

# **A REMOTE SUMMER INTERNSHIP PROGRAM**

**2020**



## **PROJECT REPORT**

**ON**

**Smart Agriculture system based on IoT**

**Submitted By:**

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# Acknowledgement

I, Himanshu Jain would like to convey my gratitude to TheSmartBridge Information Technology & Services to provide me an opportunity for 1 month Remote Summer Internship Program and giving me the platform to interact with industry professionals and to learn new concepts and to deploy it.

I would also like to thank Durgaprasad sir, to always help me to solve my queries and for giving me the opportunity to work on this project.

I extend my warm gratitude and regards to everyone who helped me during my internship.

**Himanshu Jain**  
**SBID: SB20200028227**

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# CHAPTER 1

## INTRODUCTION

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### 1.1 Overview

Plants had and still have a key role in the history of life on earth. They are responsible for presence of oxygen needed for baron survival on this planet. At the same time agriculture is also important to human beings because they forms the basis for food security. Agriculture plays a vital role in India's economy. It is very important that farmer who are responsible for agriculture should have better control over his field.

The objectives of this report is to proposed IoT based Smart Agricultue System which will enable farmers to have live data of soil moisture, humidity and temperature. Apart from this he will also able to have an eye on climatic data such as pressure, temperature and humidity of their region. This system help farmer to have control over his motor. He will be able to control motor remotely even if he is far away from his field.

### 1.2 Purpose

The purpose of this project is to make a farmer enable his control over control unit of water motor and he will be able to switch it OFF or ON on the basis of needs of his crops. By judging on the basis of his crops factor also climatic condition, he can supply water to his crops.

# CHAPTER 2

## LITERATURE SURVEY

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### 2.1 Existing problem

In the present scenario, we can observe that farmer have to face lot of struggle in farming. He has to make everything good, so that the yield will be good. He also has to stay near to his field. He has to make sure that watering of crop should be done properly, soil moisture and humidity should be perfect. Due to this farmer has to face a lot of problems.

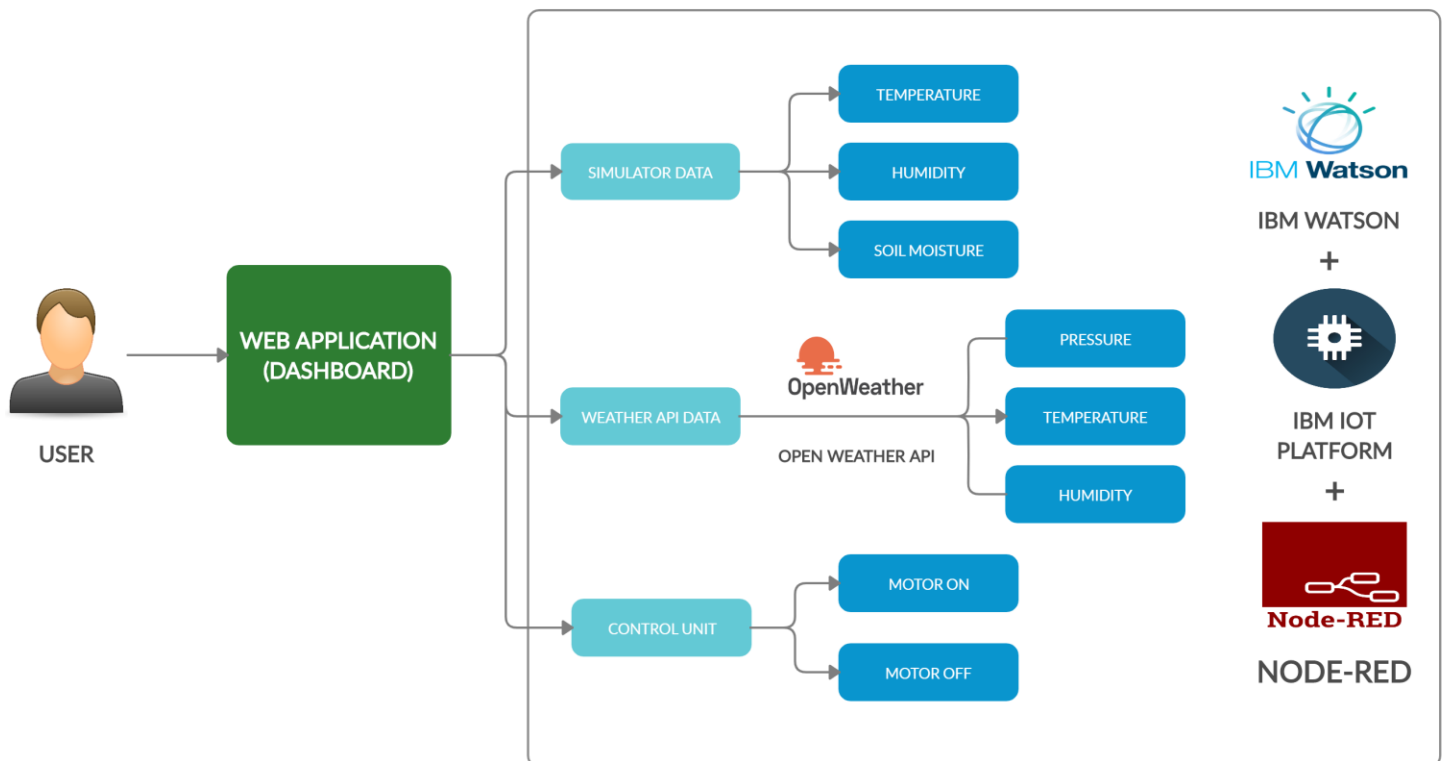
### 2.2 Proposed solution

The only solution to his problem is automation of control unit of water motor. If farmer was able to control how much amount of water should be used for agriculture on the basis of soil moisture, temperature and humidity remotely then he can also utilize his time in other activity. Our solution to this problem is that to provide an application which is user interactive which retrieves data from the field through the IoT sensor and also changes is hardware of water motor, so that on a button click he will be able to make motor either ON or OFF. Also he can supply sufficient amount of water on the basis of live weather condition.

# CHAPTER 3

## THEORETICAL ANALYSIS

### 3.1 Block diagram



### 3.2 Hardware / Software designing

Smart agriculture system implements on simulator, so there is no use of hardware designing and software designing includes

- Creation of web application through node red
- Creation of device on IBM IoT platform available on IBM cloud

- Use of IBM simulator instead of data from hardware.
- Retrieving data from open weather API to get details about climatic condition of a region
- Use of node red dashboard nodes to create interactive control unit.
- Use of python language to make control on motor.

In this project, web application is created by node red which also collapse with device created on IBM IoT platform through API and other authentication. IBM simulator is used to change data of IoT device instead of using any hardware sensor. Python language is used to depicts the control over motor. Node-red's node also used to take data from open weather API.

# CHAPTER 4

## EXPERIMENTAL INVESTIGATION

When correctly configured and connected appropriately, all the elements of the project are working correctly according to the plan. That is, we are getting weather data from the Open Weather API and the Watson IOT Sensor Simulator data. Also we are able to send motor on/off commands to the device.

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IoT Application Developer

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LEARNING PATH


Internship Title : Smart Agriculture system based on IoT - SB28227

Project ID : SPS\_PRO\_101

Project Title : Smart Agriculture system based on IoT

Duration : 16.2 Days

Internship Description : [Click here to view the Internship Description](#)

Team : 

Overall Project Progress

Assigned Tasks Progress

100%

100%

★ MENTOR INSTRUCTIONS

HIDE

- Click on Go to Workspace Option to access the Project Workspace
- Total Internship duration is 1 month, within this time you have to complete project with expected outcome
- References & Learning resources are provided for every activity
- Your login and logouts to the workspace are monitored, it is mandatory to maintain 5-days a week attendance.
- All the project deliverables shall be pushed to GitHub Repository & daily work status shall be updated to mentor via Slack Channel
- Use Zoho Writer to update the project documentation regularly
- Individual activity status shall be updated in the Kanban Board without fail
- Use commenting option on activity card to communicate with mentor in case of any query, Mentor replies can be accessed from Mentor View tab
- Once mentor approves all activities, you have to capture a project demonstration video and upload to the GitHub
- Your profile shall be filled completely to get the Internship Certificate, you can access the certificate anytime from the dashboard.
- We wish you all the best!!

Go to Git Repository

Go to Writer

Go to Slack Channel

17 Days 22:7:16

Internship Title



**Resource list**

Create resource +

Name	Group	Location	Offering	Status	Tags
Filter by name or IP address...	Filter by group or org...	Filter...	Filter...	Filter...	Filter...
Devices (0)					
VPC infrastructure (0)					
Clusters (0)					
Cloud Foundry apps (1)					
Cloud Foundry services (2)					
Services (3)					
Continuous Delivery	Default	London	Continuous Delivery	Active	—
Internet of Things Platform-wn	Default	London	Internet of Things Platform	Active	—
node-red-xodzn-cloudant-15889463...	Default	London	Cloudant	Active	—
Storage (0)					
Network (0)					
Cloud Foundry enterprise environments (0)					

## Internet of Things Platform service on IBM Cloud

**IBM Watson IoT Platform**

himanshuj581@gmail.com  
ID: 115ozv

Add Device +

Search by Device ID

Device Simulator ☒

Device ID	Status	Device Type	Class ID	Date Added	Descriptive Location
Smart_Agriculture_System	Connected	NodeMCU	Device	May 13, 2020 2:05 PM	

Identity | Device Information | Recent Events | State | Logs

Device ID: Smart\_Agriculture\_System

Device Type: NodeMCU

Date Added: May 13, 2020 2:05 PM

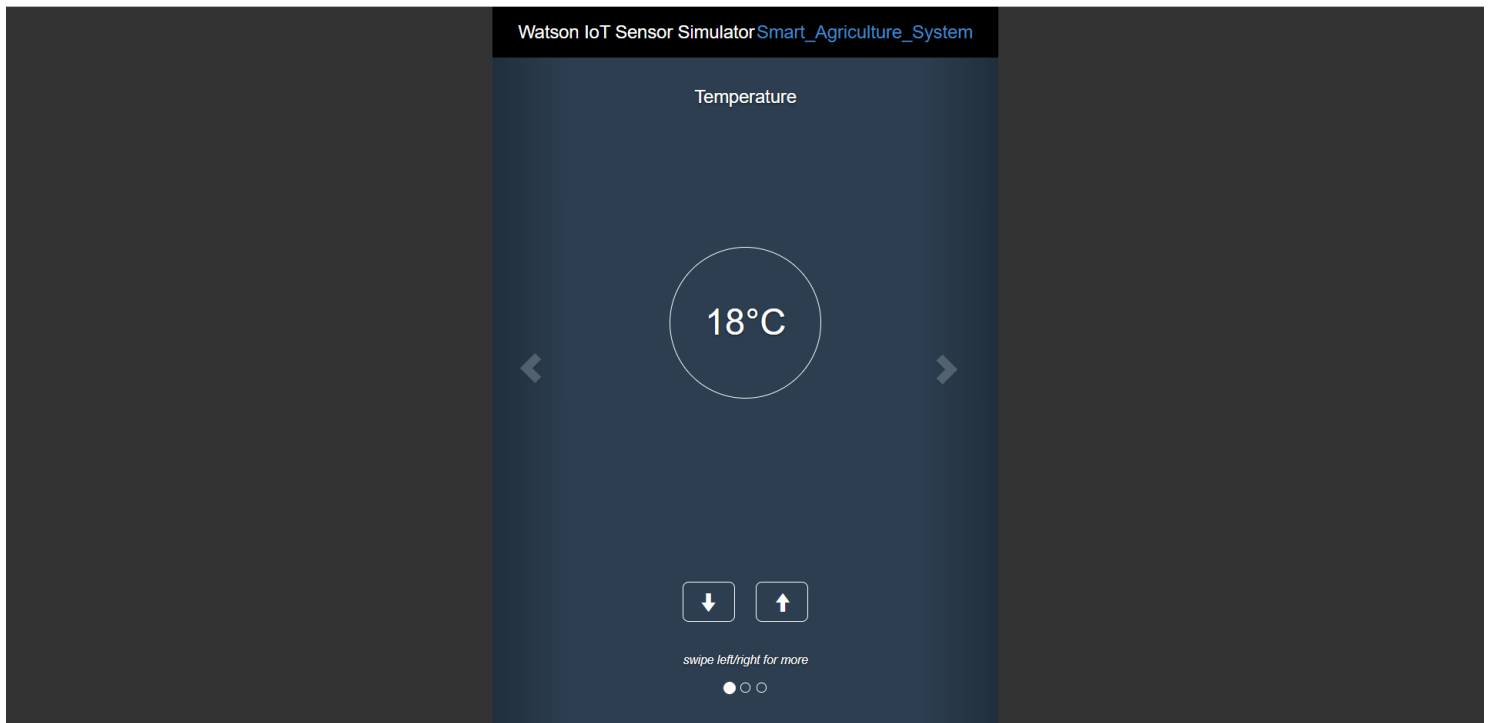
Added By: himanshuj581@gmail.com

Connection Status: **Connected**  
Connection Time: May 17, 2020 5:31 PM  
Client Address: 27.57.152.130 SecureToken

Items per page 50 | 1-1 of 1 Item

0 Simulations running

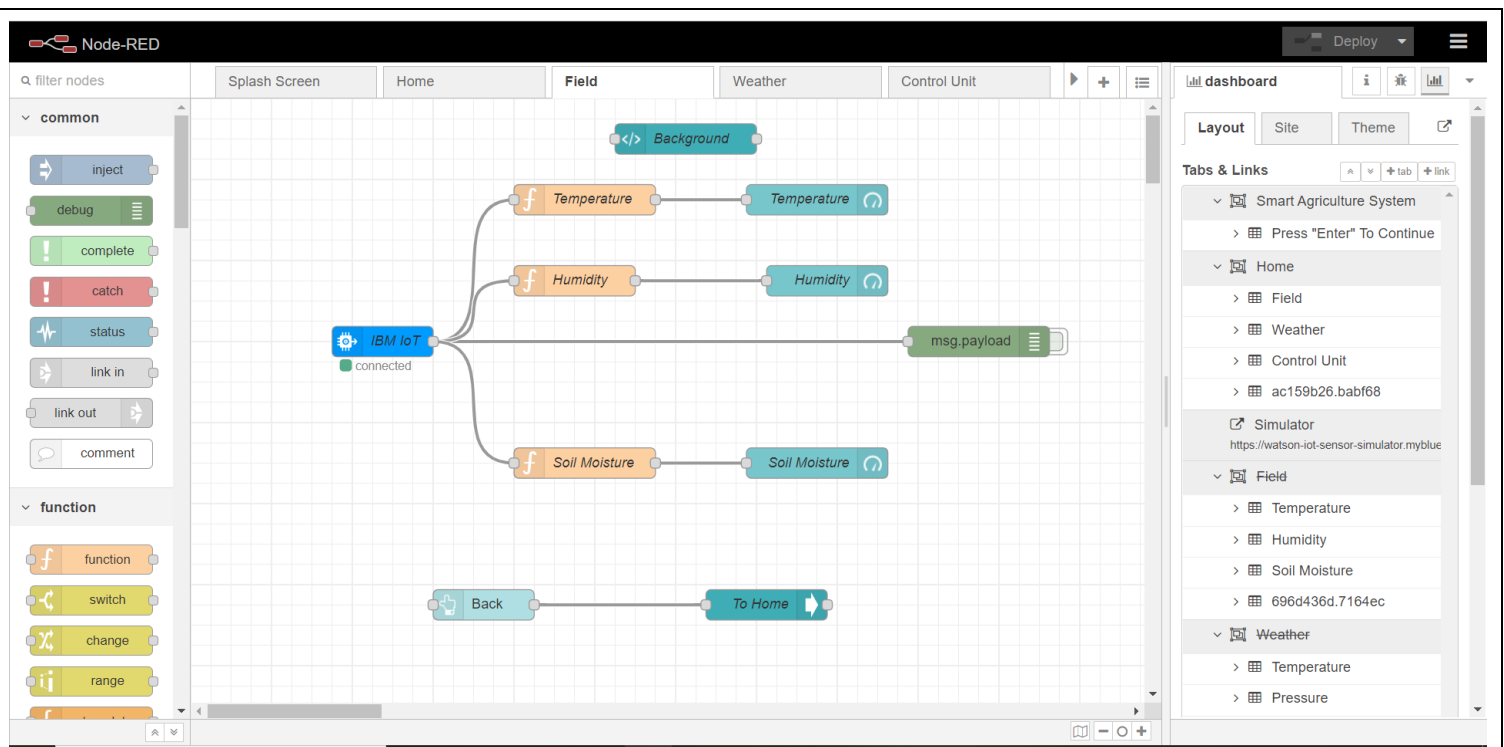
The device which we have created is showing status as “Connected” on IBM Watson IOT Platform



Watson IOT Sensor Simulator is connected and sending data to the Cloud

The image is a screenshot of the IBM Watson IoT Platform web dashboard. The top navigation bar includes the 'IBM Watson IoT Platform' logo, a user profile for 'himanshuj581@gmail.com' with ID '115ozv', and an 'Add Device' button. The main content area has a sidebar with various icons and a top navigation menu with 'Browse', 'Action', 'Device Types', and 'Interfaces'. The 'Browse' tab is active, showing a list of devices. A search bar 'Search by Device ID' is present. The device list table has columns for 'Device ID', 'Status', 'Device Type', 'Class ID', 'Date Added', and 'Descriptive Location'. One device, 'Smart\_Agriculture\_System', is listed with a status of 'Connected' and a device type of 'NodeMCU'. Below the table, there are tabs for 'Identity', 'Device Information', 'Recent Events', 'State', and 'Logs'. The 'Recent Events' tab is selected, showing a message: 'The recent events listed show the live stream of data that is coming and going from this device.' Below this is a table with columns 'Event', 'Value', 'Format', and 'Last Received'. It contains three entries, all from 'iotsensor' with a JSON value and received 'a few seconds ago'. At the bottom right, a status bar indicates '0 Simulations running'.

We are receiving data from the Watson IOT Sensor Simulator



Watson IOT Sensor Simulator data is being received on Node-RED using IBM IOT  
Input node

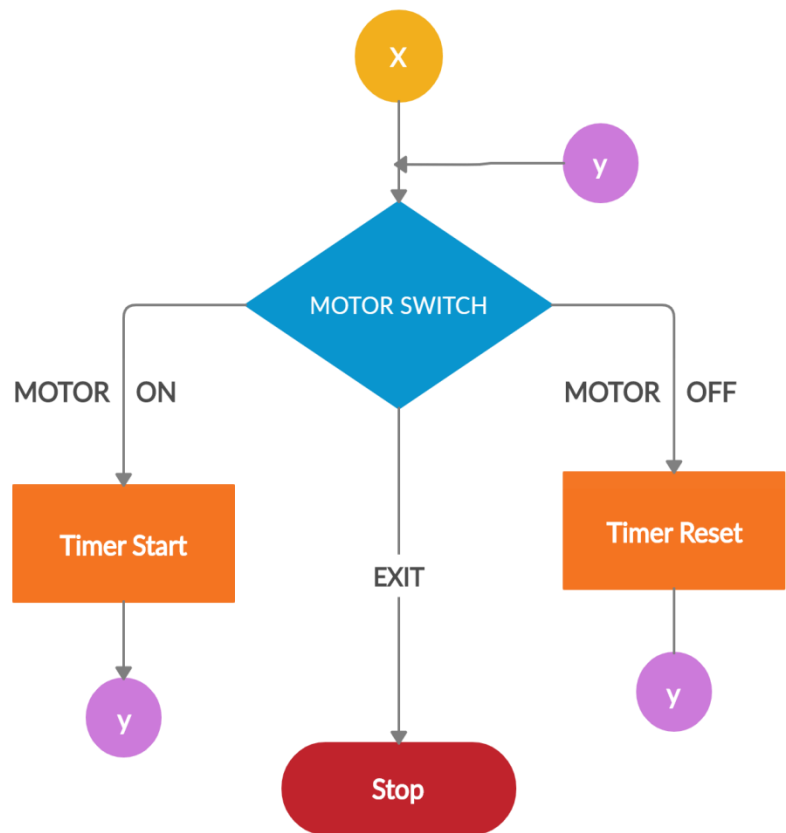
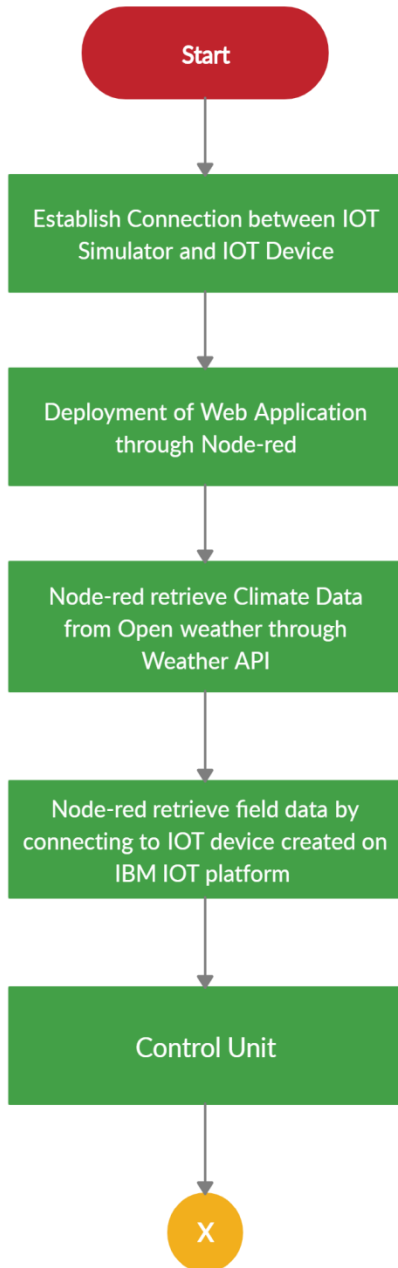
```
Anaconda Prompt (anaconda3) - python subscribeibm.py

(base) C:\Users\LENOVO\Desktop>python subscribeibm.py
2020-05-17 18:04:21,079  ibmiotf.device.Client      INFO    Connected successfully: d:115ozv:NodeMCU:Smart_Agriculture_System
Command received: {'command': 'motoron'}
MOTOR ON IS RECEIVED
Command received: {'command': 'motoroff'}
MOTOR OFF IS RECEIVED
Command received: {'command': 'motoron'}
MOTOR ON IS RECEIVED
```

Device is receiving motor ON/OFF commands via IBM IOT Output node

# CHAPTER 5

## FLOWCHART

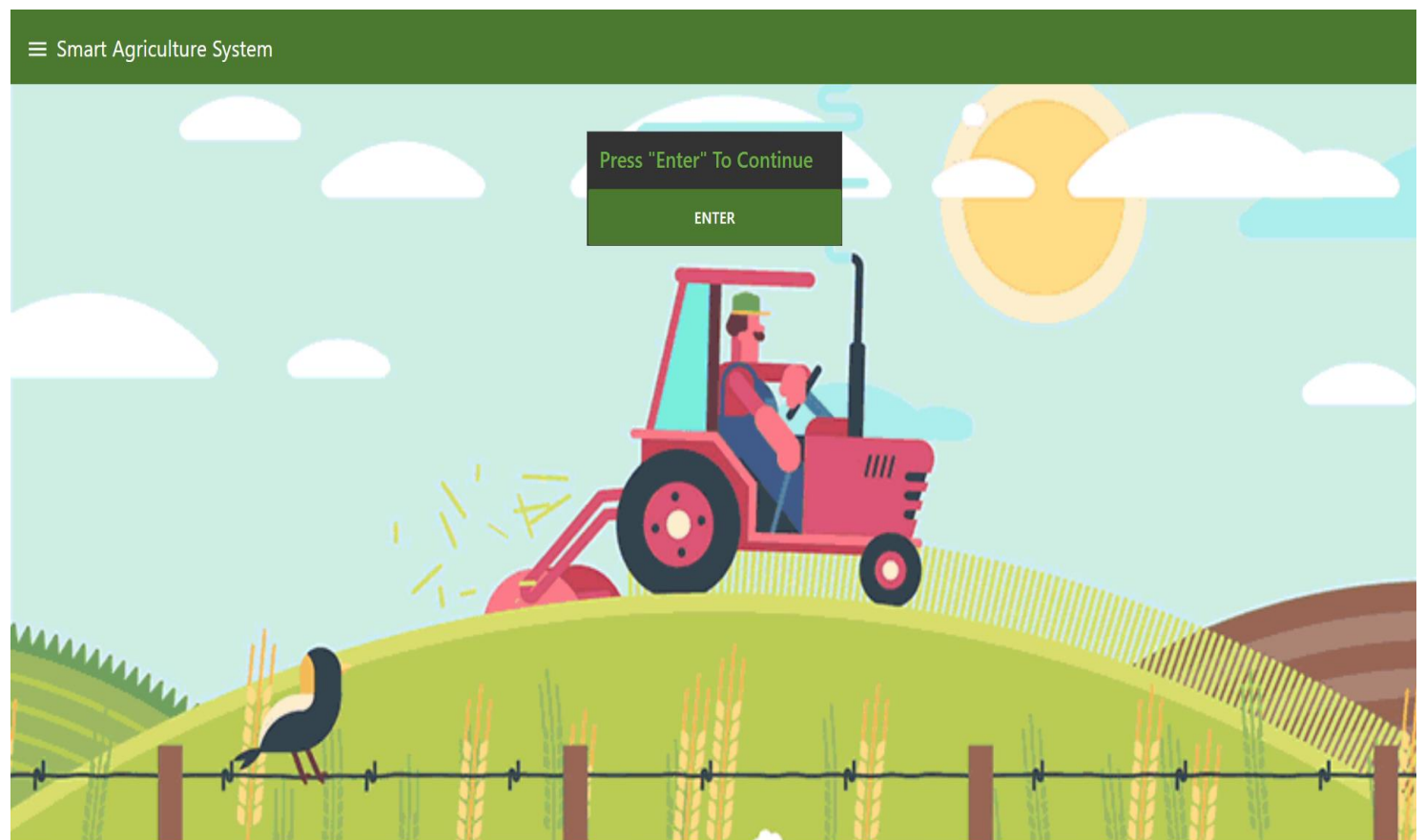


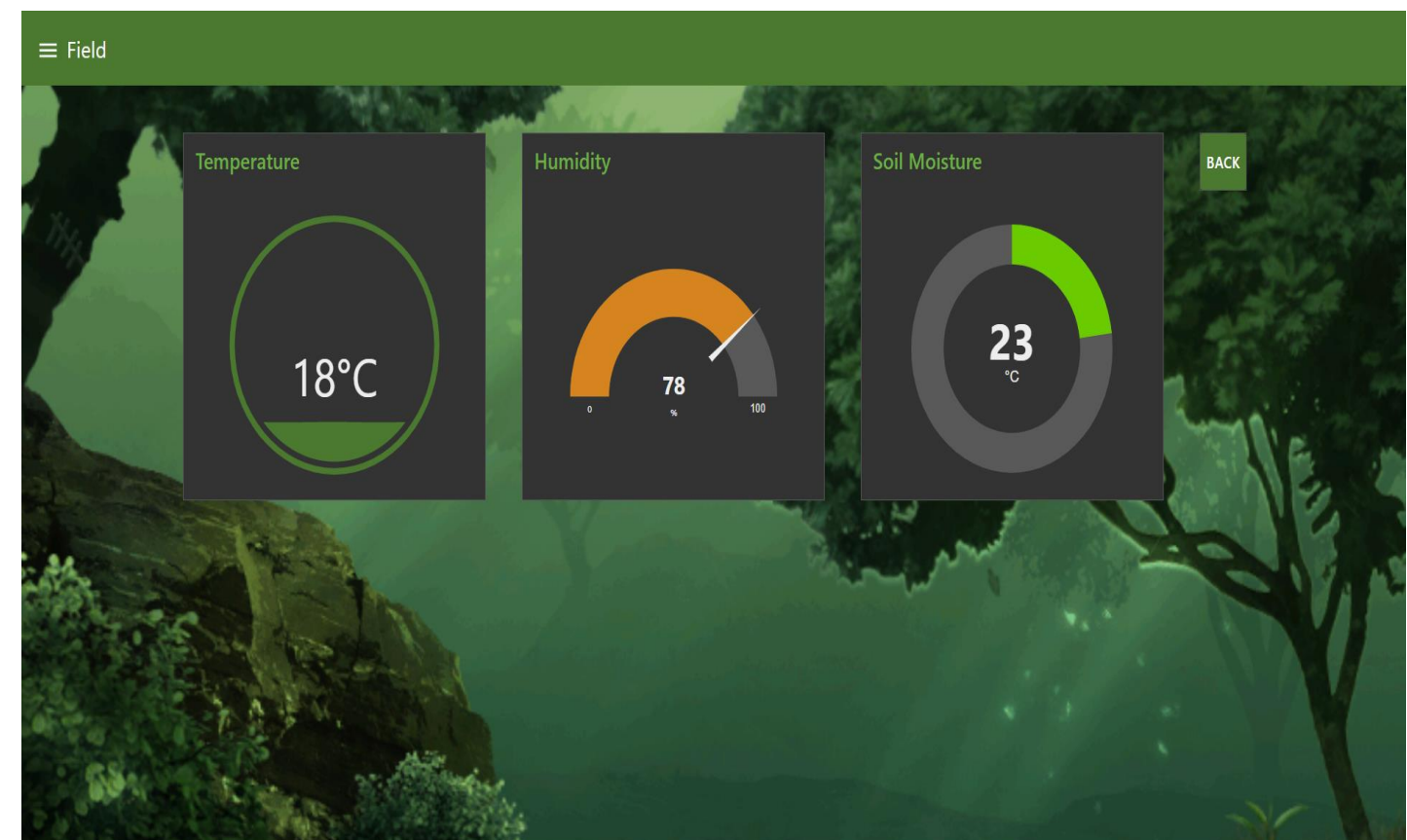
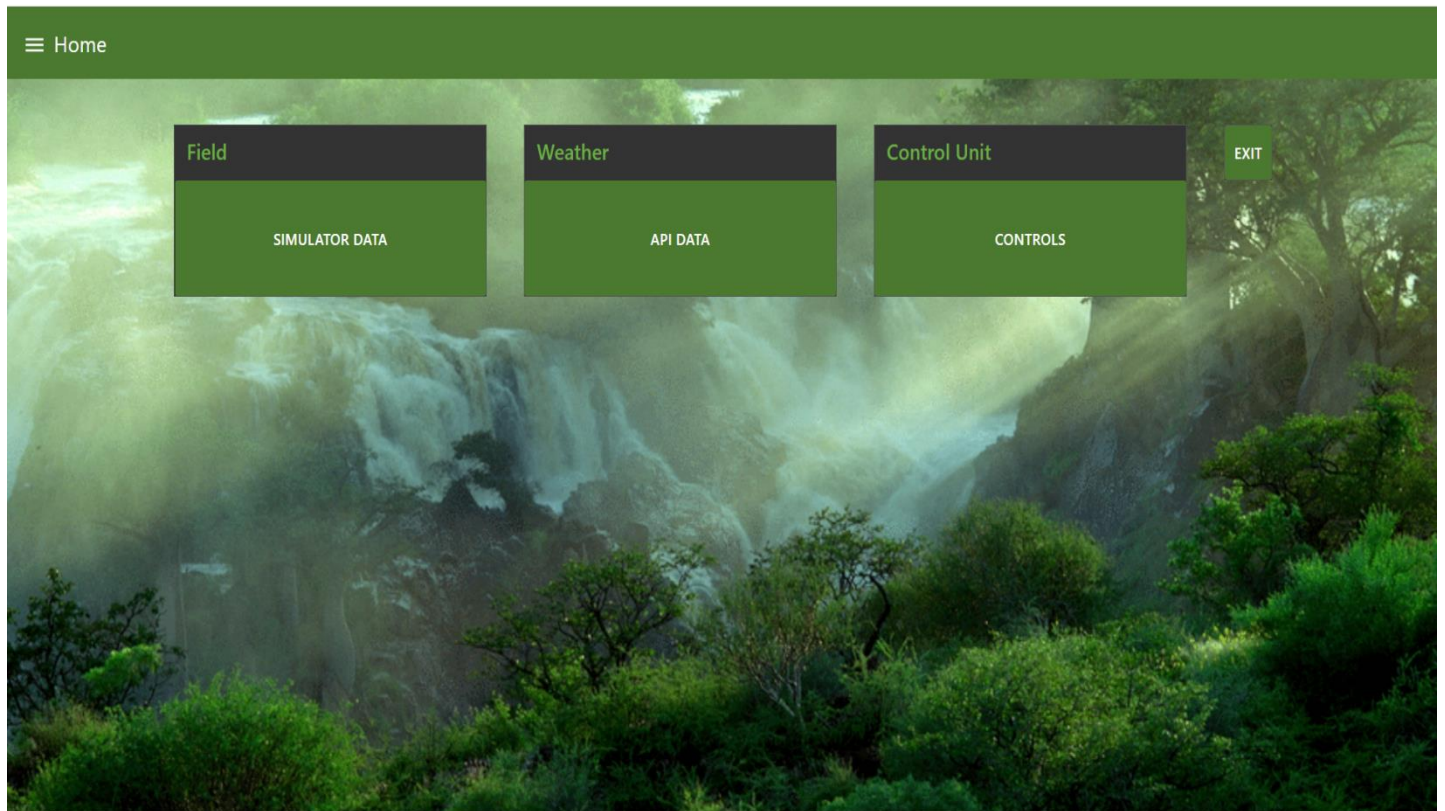
# CHAPTER 6

## RESULT

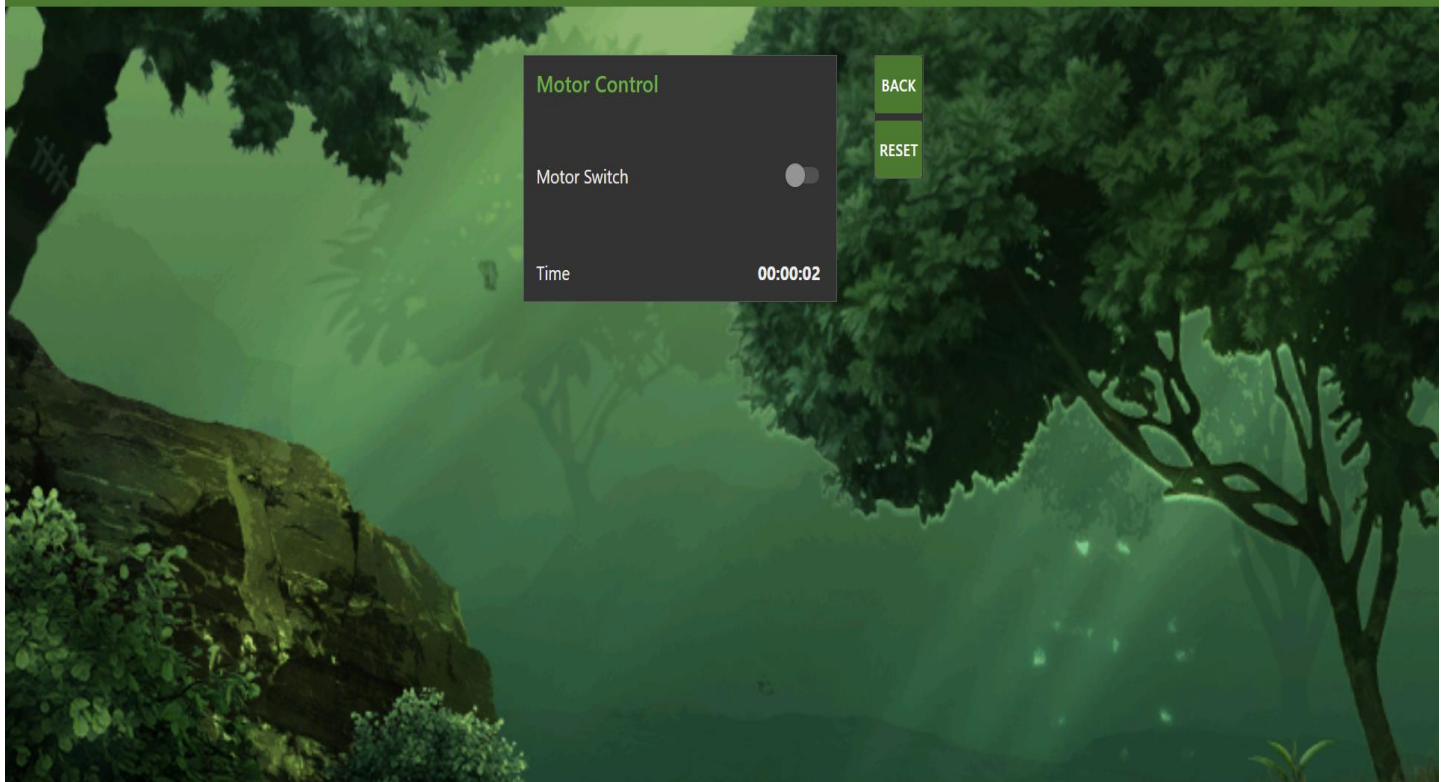
The Smart Agriculture make ease to farmer through which he can easily & effectively can do land cultivation .The farmer can control the flow of water through the web application. Through the web application, the farmer got the remote connectivity to his water supply motor.

The connectivity of farmer becomes easy with this IoT application. The IOT application helps to justify the weather of that area so farmer can do water supply effectively.









# CHAPTER 7

## ADVANTAGES & DISADVANTAGES

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- **Advantages**

- ➡ It allows farmers to maximize yields using minimum resources such as water, etc.

- ➡ Water Conservation

- ➡ It is cost effective method.

- ➡ It delivers high quality crop production.

- **Disadvantages**

Following are the drawbacks of Smart Agriculture System:

- ➡ The smart agriculture needs availability of internet continuously. Rural part of most of the developing countries does not fulfill this requirement. Moreover internet connection is slower.

- ➡ The smart farming based equipments require farmers to understand and learn the use of technology. This is major challenge in adopting smart agriculture farming at large scale across the countries.



# CHAPTER 8

## APPLICATIONS

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### **1 Precision Farming**

The adoption of access to high-speed internet, mobile devices, and reliable, low-cost satellites (for imagery and positioning) by the manufacturer are a few key technologies characterizing the precision agriculture trend. By adopting this system, it helps in reduction of cost and yield will also increase.

### **2. Live Monitoring**

This system can be implemented in any small scale, medium scale or large scale agriculture. Through this live monitoring of field can be done which will be useful to increase the growth. By monitoring different parameter accurately, there will be proper supply of water, pesticides, fertilizers etc.

IoT based SMART Agriculture SYSTEM for live Monitoring of Temperature, Humidity and Soil Moisture has been proposed using IBM Simulator and Cloud Computing . The System has high efficiency and accuracy in fetching the live data of temperature, humidity and soil moisture not only from field but also collecting weather data. The IoT based smart agriculture 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.

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. This project is now implemented through web application but it also find it utilities in mobile application. Apart from controlling water supply motor, we can also enhance it with other functionalities such as pH determination of soil, plant growth etc.

# CHAPTER 11

## BIBLIOGRAPHY

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Following resources are helpful in creation of this project:

1. <https://dzone.com/articles/iot-application-development-tips-to-make-it-succes>
2. <https://cloud.ibm.com/docs>
3. <https://nodered.org/>
4. <https://internetofthings.ibmcloud.com/>
5. <https://cloud.ibm.com/docs/services/IoT?topic=iot-platform-ref-index>
6. <https://nodered.org/docs/getting-started/windows#3-run-node-red>

- **Device Credentials:**

Organization ID:	115ozv
Device Type:	NodeMCU
Device ID:	Smart_Agriculture_System
Authentication Method:	use-token-auth
Authentication Token:	D+2RcRgl3nO92TkJER

- **Web Application:**

API Key:	a-115ozv-syv612nwsm
Authentication token: -	u@?WNcX&m72H+UNb?Z

- **Open Weather API details:**

API call: `api.openweathermap.org/data/2.5/weather?q={city name}&&appid={your api key}`

API Key on open weather: 1e572465a6f7b6478bbd61535f6b9e28

City: Bhopal

URL:  
<https://api.openweathermap.org/data/2.5/weather?q=Bhopal&appid=1e572465a6f7b6478bbd61535f6b9e28>

- **Python Code**

```
import time
import sys
import ibmiotf.application # to install pip install ibmiotf
import ibmiotf.device
```

```
#Provide your IBM Watson Device Credentials
organization = "115ozv" #replace the ORG ID
deviceType = "NodeMCU"#replace the Device type wi
```

```

deviceId = "Smart_Agriculture_System"#replace Device ID
authMethod = "token"
authToken = "D+2RcRgI3nO92TkJER" #Replace the authtoken

def myCommandCallback(cmd): # function for Callback
    print("Command received: %s" % cmd.data)
    if cmd.data['command']=='motoron':
        print("MOTOR ON IS RECEIVED")

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

    if cmd.command == "setInterval":

        if 'interval' not in cmd.data:
            print("Error - command is missing required information: 'interval'")
        else:
            interval = cmd.data['interval']
    elif cmd.command == "print":
        if 'message' not in cmd.data:
            print("Error - command is missing required information: 'message'")
        else:
            output=cmd.data['message']
            print(output)

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:
```

```
    deviceCli.commandCallback = myCommandCallback
```

```
# Disconnect the device and application from the cloud
```

```
deviceCli.disconnect()
```

- **JSON Code**

<https://drive.google.com/file/d/110TdneVkclo4v0mEjE1IkYCO6C7itbAL/view>