**INTERNET OF THINGS April20**

**Project**

**On**

REAL TIME WEATHER BASED SMART SPRINKLER SYSTEM FOR GOLF COURSE(using random values n weather api)

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1. **Introduction**

Internet of Things represents a general concept for the ability of network devices to sense and collect data from the world around us, and then share that data across the Internet where it can be processed and utilized for various interesting purposes.Internet of Things is very quickly becoming a reality. We can see the proof of it around us. Our devices are getting smarter each day from smartphones to smart TV to smart car to Smart kitchen. Everything is now getting connected to Internet. Internet of Things (IoT) describes a network of physical objects that connect to each other through the internet. Objects, or ‘things’ can transfer information wirelessly without requiring human interaction.Moreover ,IOT has it’s footpaths in Agrculture industry as well.One among them include Agriculture in Golf courses .IoT lays a solution in this field by way of managing and controlling the activities like Adequate water supply which is an essence for grass to grow in the fields and if the field is supplied with inadequacy field can be damaged in either of situation of excess of water supply or in shortage of water supply. In Precision agriculture - The level of accuracy of temperature, moisture, pH of the soil affects the productivity to a greater extent. Higher the level of accuracy, lower would be the chances of Golf fields being damaged.

* 1. **Overview:**

Internet of Things(IoT) is transforming the agriculture industry and enabling farmers to content with enormous challenges they face. Livestock monitoring, conservation monitoring and plant & soil monitoring are the challenges where IoT can be a solution. The innovative IoT applications address the issues not only in agriculture but also other applications including Golf courses,which this projects aims to deal with. In addition to that it also increases the quality, quantity, sustainability and cost effectiveness and maintenance of Golf courses. Today’s large and local farms can leverage Iot to remotely monitor sensors that can detect soil moisture, crop growth and control their smart connected harvesters and irrigation equipments.This project aims at monitoring the soil parameters like soil moisture, temperature and humidity and automates the irrigation process. Decision making is done through Mobile app. User is acknowledged about the field when there is any deviation from the expected values via text message. Along with soil parameters, temperature and humidity in this project. This ensures the complete system health.

**1.2 Purpose:**

In recent years, IOT solutions have become popular as they allow researchers to improve the problem solvency of target users and are used for various engineering applications.The main purpose of this project is that ,maintenance of turf grass or the filed grass in Golf course is strictly based on the weather conditions itself..To avoid latency and wastage of water in the unwanted time intervals,time to time monitoring is required to keep the grass healthy so that the field would be fit for Golf players to continue with their respective activities. Continuous monitoring and storage of weather and soil moisture information is the key point.Alert is generated if the soil moisture is above the threshold value.The water sprinklers can be controlled remotely using mobile app.Less latency in communication from device to cloud with MQTT.

1. **Literature Survey**

**2.1 Existing Problem**

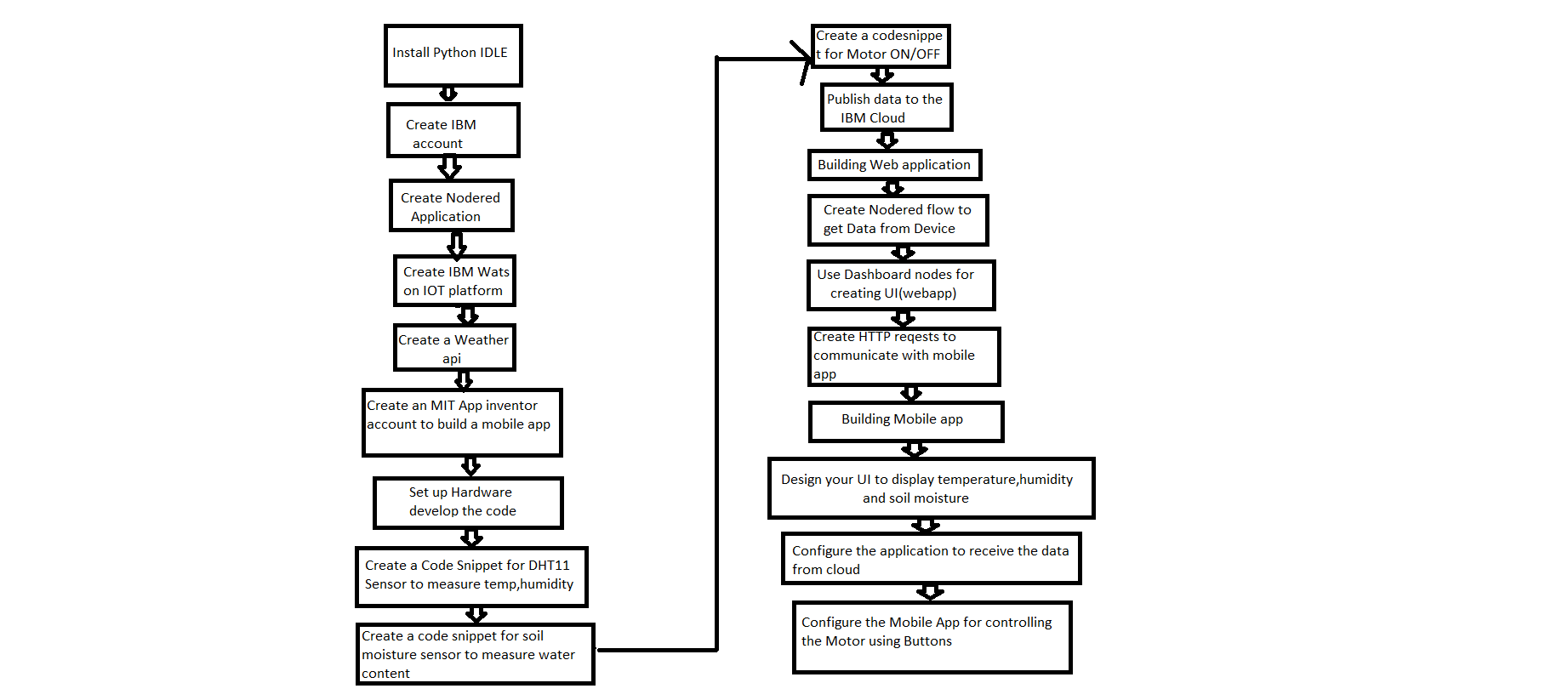
The main problem with Golf courses is that temperatures and soil moisture levels has to be accurate or else, the field would be unfit for the players to carry out their activities.A person has to be there monitoring the soil moisture levels.This would be a tidy task for those who look over the fields.If the soil moisture levels goes up and down ,it would be problem and has to replace it with another.Also,human error is one of the issue in the failure of maintaining the Golf courses well.

**2.2 Proposed Solution**

Current solution for this problem is only one thing i.e.,continuous monitoring of the soil moisture,temperature and humidity levels automatically.This can be achieved through connected devices via internet i.e.,by using IOT technology.It uses a device like mobile phone or tablet where the information of DHT11 sensor,Soil moisture sensors are sent to the cloud,the cloud processes the data and finally gives it to the mobile app.All the things which are said here are connected to the internet to enable the continuous monitoring of the filed.In addition to this,weather api can be used to get the temperature,humidity and soil moisture of a particular place where this type fields exists.So that it increases the accuracy of data obtained and further sents to cloud to process ,then to mobile app.Through this model,we can control the sprinklers with the data obtained with highest productivity.

1. **Theoretical Analysis**

**3.1 Block Diagram**

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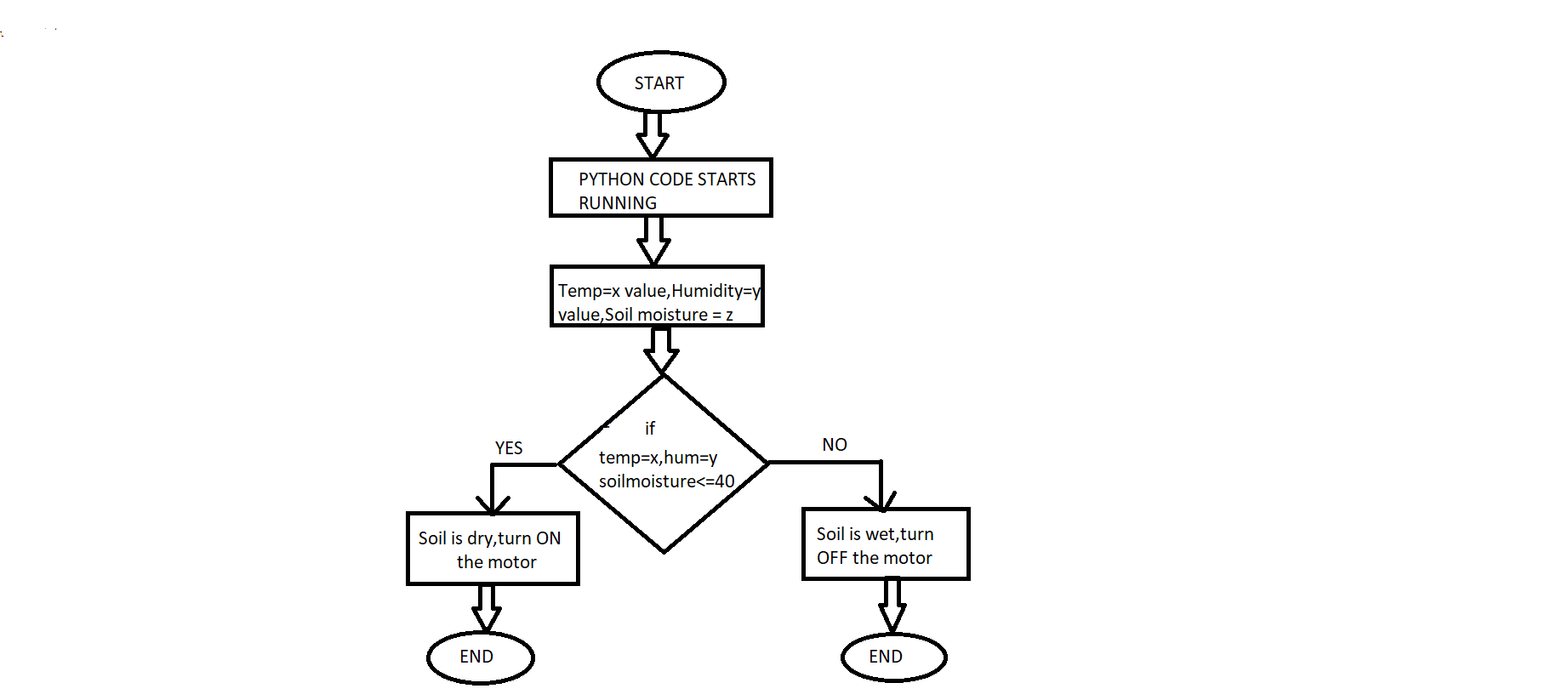
**3.2 Hardware / Software designing**

Python,Open weather api,IBM Cloud Nodered,MIT App inventor,

1. **Experimental Investigation**

From the obtained results we have observed that,when the soil moisture is below the threshold value(40) the sensor gives an alert to the device displaying that the “Soil is Dry,turn on the motor” and if the soil moisture value is greater than the threshold value the sensor gives an alert message to the device displaying that the “Soil is Wet,turn off the motor”.It also displays the current temperature and humidity levels also.

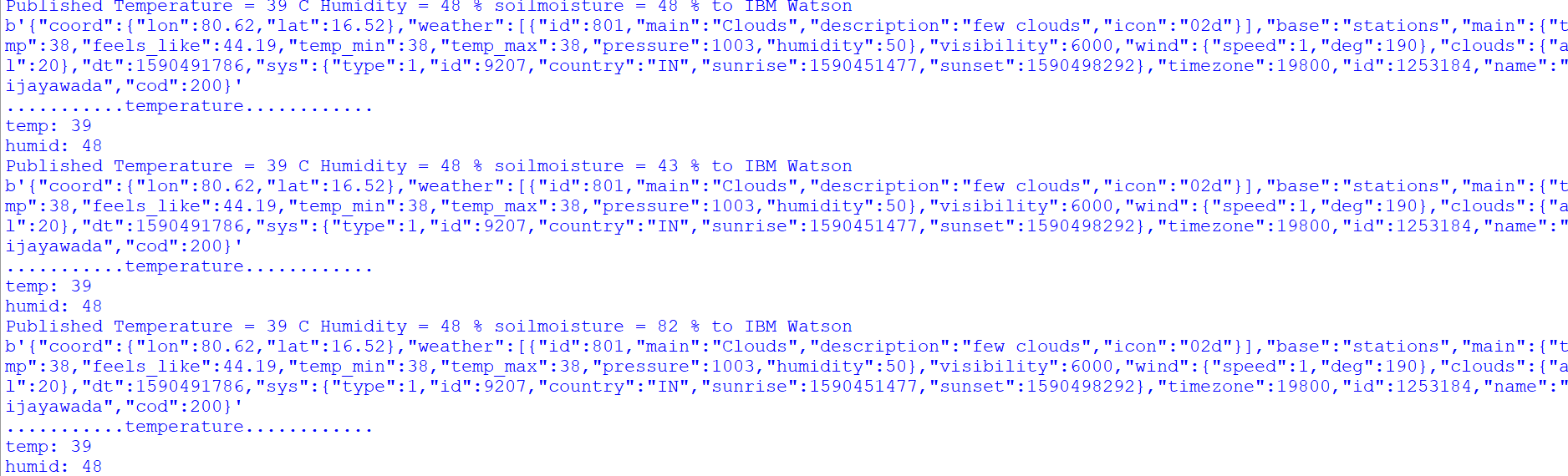
1. **Flowchart**

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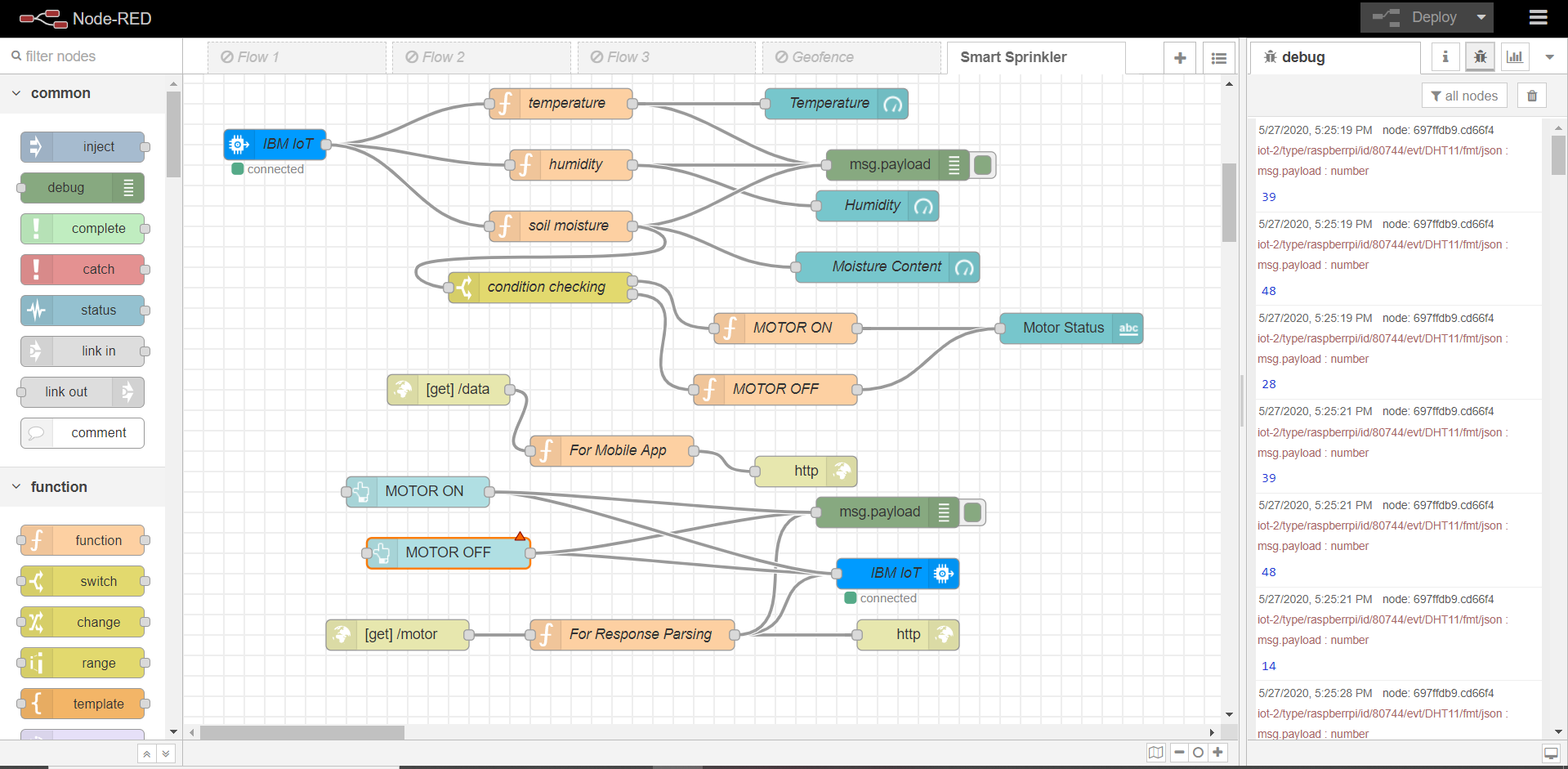
1. **Result**

We have analysed the temperature,humidity and soil moisture levels and found that they accurately fit the grass growth . The usage of Nodered and MIT App inventor enables user to control the motor on/off depending upon the moisture levels. This model has highest accuracy and is a good choice for this problem. This will make our model more robust.

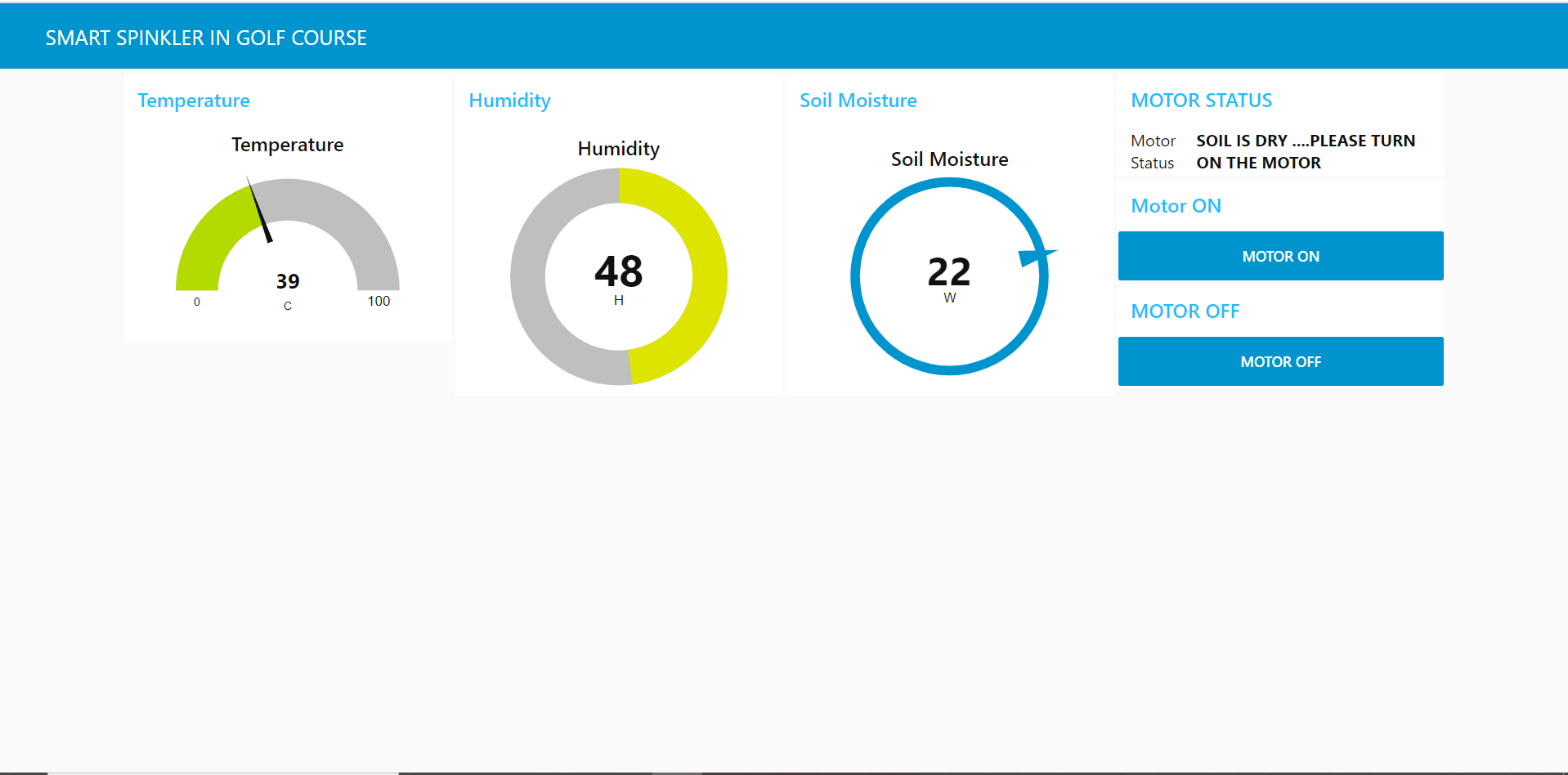
**Resultant output of Python Code:**



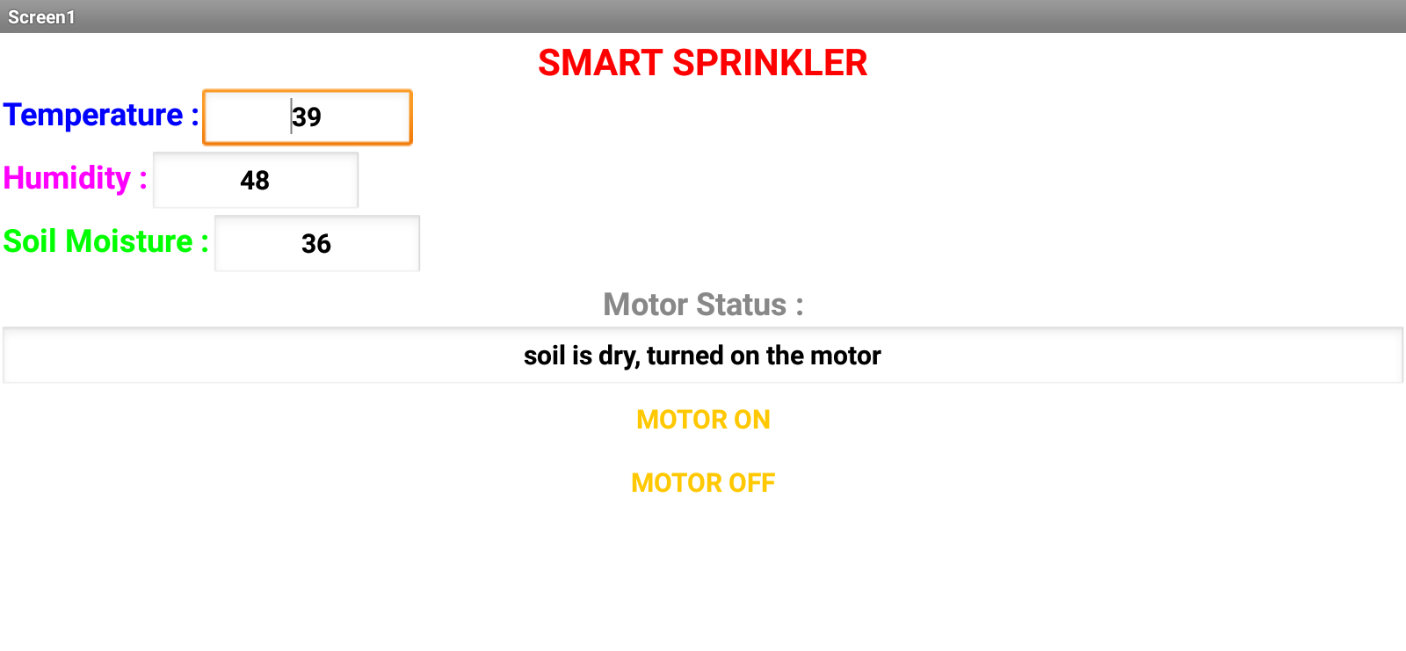
**Resultant ouput of Nodered flow :**

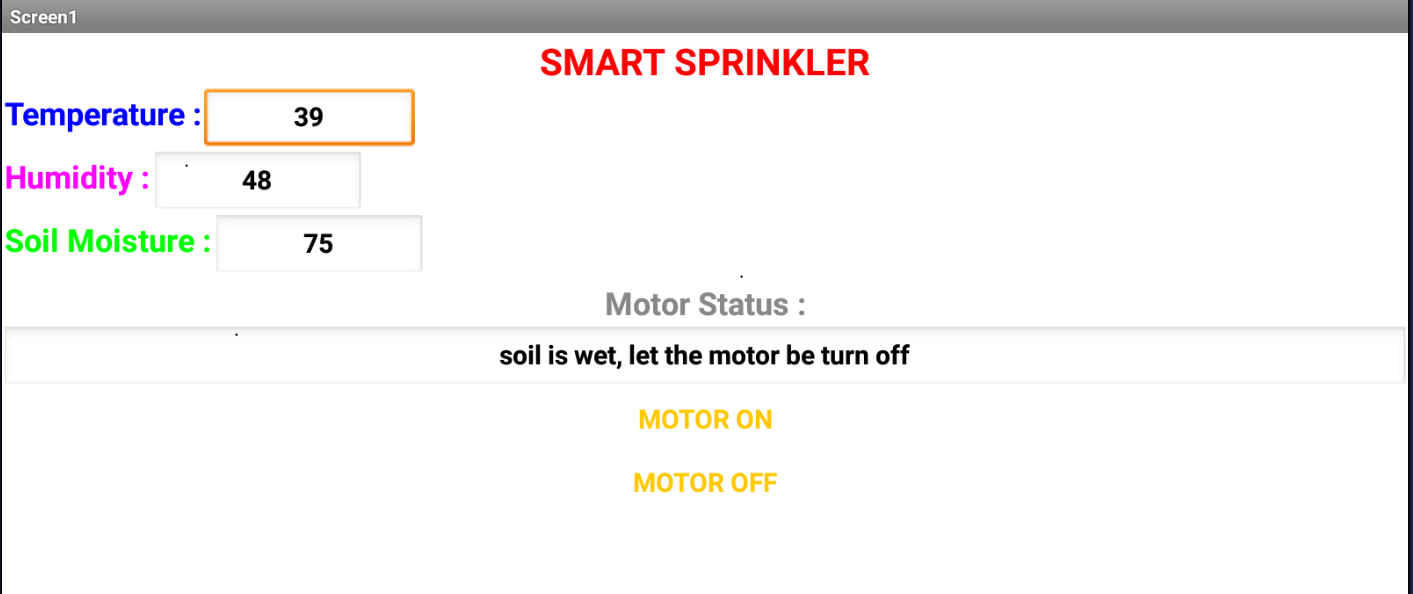


**Resultant output of Nodered UI :**



**Resultant output of MIT App inventor(MOBILE APP) :**





1. **Advantages and Disadvantages**

**Advantages:**

* This type of smart sprinkler technology saves time,cost effectiveness and productivity can be improved.
* Inexpensive and easy to install.

**Disadvantages :**

* There can be Hardware failure of components like sensors after using them for a time long.So they may have to replaced.

**Applications:**

* Used in Smart Home Automation
* Used in Smart irrigation
* Used in the case of Physically challenged people like blink stick and ear instruments.
* Used in Driverless cars,Smart Attendance systems and many more.

1. **Conclusion**

In this study, Smart sprinkler system has enabled Golf courses to maintain their fields utmostly well by installing sensors in the Golf fields through continuous monitoring of Weather including temperature,humidity and soil moisture levels made this project to be a successful one in smart weather forcast for smart sprinkler systems.

**Future Scope**

* Areas of drought condition, IoT can prove to be a great value as it manages the limited water supply smartly with least wastage of water resource.
* Smart irrigation enables in pest control,crop productivity,reduces wastage of water.

1. **Bibliography**

**Books**

* Attar, S., & Sudhakar, K. N. Real-Time Monitoring Of Agricultural Activities Using Wireless Sensor Network.
* Awasthi, A., & Reddy, S. R. N. (2013). Monitoring for Precision Agriculture using Wireless Sensor Network-A review. GJCST-E: Network, Web & Security, 13(7).

**Data repositories**

Github repositary

**Algorithms**

thesmartbridgeteachable.com

1. **Appendix**

**Source Code :**

import time

import sys

import ibmiotf.application

import ibmiotf.device

import random

import urllib.request

import json

#Provide your IBM Watson Device Credentials

organization = "6i69ba"

deviceType = "raspberrpi"

deviceId = "80744"

authMethod = "token"

authToken = "12345678"

# Initialize GPIO

def myCommandCallback(cmd):

print("Command received: %s" % cmd.data['command'])

if cmd.data['command']=='motoron':

print("soil is dry,turn on the motor")

elif cmd.data['command']=='motoroff':

print("soil is wet,let the motor be turn off")

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()

# Connect and send a datapoint "hello" with value "world" into the cloud as an event of type "greeting" 10 times

deviceCli.connect()

while True:

#To get the temp,hum data from weather api

request\_url = urllib.request.urlopen('http://api.openweathermap.org/data/2.5/weather?q=Vijayawada,IN&appid=d7973a07aeefc9b481436b83ba5eecdd&units=metric')

print(request\_url.read())

soilmoisture = random.randrange(1,100)

var=b'{"coord":{"lon":80.62,"lat":16.52},"weather":[{"id":801,"main":"Clouds","description":"few clouds","icon":"02d"}],"base":"stations","main":{"temp":39,"feels\_like":45.33,"temp\_min":39,"temp\_max":39,"pressure":1004,"humidity":48},"visibility":6000,"wind":{"speed":1,"deg":110},"clouds":{"all":20},"dt":1590215792,"sys":{"type":1,"id":9207,"country":"IN","sunrise":1590192304,"sunset":1590239028},"timezone":19800,"id":1253184,"name":"Vijayawada","cod":200}'

python=json.loads(var)

print("...........temperature............")

print("temp:", python['main']['temp'])

print("humid:", python['main']['humidity'])

temp=python['main']['temp']

hum=python['main']['humidity']

#Send Temperature & Humidity to IBM Watson

data = { 'Temperature': temp ,'Humidity': hum ,'soilmoisture': soilmoisture}

#print (data)

def myOnPublishCallback():

print ("Published Temperature = %s C" % temp, "Humidity = %s %%" % hum, "soilmoisture = %s %%" % soilmoisture, "to IBM Watson")

success = deviceCli.publishEvent("DHT11", "json", data, qos=0, on\_publish=myOnPublishCallback)

if not success:

print("Not connected to IoTF")

time.sleep(2)

deviceCli.commandCallback = myCommandCallback

# Disconnect the device and application from the cloud

deviceCli.disconnect()