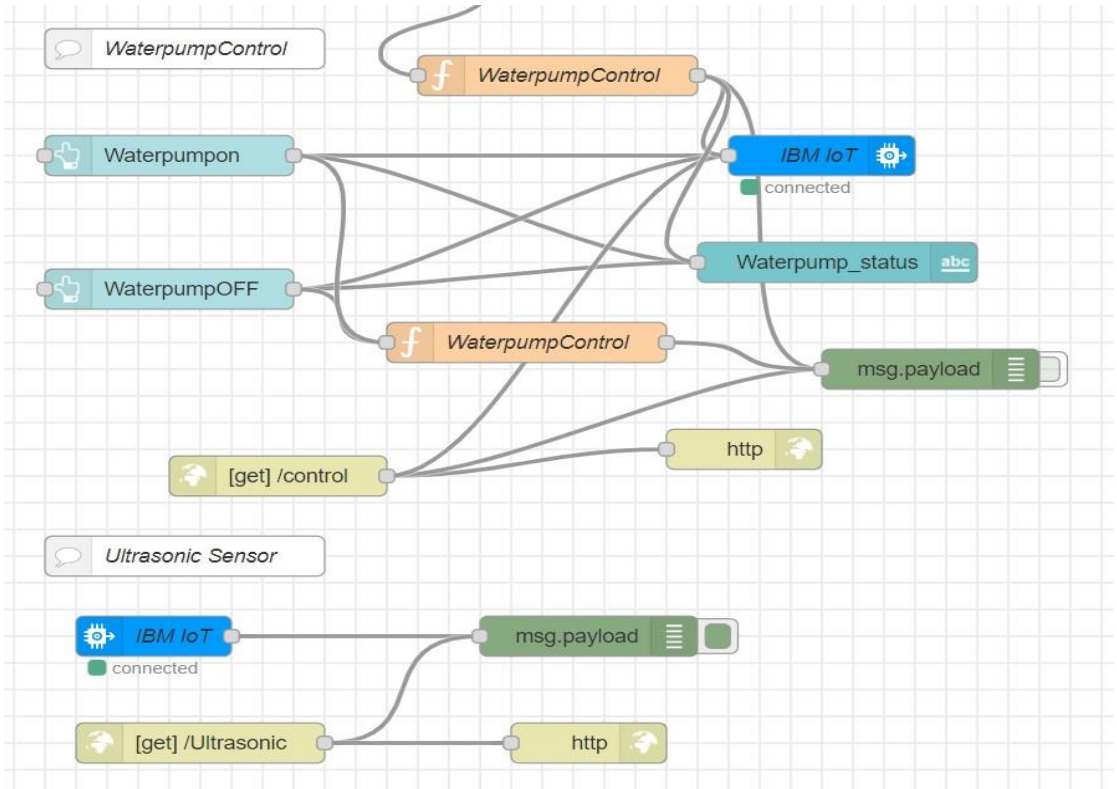


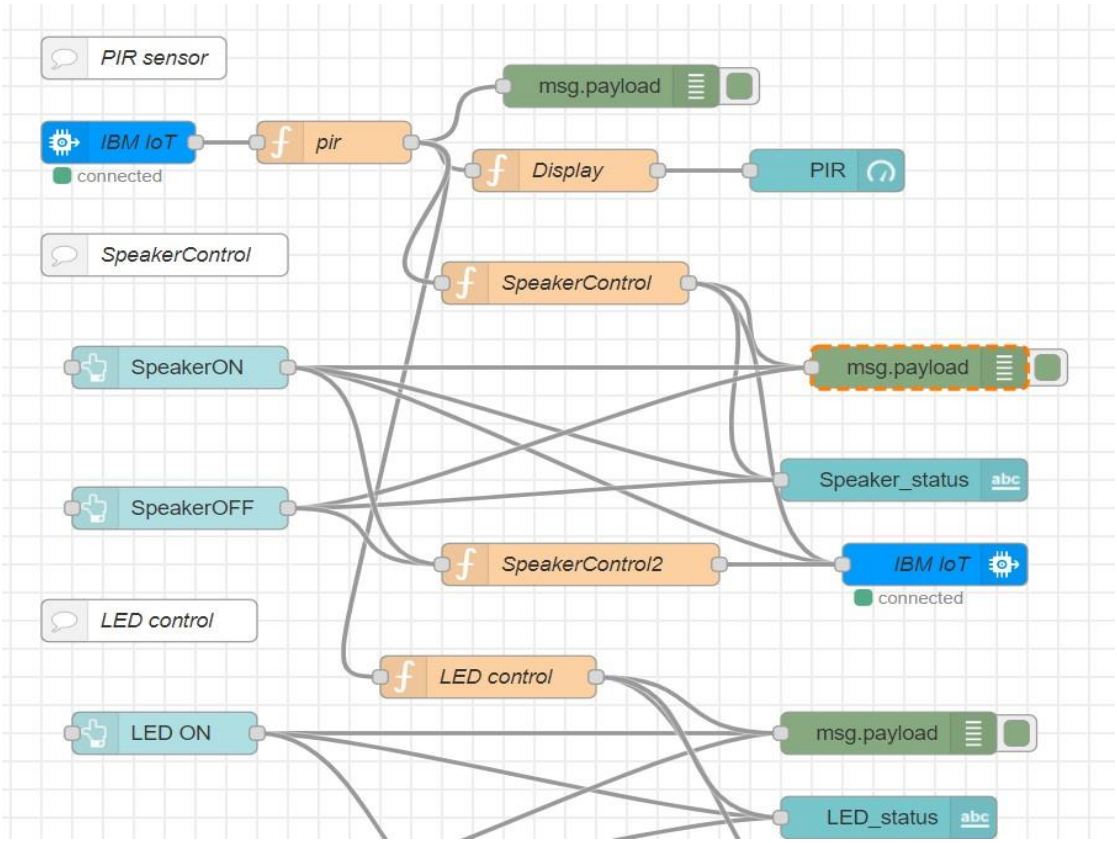
IBM Watson Output:

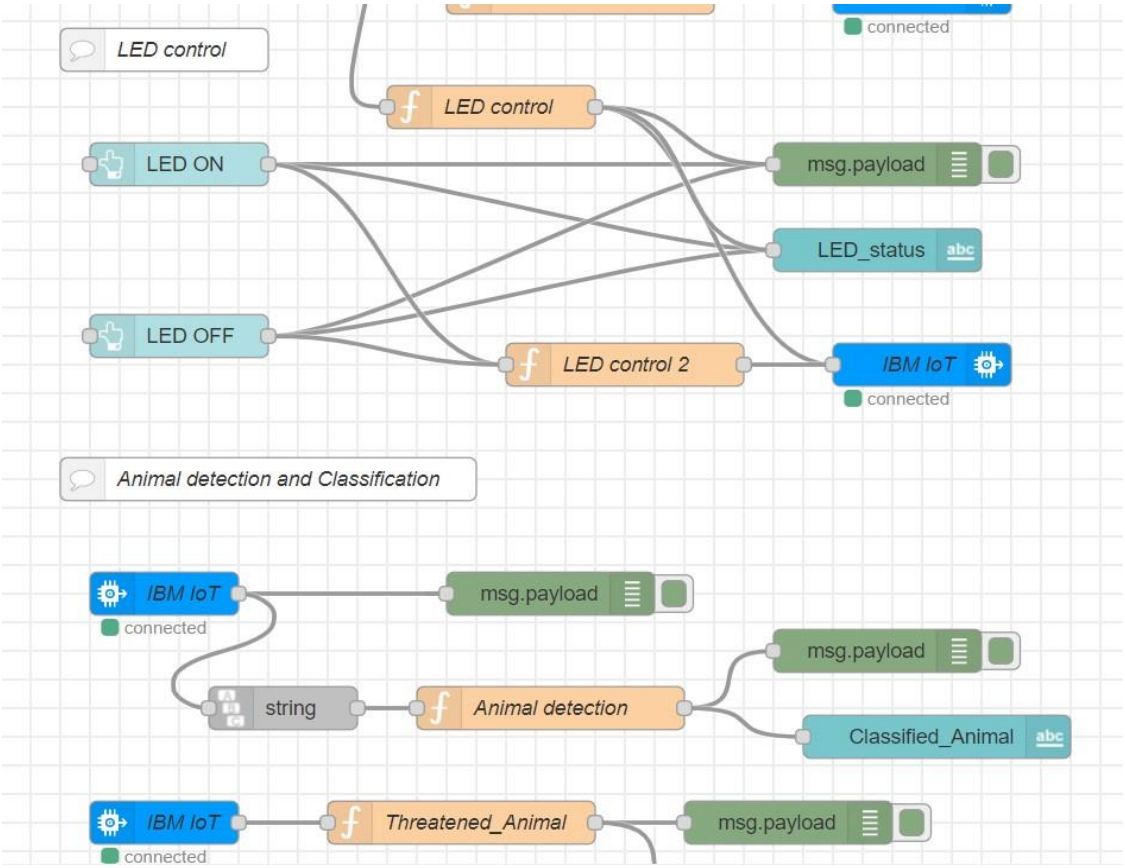


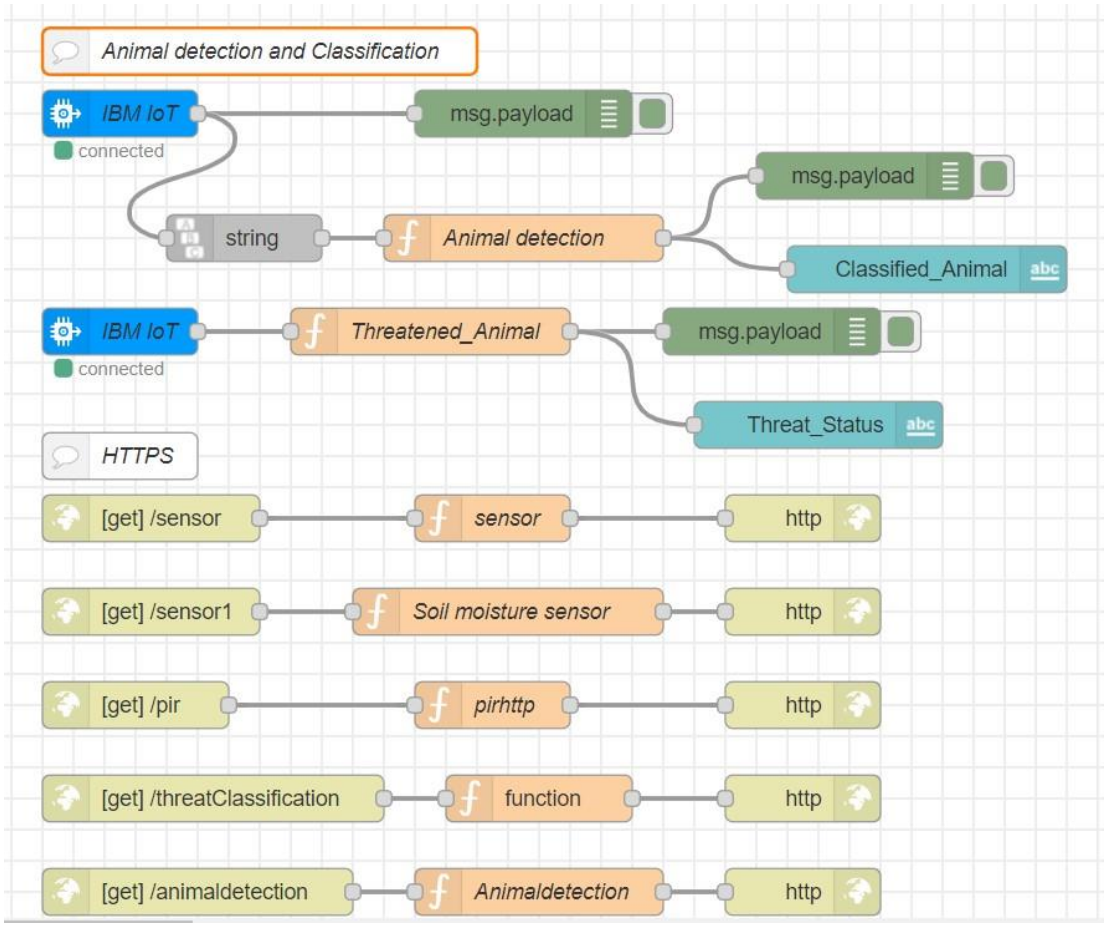
Node Red Flow:

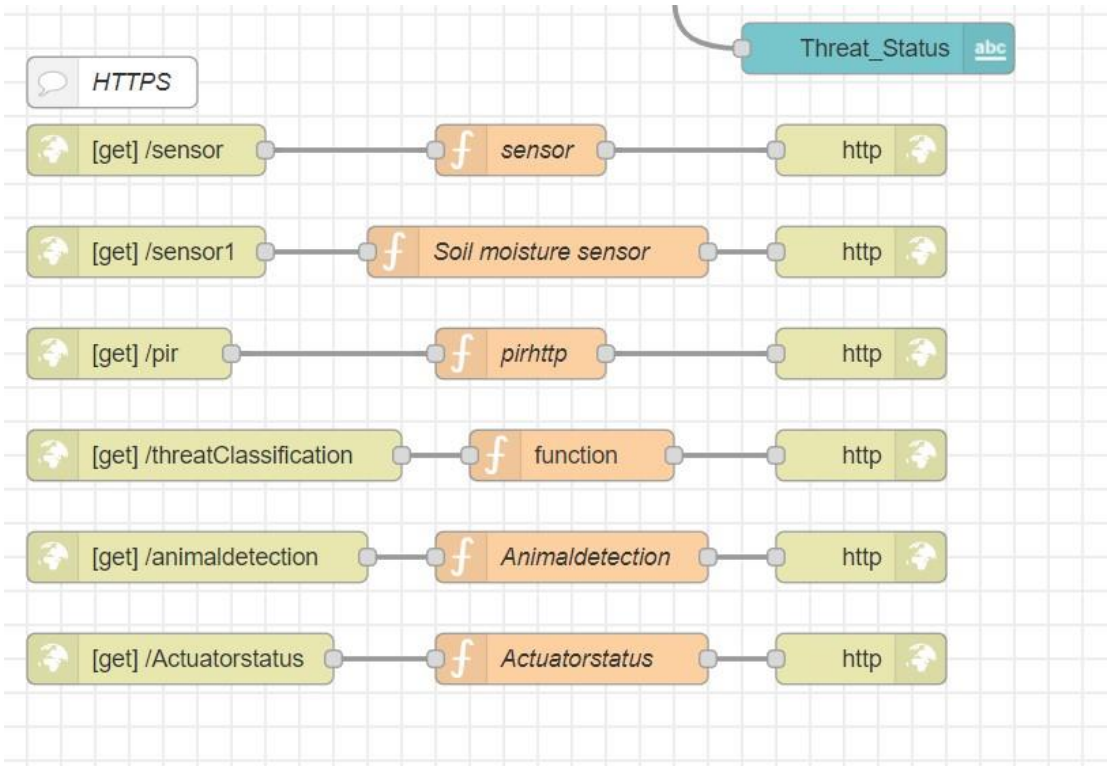





PIR sensor
IBM IoT
connected
pir
msg.payload
Display
PIR
SpeakerControl
SpeakerControl
SpeakerON
msg.payload
Speaker_status
SpeakerOFF
SpeakerControl2
IBM IoT
connected
LED control
LED control
LED ON
msg.payload
LED_status


connected
LED control
LED control
LED ON
msg.payload
LED_status
LED OFF
LED control 2
IBM IoT
connected
Animal detection and Classification
IBM IoT
connected
msg.payload
msg.payload
string
Animal detection
Classified_Animal
IBM IoT
connected
Threatened_Animal
msg.payload


Animal detection and Classification
IBM IoT
connected
msg.payload
string
Animal detection
msg.payload
Classified_Animal
IBM IoT
connected
Threatened_Animal
msg.payload
Threat_Status
HTTPS
[get] /sensor
sensor
http
[get] /sensor1
Soil moisture sensor
http
[get] /pir
pirhttp
http
[get] /threatClassification
function
http
[get] /animaldetection
Animaldetection
http


Threat_Status
HTTPS
[get] /sensor
sensor
http
[get] /sensor1
Soil moisture sensor
http
[get] /pir
pirhttp
http
[get] /threatClassification
function
http
[get] /animaldetection
Animaldetection
http
[get] /Actuatorstatus
Actuatorstatus
http

Node Red Web UI :