IoT Based Smart Animal farm Using IBM Watson

1.INTRODUCTION:

a.Overview

Farming plays an important role in today's world and it requires proper environmental and diet care. A smart system is needed to operate and monitor animal farm remotely. This system should provide feed and water as required, exhaust the excess of biogas which is produced by the animals' waste, detect fire in the farm, and also the temperature and humidity in the farm. Moreover, this intelligent system should also do surveillance of the entire farm.

Smart Animal Farm is a manual system with a monotonous process and is very less time-consuming. This paper proposes a sensor-based smart animal farm. The main components of Wireless Sensor Network (WSN) include a microcontroller for processing the system, communication system for inter and intra node communication and several sensors. Real-time data access can be done by using remote monitoring and Internet of Things (IoT) technology. Here in this project Using IBM cloud,NODERED,MIT APP INVENTOR the following features are done:

*Smart Animal Farm can be monitored by the web application.
*Can be able to know if there are any gases present in the farm.
*The lights in the farm can be monitored.
*Water level, temperature, humidity in farm can be monitored.
*Alerting the authorities if the water level are so that they can go and turn on water pump if temperature,humidity is more they can turn on fans.

b.Purpose

Farming plays an important role in today's world and it requires proper environmental and diet care. A smart system is needed to operate and monitor animal farm remotely. This system should provide feed and water as required, exhaust the excess of biogas which is produced by the animals' waste, and detect fire in the farm. this can also measure the temperature and humidityof the farm.Moreover, this intelligent system should also do surveillance of the entire farm.To overcome this problem and also update the technology in a smart way using IOT.

2.LITERATURE SURVEY:

a.Extising problem

Smart animal farm is the most curical for our dialy usage of milk, food products etc. Now-a-days it is very difficult to maintain the farm. The record shows more usage of milk from diary farms. Many of them are lacking to maintain the animal farm. The reason is that they are not following the enviromental conditions and also lack of labour for working in the farm. Every one is busy with their work as they are lack of smart monitoring system which makes it easy to do animal farm.

b.Proposed solution

The main aim is to develop a system for continuous smart animal farming in farm using wireless sensor networks with low power consumption, low-cost and high detection accuracy. Temperature, humidity, water level ,etc. are the limits that are analyzed to improve the smart animal farming. Following are the aims of idea implementation (a) To measure water parameters such as temperature, humidity, water level, etc. using available sensors at a farm. (b) To assemble data from various sensor nodes and send it to the base station by the wireless channel. (c) To simulate and evaluate quality parameters for animal farm. (d) To send SMS to an authorized person routinely when water level, temperature, humidity quality detected does not match the preset standards, so that, necessary actions can be taken.The following steps can be satisfied:

*Smart Animal Farm can be monitored by the web application.

*Can be able to know if there are any gases present in the farm.

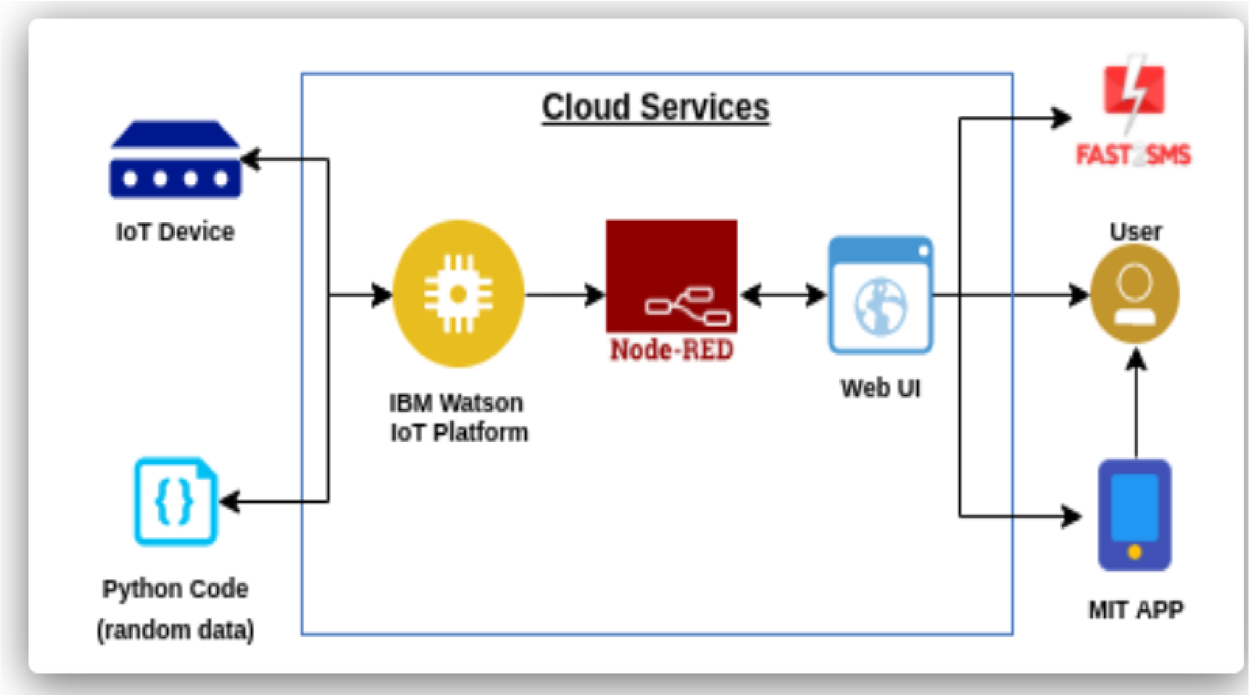
*The lights in the farm can be monitored.

*Water level, temperature, humidity in farm can be monitored.

*Alerting the authorities if the water level are so that they can go and turn on water pump if temperature,humidity is more they can turn on fans.

3.THEORITICAL ANALYSIS:

a.Block Diagram



Note: Use random values in python for sensor data as physical hardware is not available.

b.Hardware/Software Designing:

As Hardware is not available I have taken random values in python for sensor data as physical hardware is not available.

Coming to Software,the smart animal farm using iot monitoring system can be divided into:

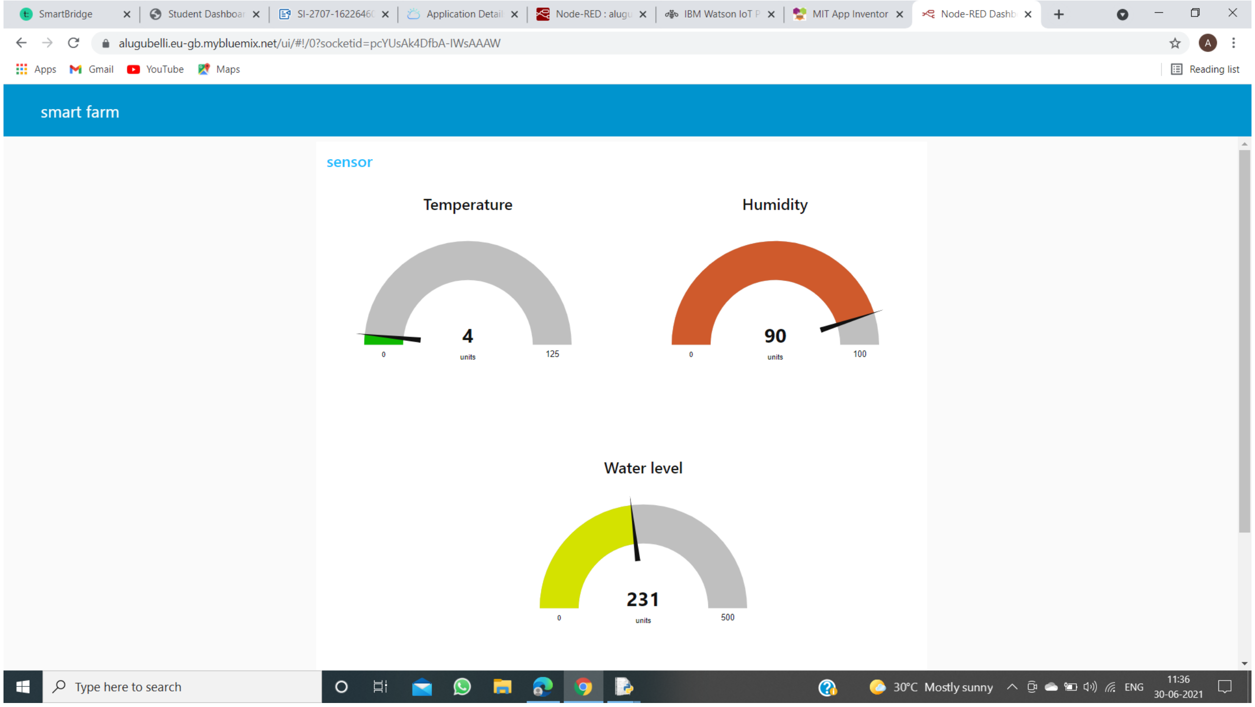
- IBM WATSON IOT PLATFORM
- NODERED
- MIT APP INVENTOR
- WEB UI AND HTTP REQUESTS
- FAST2SMS

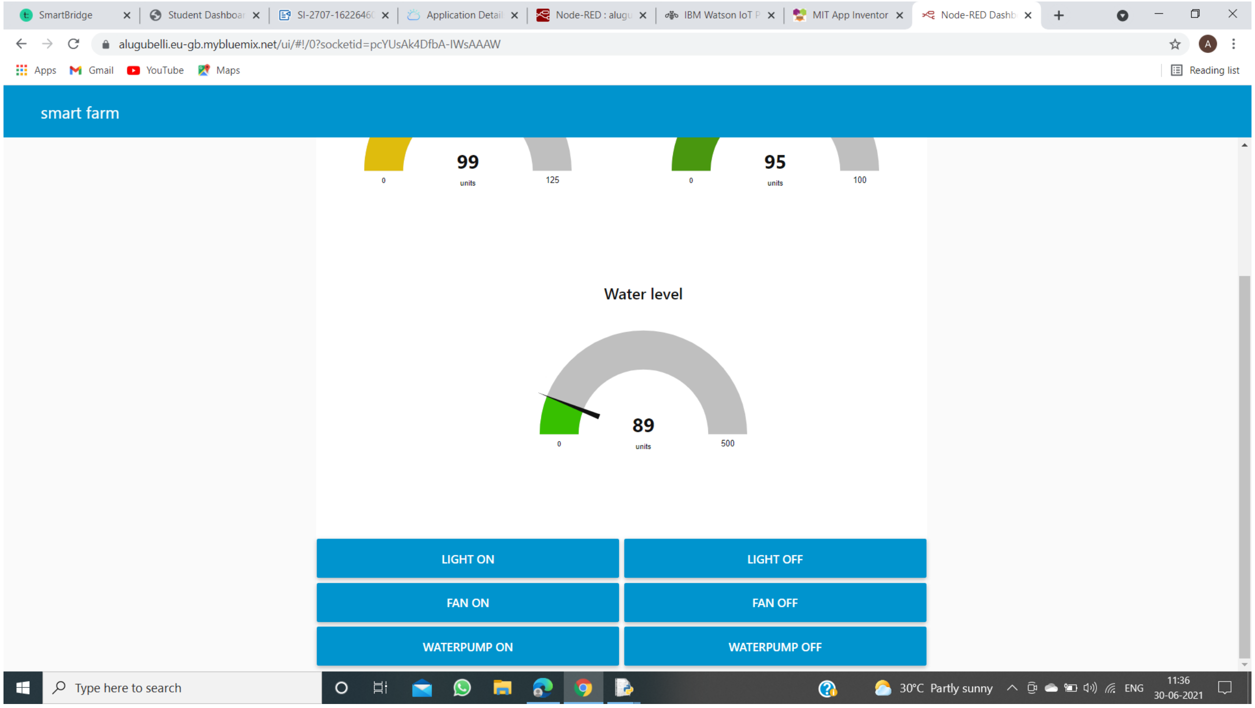
First we have to create an account in IBM cloud,then a device is to be created.using the device credentials in the python code we have take some random values as Hardware is not avaialble.Using different nodes in NODERED,a flow is created and connected to IBM platform.using the url we can get data and pictorial representation by appending /data and /uirespectively to the url in new page.This is further extende to mobile application use by using MIT APP INVENTOR.A design and blocks are created according to the use.In order generate message to the agent FAST2SMS app is created.This completes the software along with hardware of the project.

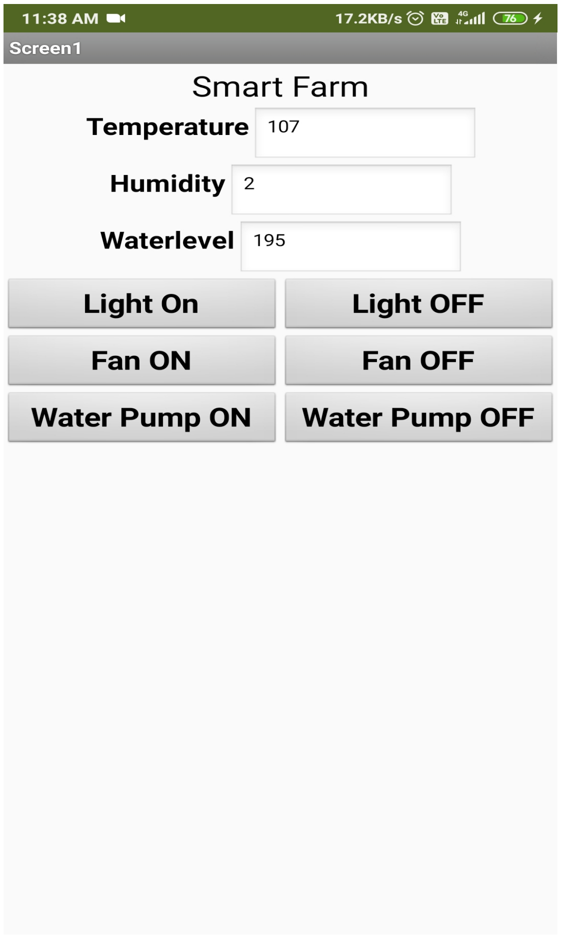
4.EXPERIMENTAL INVESTIGATION:

Three parameters namely Temperature, Humidity and water level are measured using the experimental setup. The setup(Python code) is connected to the IBM watson Iot platform. The measured results are compared with temperature, humidity, water level quality standards.

The graphical representations and getting uoput in the mobile app are the main chalalnges in the experimental process. This can be done using url in the node red flow and blocks in the mit app.







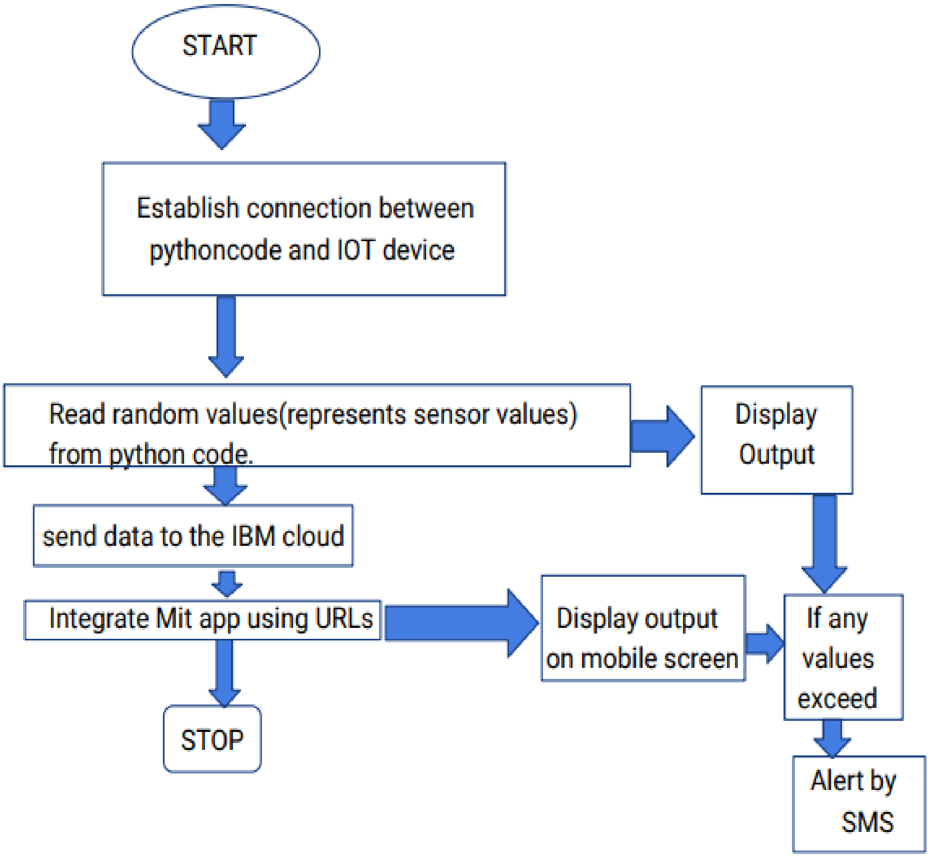
Smart Farm

Temperature 107

Humidity 2

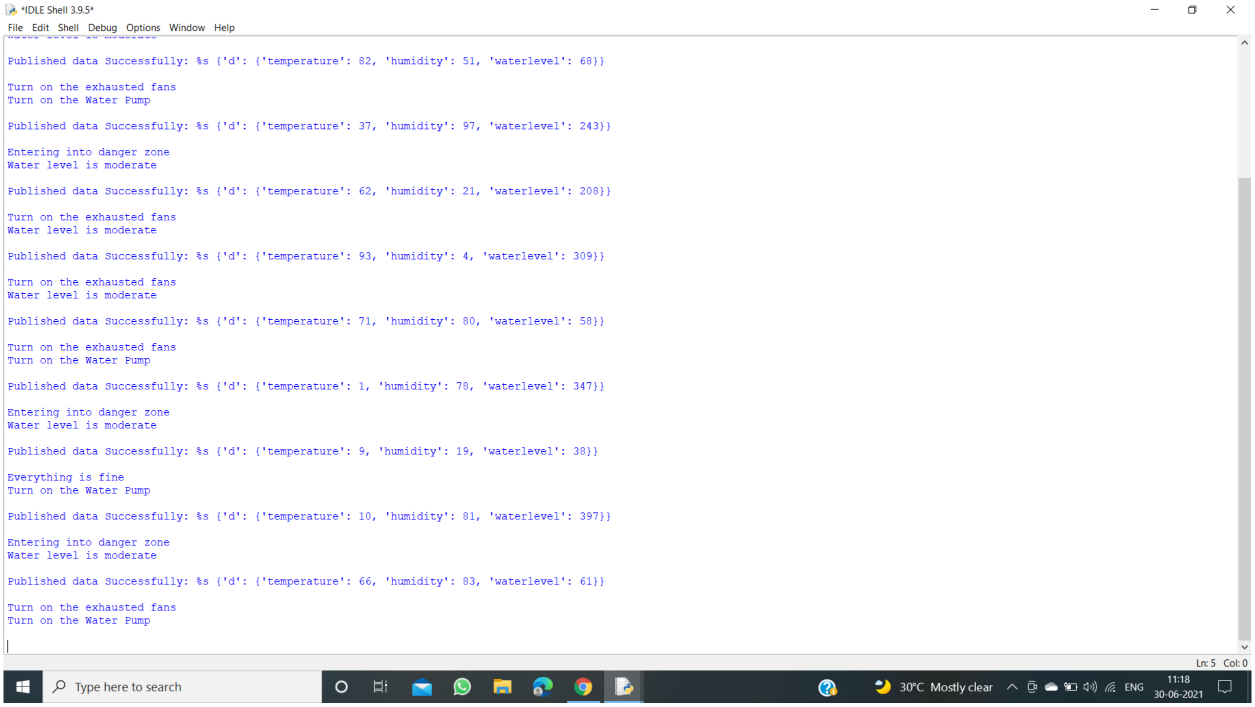
Waterlevel 195

5.FLOWCHART:

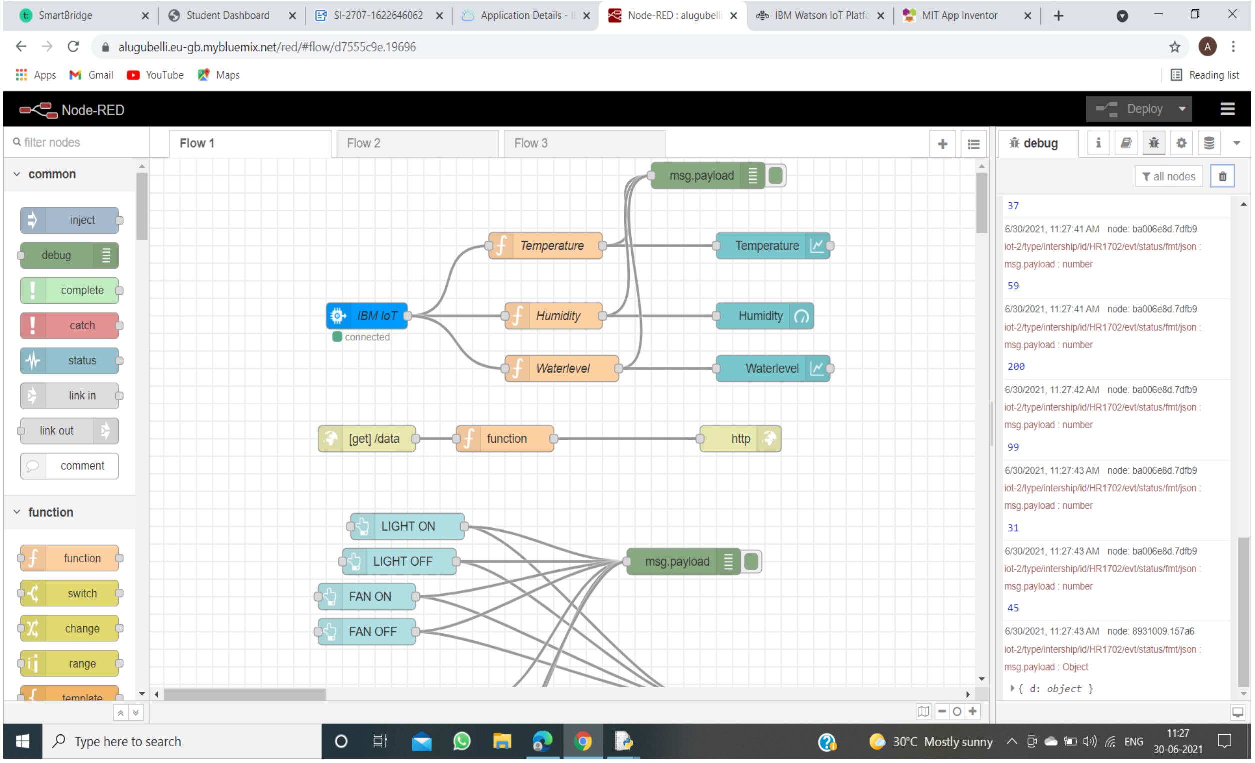

START
Establish connection between pythoncode and IOT device
Read random values(represents sensor values) from python code.
Display Output
send data to the IBM cloud
Integrate Mit app using URLs
Display output on mobile screen
If any values exceed
STOP
Alert by SMS

6.RESULT:

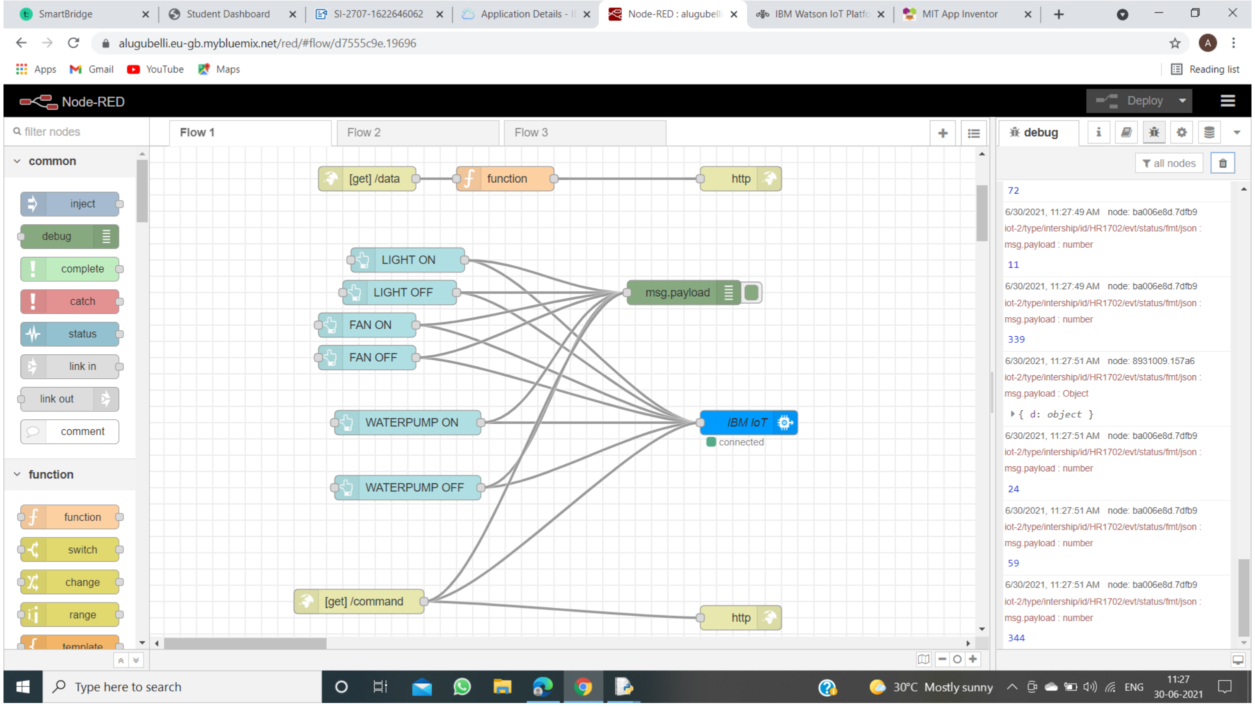
The following are the results of the project:



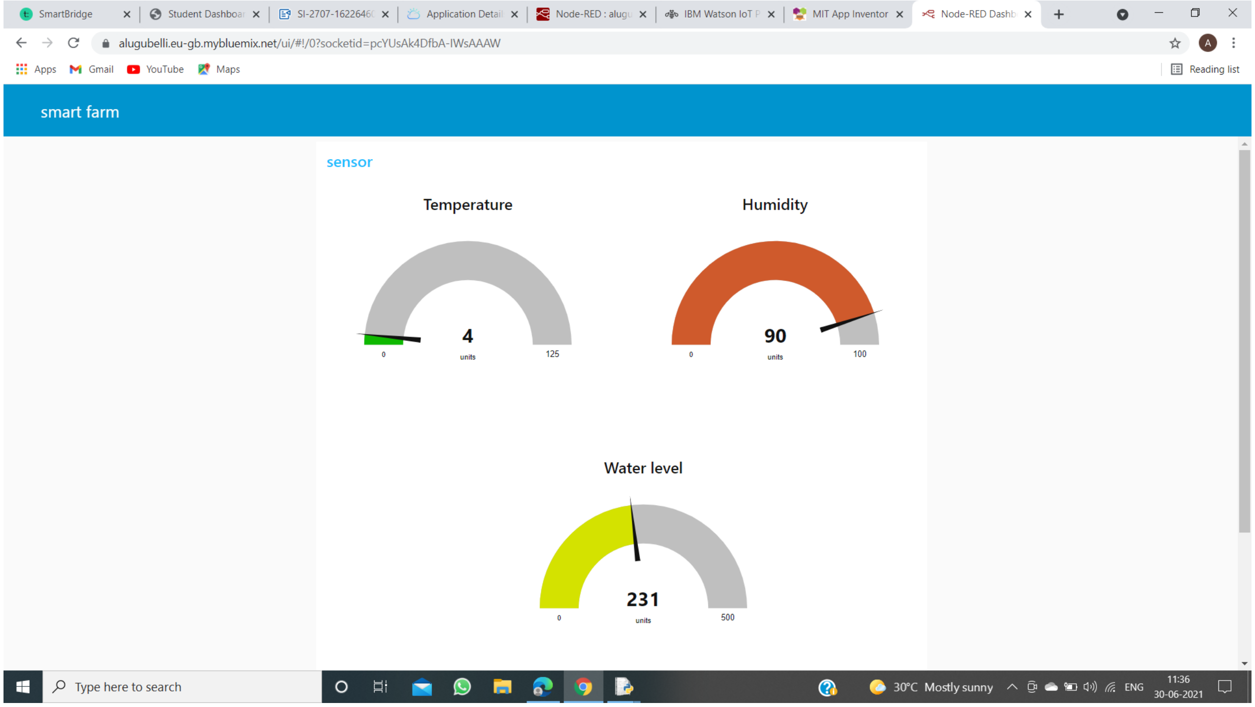
```
Water level is moderate

Published data Successfully: %s {'d': {'temperature': 82, 'humidity': 51, 'waterlevel': 68}}

Turn on the exhausted fans
Turn on the Water Pump

Published data Successfully: %s {'d': {'temperature': 37, 'humidity': 97, 'waterlevel': 243}}

Entering into danger zone
Water level is moderate

Published data Successfully: %s {'d': {'temperature': 62, 'humidity': 21, 'waterlevel': 208}}

Turn on the exhausted fans
Water level is moderate

Published data Successfully: %s {'d': {'temperature': 93, 'humidity': 4, 'waterlevel': 309}}

Turn on the exhausted fans
Water level is moderate

Published data Successfully: %s {'d': {'temperature': 71, 'humidity': 80, 'waterlevel': 58}}

Turn on the exhausted fans
Turn on the Water Pump

Published data Successfully: %s {'d': {'temperature': 1, 'humidity': 78, 'waterlevel': 347}}

Entering into danger zone
Water level is moderate

Published data Successfully: %s {'d': {'temperature': 9, 'humidity': 19, 'waterlevel': 38}}

Everything is fine
Turn on the Water Pump

Published data Successfully: %s {'d': {'temperature': 10, 'humidity': 81, 'waterlevel': 397}}

Entering into danger zone
Water level is moderate

Published data Successfully: %s {'d': {'temperature': 66, 'humidity': 83, 'waterlevel': 61}}

Turn on the exhausted fans
Turn on the Water Pump
```

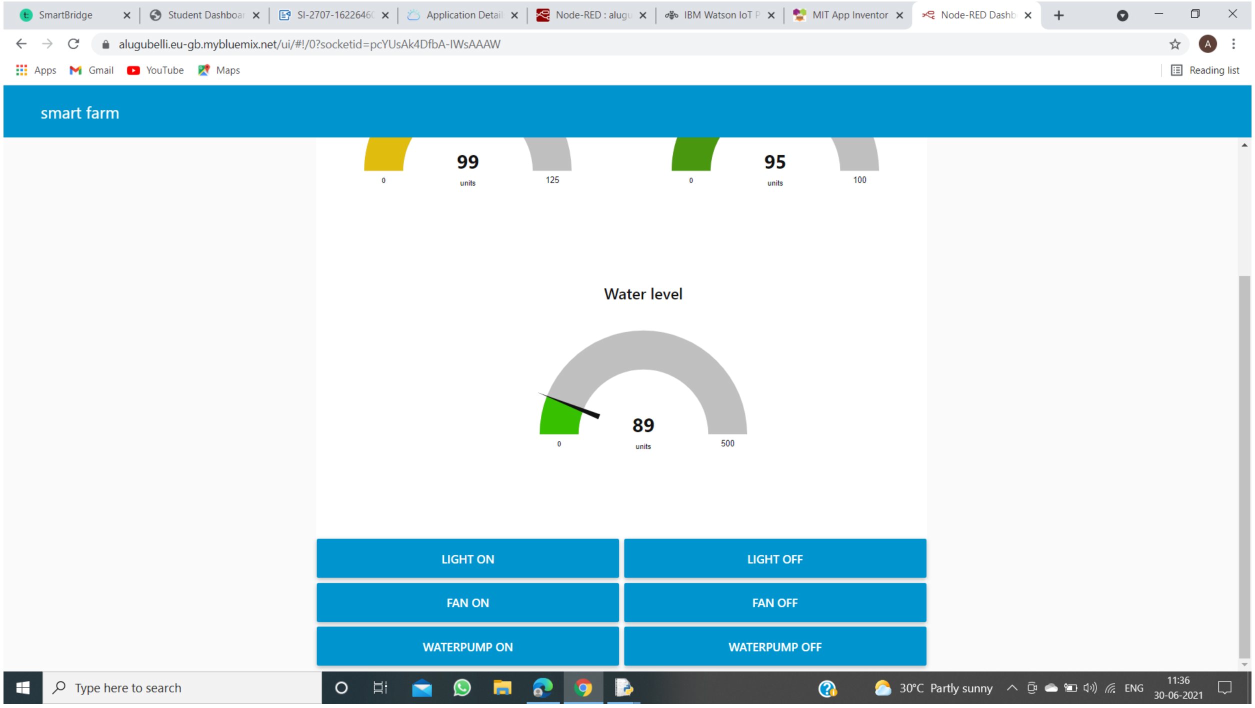


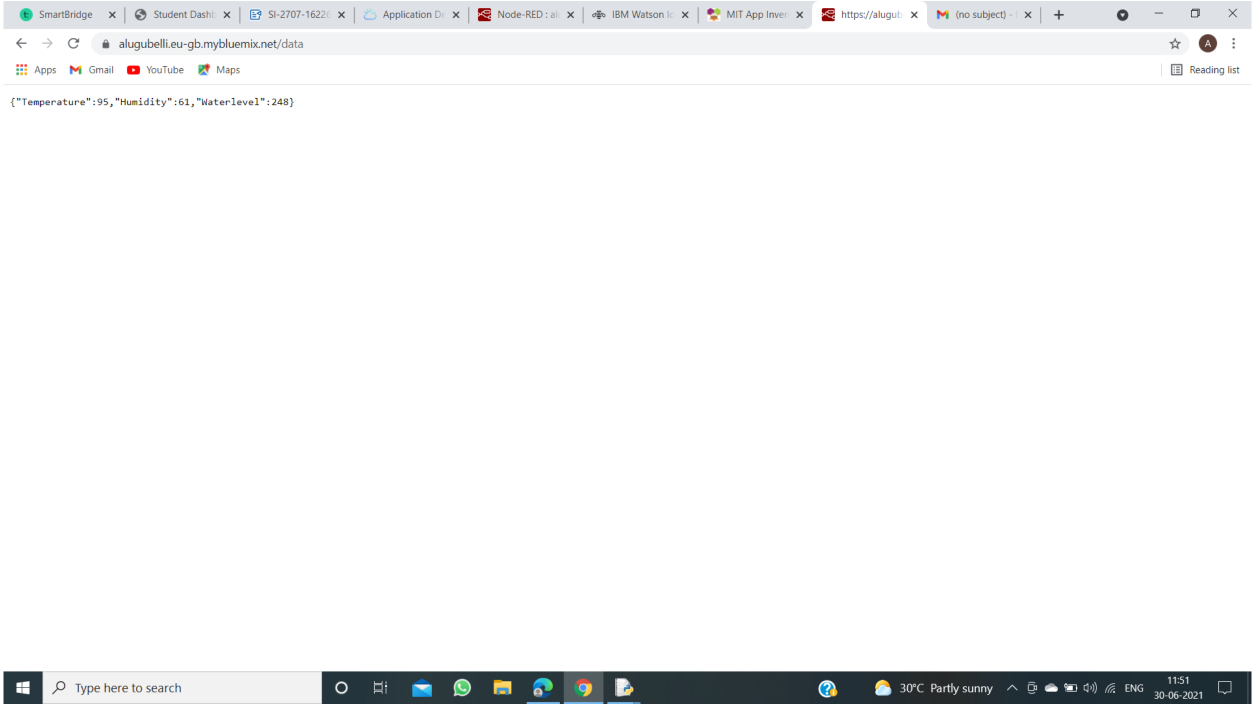
```
37

6/30/2021, 11:27:41 AM   node: ba006e8d.7dfb9
iot-2/type/intership/id/HR1702/evt/status/fmt/json :
msg.payload : number

59

6/30/2021, 11:27:41 AM   node: ba006e8d.7dfb9
iot-2/type/intership/id/HR1702/evt/status/fmt/json :
msg.payload : number

200

6/30/2021, 11:27:42 AM   node: ba006e8d.7dfb9
iot-2/type/intership/id/HR1702/evt/status/fmt/json :
msg.payload : number

99

6/30/2021, 11:27:43 AM   node: ba006e8d.7dfb9
iot-2/type/intership/id/HR1702/evt/status/fmt/json :
msg.payload : number

31

6/30/2021, 11:27:43 AM   node: ba006e8d.7dfb9
iot-2/type/intership/id/HR1702/evt/status/fmt/json :
msg.payload : number

45

6/30/2021, 11:27:43 AM   node: 8931009.157a6
iot-2/type/intership/id/HR1702/evt/status/fmt/json :
msg.payload : Object

▸{ d: object }
```



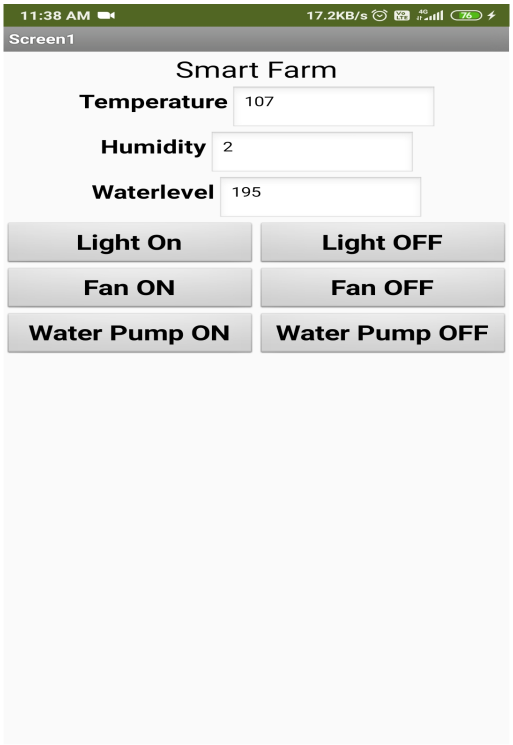
```
72
6/30/2021, 11:27:49 AM   node: ba006e8d.7dfb9
iot-2/type/intership/id/HR1702/evt/status/fmt/json :
msg.payload : number
11
6/30/2021, 11:27:49 AM   node: ba006e8d.7dfb9
iot-2/type/intership/id/HR1702/evt/status/fmt/json :
msg.payload : number
339
6/30/2021, 11:27:51 AM   node: 8931009.157a6
iot-2/type/intership/id/HR1702/evt/status/fmt/json :
msg.payload : Object
▸{ d: object }
6/30/2021, 11:27:51 AM   node: ba006e8d.7dfb9
iot-2/type/intership/id/HR1702/evt/status/fmt/json :
msg.payload : number
24
6/30/2021, 11:27:51 AM   node: ba006e8d.7dfb9
iot-2/type/intership/id/HR1702/evt/status/fmt/json :
msg.payload : number
59
6/30/2021, 11:27:51 AM   node: ba006e8d.7dfb9
iot-2/type/intership/id/HR1702/evt/status/fmt/json :
msg.payload : number
344
```







```
{"Temperature":95,"Humidity":61,"Waterlevel":248}
```

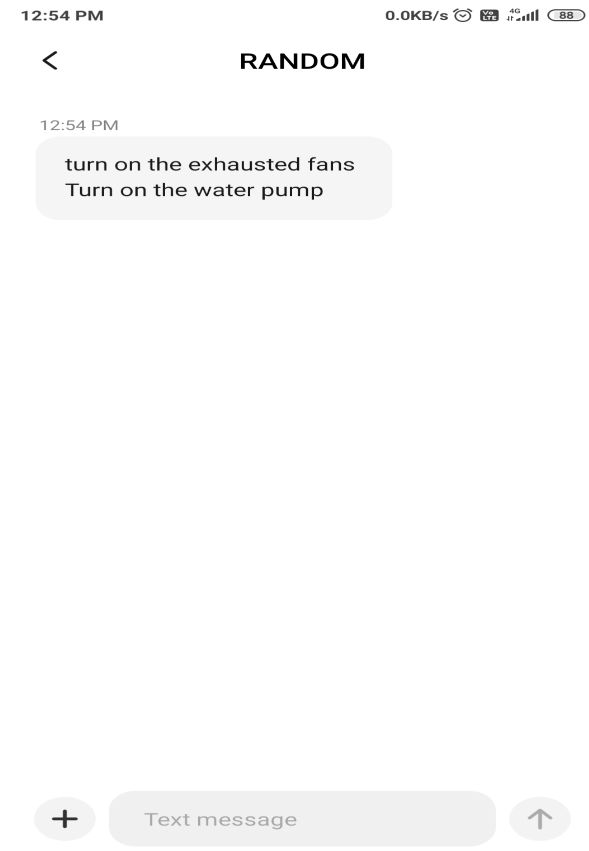


Smart Farm

Temperature 107

Humidity 2

Waterlevel 195



turn on the exhausted fans
Turn on the water pump

7.ADVANTAGES AND DISADVANTAGES:

Advantages**:**

○ **Efficient resource utilization:** If we know the functionality and the way that howeach device work we definitely increase the efficient resource utilization as well as monitor natural resources.

○ **Minimize human effort:** As the devices of IoT interact and communicate with each other and do lot of task for us, then they minimize the human effort.

○ **Save time:** As it reduces the human effort then it definitely saves out time. Time is the primary factor which can save through IoT platform.

○ **Enhance Data Collection:**

○ **Improve security:** Now, if we have a system that all these things are interconnected then we can make the system more secure and efficient.

Disadvantages:

○ **Security:** As the IoT systems are interconnected and communicate over networks. The system offers little control despite any security measures, and it can be lead the various kinds of network attacks.

○ **Privacy:** Even without the active participation on the user, the IoT system provides substantial personal data in maximum detail.

○ **Complexity:** The designing, developing, and maintaining and enabling the large technology to IoT system is quite complicated.

8.APPLICATIONS:

>Smart animal farming etc.

9.CONCLUSION: Real-time smart animal farming by using IoT platform will immensely help people to become conscious against temperature, humidity as well as water levels in the tank. The research is conducted focusing on smart animal farming in real-time. Due to the limitation, we only focus on measuring the temperature, humidity and water level parameters.We can also switch on and the lights, exausted fan and water pump.

10.FUTURE SCOPE: This project can be extended into an efficient smart animal farming system of a local area. Moreover, other parameters which wasn’t the scope of this project such as total dissolved solid waste of animals, amonia gas and dissolved oxygen in farm can also be quantified. So the additional parameters are required for further improvement of the overall system.

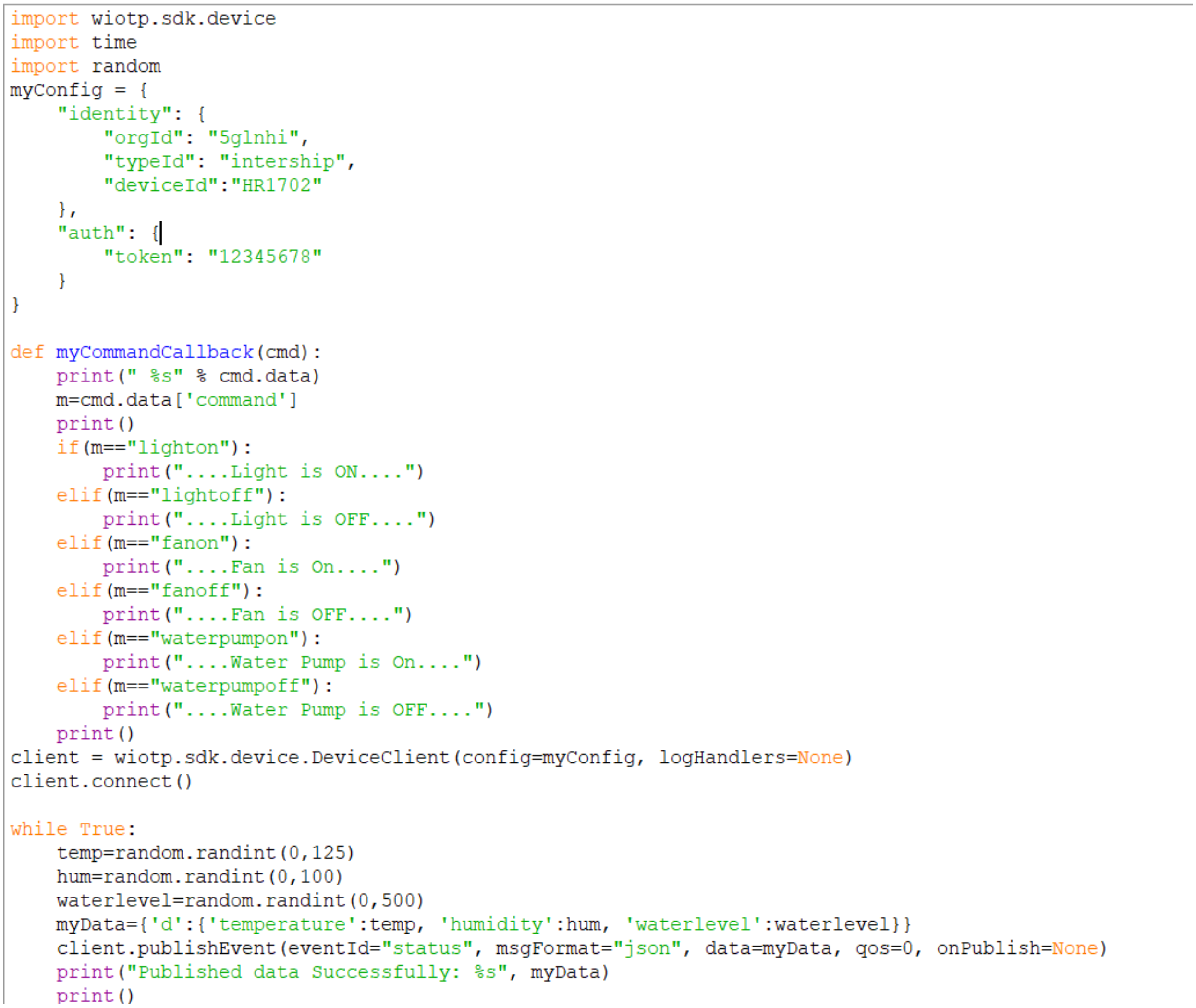
11.BIBLIOGRAPHY:

I. P.K. MashokoNkwari, S. Rimer and B.S. Paul, "Cattle monitoring system using wireless sensor network in order to prevent cattle rustling", *IST-Africa Conference Proceedings*, pp. 1-10, 7–9 May 2014.

II. L. Atzori, A. Lera and G. Morabito, "The Internet of Things: A survey", *Computer Networks*, vol. 54, no. 15, pp. 2787-2805, 2010.

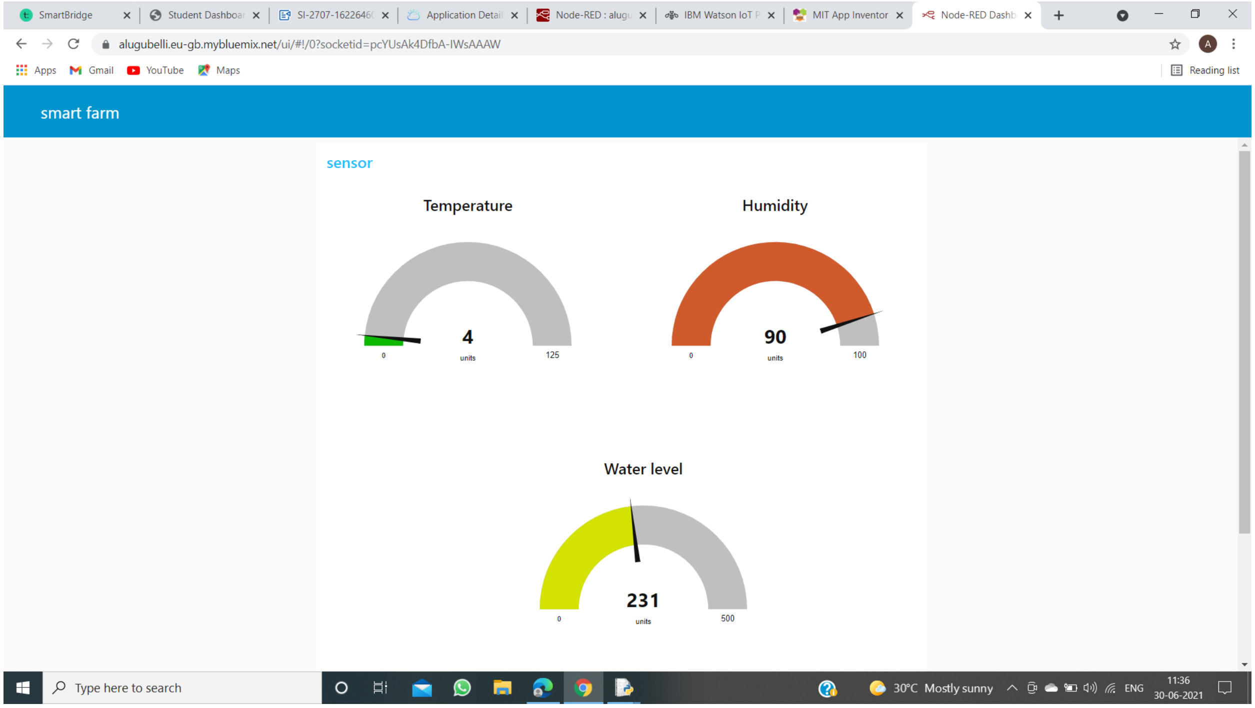
12.APPENDIX:

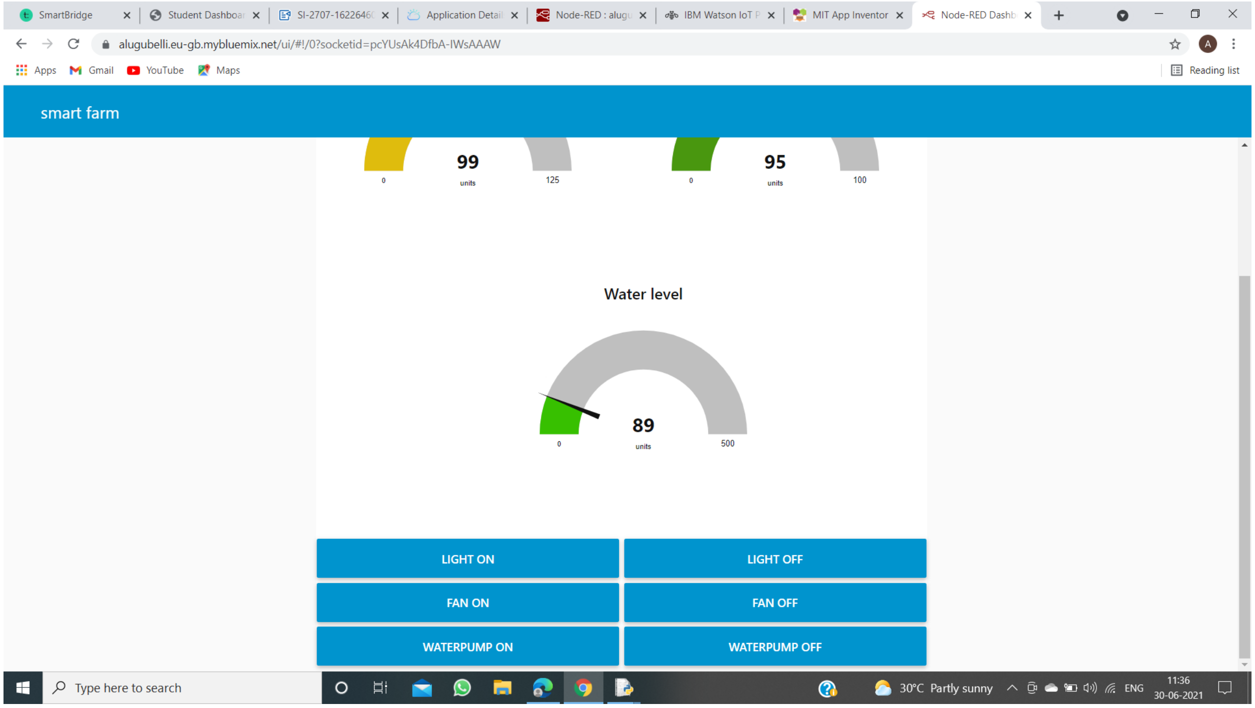
A.Source Code:

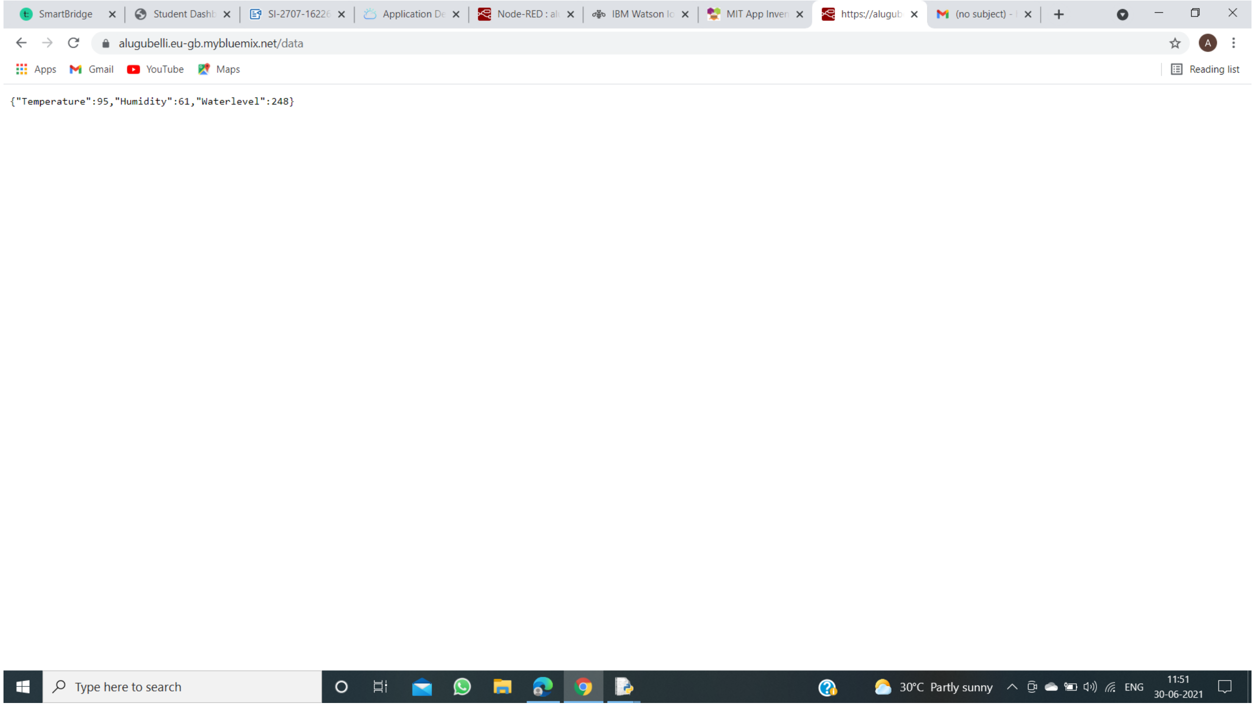


```python
import wiotp.sdk.device
import time
import random
myConfig = {
    "identity": {
        "orgId": "5glnhi",
        "typeId": "intership",
        "deviceId":"HR1702"
    },
    "auth": {
        "token": "12345678"
    }
}

def myCommandCallback(cmd):
    print(" %s" % cmd.data)
    m=cmd.data['command']
    print()
    if(m=="lighton"):
        print("....Light is ON....")
    elif(m=="lightoff"):
        print("....Light is OFF....")
    elif(m=="fanon"):
        print("....Fan is On....")
    elif(m=="fanoff"):
        print("....Fan is OFF....")
    elif(m=="waterpumpon"):
        print("....Water Pump is On....")
    elif(m=="waterpumpoff"):
        print("....Water Pump is OFF....")
    print()
client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()

while True:
    temp=random.randint(0,125)
    hum=random.randint(0,100)
    waterlevel=random.randint(0,500)
    myData={'d':{'temperature':temp, 'humidity':hum, 'waterlevel':waterlevel}}
    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
    print("Published data Successfully: %s", myData)
    print()
    if temp<30 and hum<30:
        print("Everything is fine")
        if waterlevel<100:
         print("Turn on the Water Pump")
        elif 100<waterlevel<450:
         print("Water level is moderate")
        elif waterlevel>450:
         print("Water level is full")
    elif temp<40 and hum>30:
        print("Entering into danger zone")
        if waterlevel<100:
         print("Turn on the Water Pump")
        elif 100<waterlevel<450:
         print("Water level is moderate")
        elif waterlevel>450:
         print("Water level is full")
    elif temp>40 or waterlevel>450:
        print("Turn on the exhausted fans")
        if waterlevel<100:
         print("Turn on the Water Pump")
        elif 100<waterlevel<450:
         print("Water level is moderate")
        elif waterlevel>450:
         print("Water level is full")
    print()
    client.commandCallback = myCommandCallback
    time.sleep(2)
client.disconnect()
```

B.UIOUT:


alugubelli.eu-gb.mybluemix.net/ui/#!/0?socketid=pcYUsAk4DfbA-IWsAAAW
smart farm
sensor
Temperature
4
units
0
125
Humidity
90
units
0
100
Water level
231
units
0
500
Type here to search
30°C Mostly sunny
11:36
30-06-2021


alugubelli.eu-gb.mybluemix.net/ui/#!/0?socketid=pcYUsAk4DfbA-IWsAAAW
smart farm
99
units
0
125
95
units
0
100
Water level
89
units
0
500
LIGHT ON
LIGHT OFF
FAN ON
FAN OFF
WATERPUMP ON
WATERPUMP OFF
Type here to search
30°C Partly sunny
11:36
30-06-2021



alugubelli.eu-gb.mybluemix.net/data

```
{"Temperature":95,"Humidity":61,"Waterlevel":248}
```