A PROJECT REPORT

SMART AGRICULTURE SYSTEM BASED ON IoT

Carried out a part of internship during SUMMER 2020 At

SMARTBRIDGE
Let's Bridge the Gap

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CONTENTS

1. INTRODUCTION

1.1 OVERVIEW

Agriculture plays a critical role in the entire life of a given economy. Agriculture is the key development in the rise of a sedentary human civilization. There are various issues that are hampering the development of the country. The possible solutions for the problems faced is to opt for modernized agriculture. Agriculture can be made smart by using Internet of Things (IoT) technologies. Smart Agriculture increases quality, quantity, sustainability and cost-effectiveness of crop production and also analyses the weather conditions. This paper proposes a system which is useful in monitoring the field data as well as controlling the field operations which provides the flexibility. The paper aims at making agriculture smart using automation and IoT technologies.

1.2 PURPOSE

The Smart Agriculture System is a hi-tech and effective system of doing cultivation and growing food in a sustainable way. It majorly depends on IoT thus eliminating the need of physical work of farmers and growers and thus increasing the productivity in every possible manner. IoT based Smart Agriculture System improves the entire Agriculture system by monitoring the field in real-time. Several great uses for agriculture IoT in this space:

- Sensing for soil moisture and nutrients.
- Controlling water usage for optimal plant growth.
- Reporting weather conditions.

With the help of sensors and interconnectivity, the IoT in Agriculture has not only saved the time of the farmers but has also reduced the use of resources such as water and electricity.

2. LITERATURE SURVEY

2.1 EXISTING SYSTEM

1. Anand Nayyar, Er. Vikram Puri, "IoT Based Smart Sensors Agriculture Stick for Live Temperature and Moisture Monitoring using Arduino, Cloud Computing & Solar Technology" May 2015.

This paper presents an IoT based smart stick that enables live monitoring of the different agricultural parameters. This stick helps farmer acquire live data of temperature, soil moisture. The agricultural IoT stick gives the idea of plug and measures in which farmers can instantly enact smart monitoring system by positioning the stick in the field and obtaining live data feeds on different smart gadgets like smart tablets, phones etc. and the information which is produced through sensors could be simply analysed and processed by agricultural experts even in remote areas via cloud computing technologies.

2. Chandan Kumar Sahu, Pramitee Behera, "A Low Cost Smart Irrigation Control System", IEEE sponsored 2nd International Conference on Electronics and Communication System (ICECS2015)

In this paper, the author proposes a model where the flow and direction of water is supervised and controlled. This is done with the help of DHTT11 and soil moisture sensor. This method also proposes a way to select the direction of water and this information is also sent to the phone and Gmail account of the farmer. This model also enables the farmer to switch on and off the motor with a single click. This paper proposes a prototype where number of sensors are deployed at different positions in the field. This paper also shows how the proposed model makes the traditional irrigation system more effective and sustainable. This paper also suggests an efficient energy and network model. This paper presents a model that is energy efficient, sustainable, automated and cost effective.

3. S.Sivachandran, K.Balakrishnan, K.Navin, "RealTime Embedded Based Soil Analyser", International Research Journal of Engineering and Technology (IRJET). Volume: 3 Issue 3 | March 2014

In this paper, authors propose an embedded soil analyser with measures the pH value of the soil and based on this value gives measure of various soil nutrients. The system proposed here uses signal conditioning, display, microcontroller unit, sensors, power supply and thermal printer. This model helps in prediction of the soil sequence based on the availability of nutrients. Many techniques monitor various soil parameters and this paper points at soil fertility. The main aim of this model is to replace the conventional method of soil testing by automated soil testing. It automatically measures the major soil nutrients like potassium, phosphorus and nitrogen by calculating the pH value.

2.2 LIMITATIONS

A major drawback is that, the models proposed in above research papers are

- Cost ineffective.
- Quite complex
- Use of high technology.

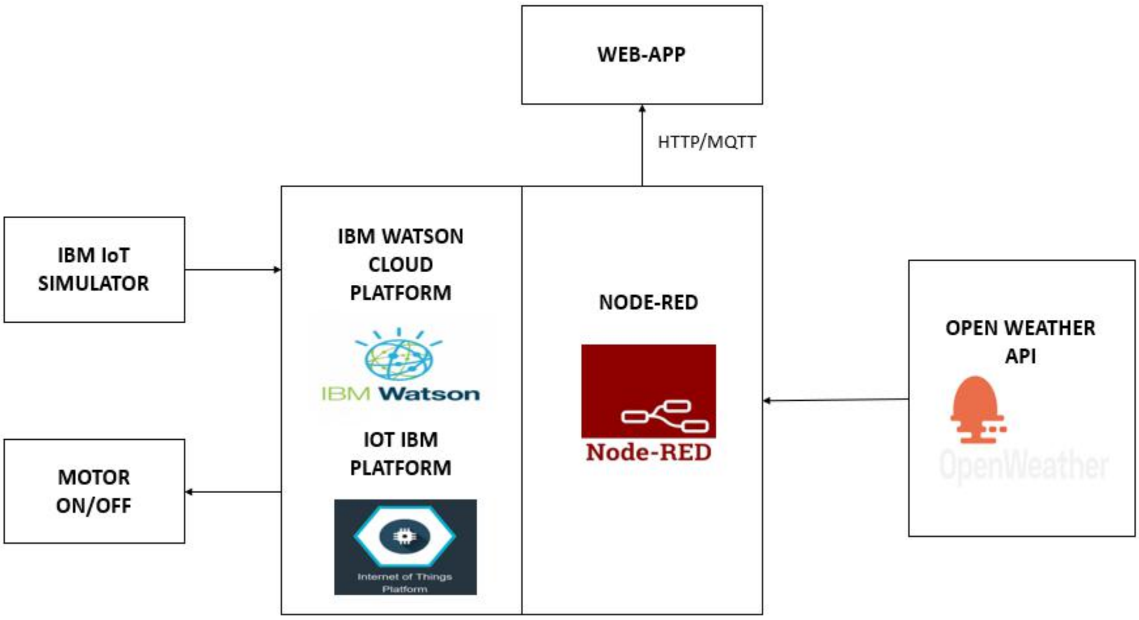
The model proposed by us is way simpler as well as affordable. It uses cheap yet effective technology and includes all the advantages of the models proposed above.

2.3 PROPOSED SYSTEM

We propose the using evolving technology i.e., IOT for opting Smart Agricultural system. The highlighting feature of this project is that it measures different agricultural parameters effecting the yield and it also a GPS module to get the information about the location. Secondly, it sends all the information to the cloud where it can be further analysed. On top of that this project also contains an android mobile app providing an easy access of information to the farmer. This helps farmers in increasing the quantity as well as the quality of production, water conservation and many more.

2. THEORITICAL ANALYSIS

3.1 BLOCK DIAGRAM

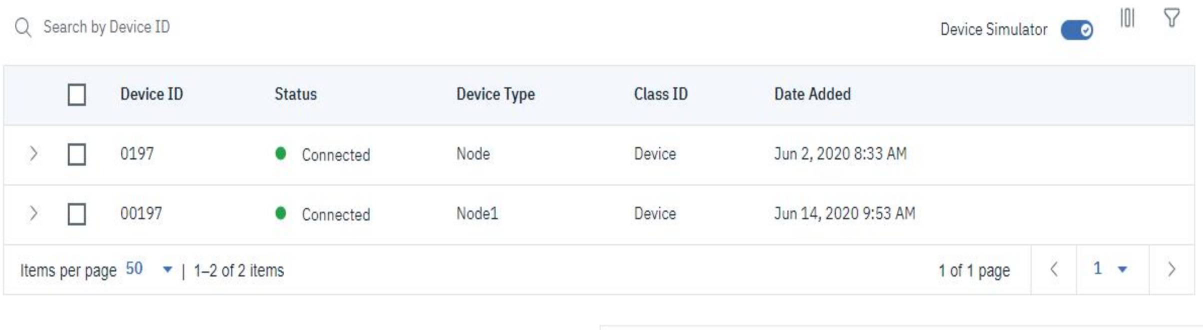


3.2 HARDWARE/SOFTWARE DESIGNING

- Firstly, create a device in IBM Cloud.
- Connect the device to IBM Simulator by giving device credentials to get the weather conditions.
- Build a Node-RED flow to display the weather conditions and control the devices for displaying data in the web application.
- Get the real time weather condition data from open weather
- API and integrate it in the Node-RED.
- Control the working of the created web application to the devices by python coding.

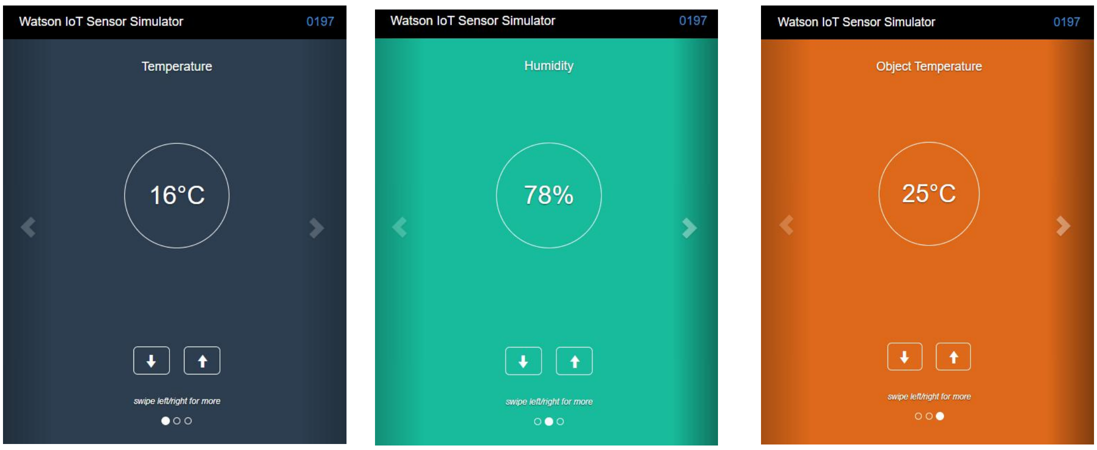
4. EXPERIMENTAL INVESTIGATIONS

Device Creation



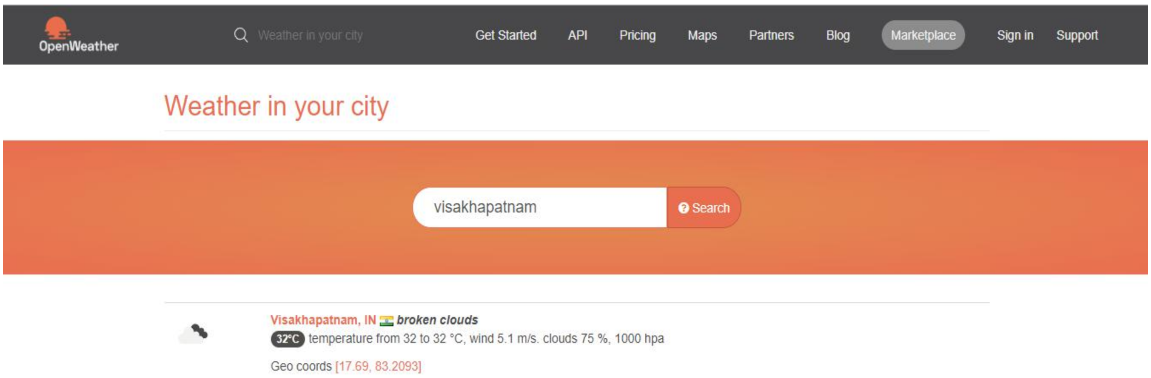
Device ID	Status	Device Type	Class ID	Date Added
0197	Connected	Node	Device	Jun 2, 2020 8:33 AM
00197	Connected	Node1	Device	Jun 14, 2020 9:53 AM

IoT Device Simulator

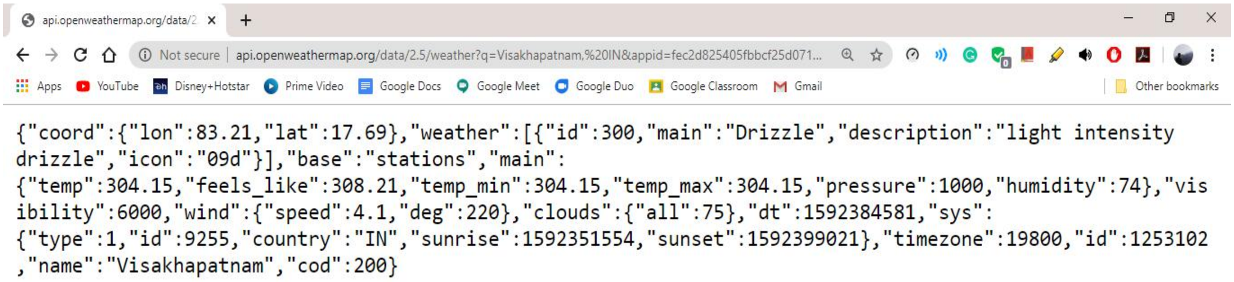


TEMPERATURE HUMIDITY OBJECT-TEMP

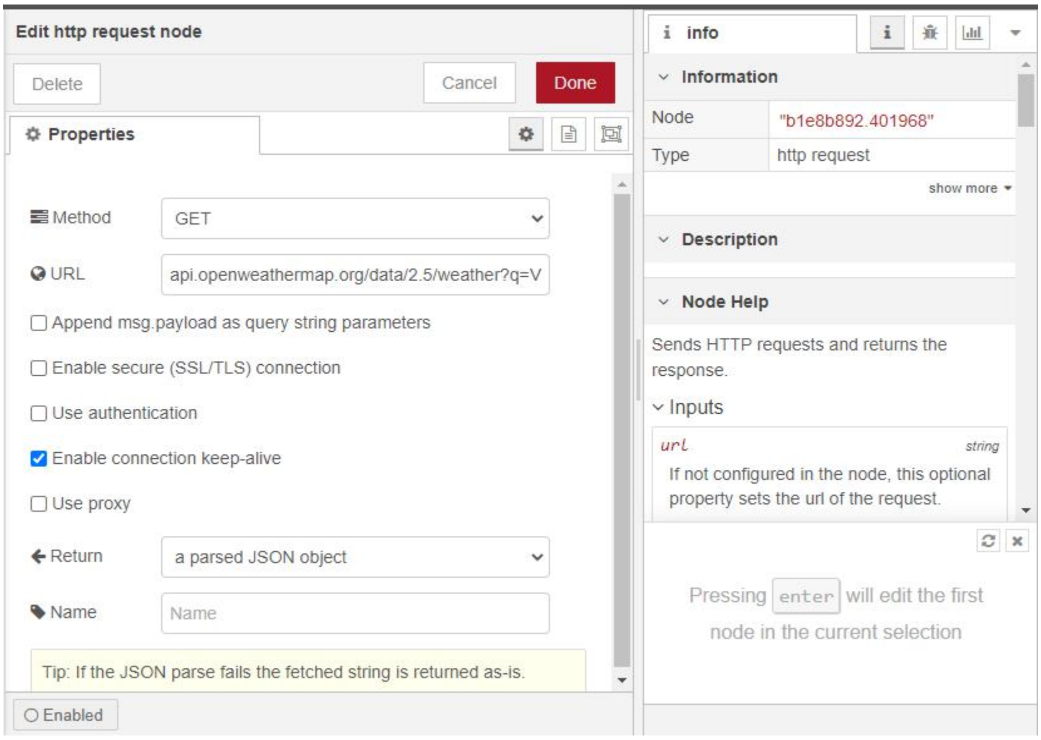
OPEN WEATHER MAP



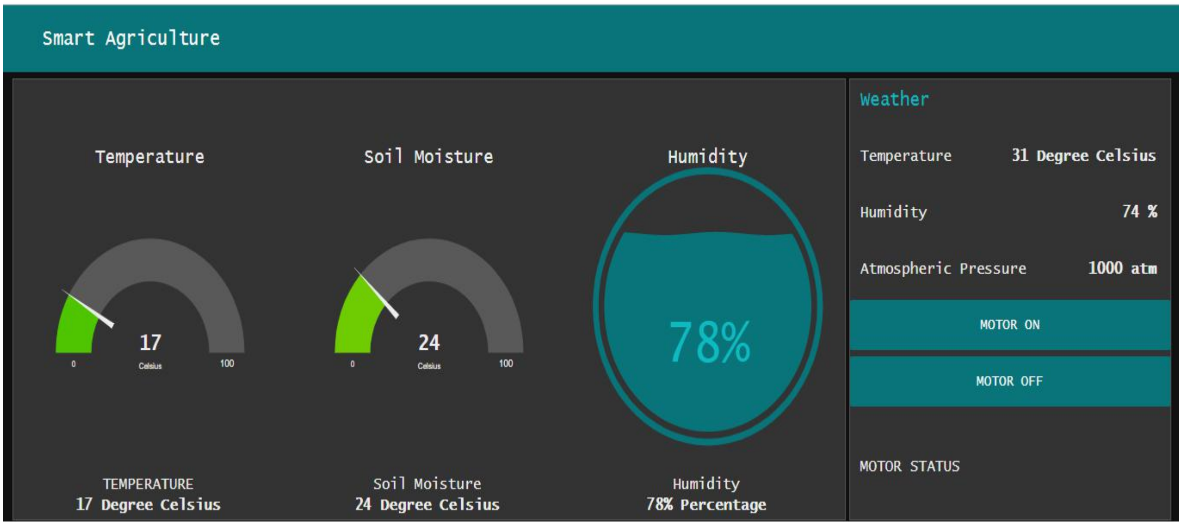
JSON data fetched from API



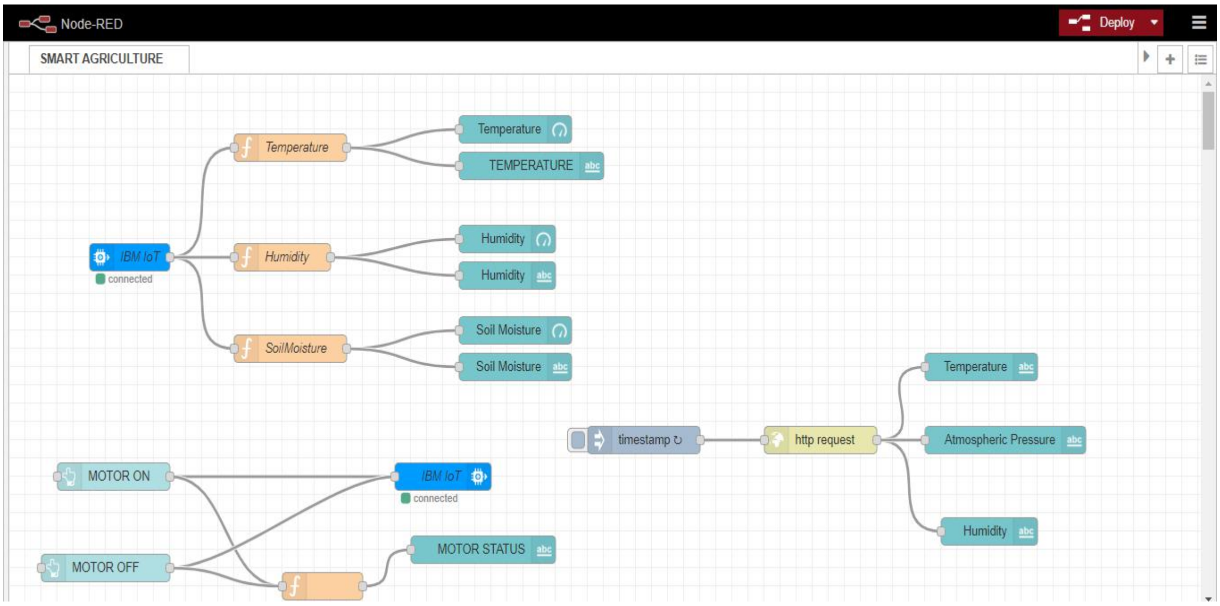
Node-RED HTTP Request



Node-RED UI


Smart Agriculture
Temperature
Soil Moisture
Humidity
17
Celsius
0
100
24
Celsius
0
100
78%
TEMPERATURE
17 Degree Celsius
Soil Moisture
24 Degree Celsius
Humidity
78% Percentage
Weather
Temperature 31 Degree Celsius
Humidity 74 %
Atmospheric Pressure 1000 atm
MOTOR ON
MOTOR OFF
MOTOR STATUS

5. FLOW CHART



When running Node-Red in the IBM Cloud, there used to be "IBM IoT in" and "IBM IoT out" nodes which allowed to easily connect to the IBM Watson IoT platform.

Nodes used in Web-App

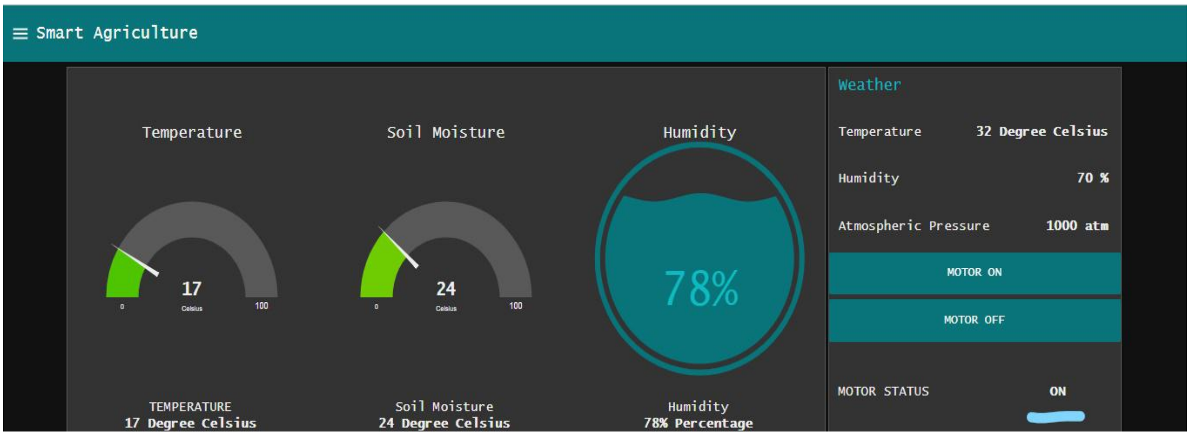
- IBM IoT -IN and OUT Nodes
- Function Nodes
- Gauge Nodes
- Button Nodes
- Inject Node (Timestamp)
- Text Nodes
- Http request Node

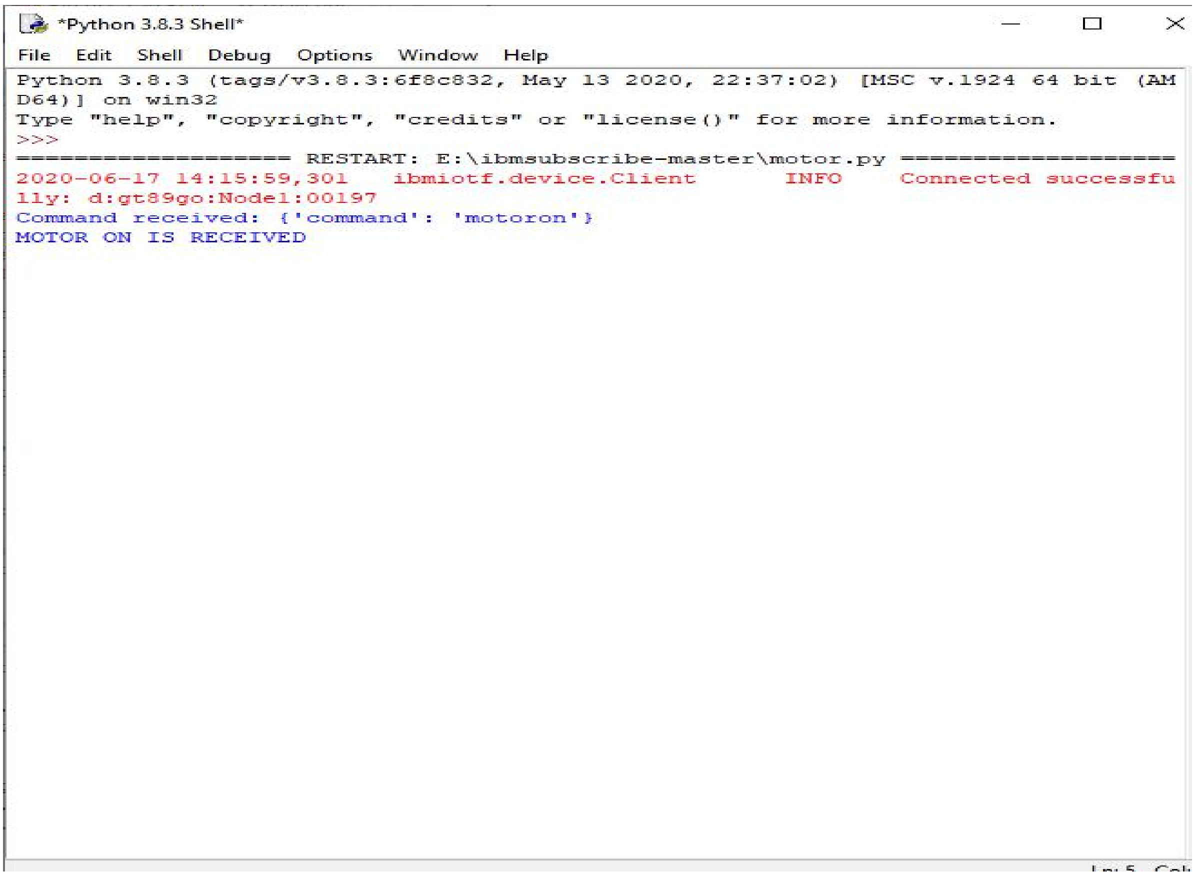
6. RESULT

We have successfully built a web-based UI and integrated the services using Node-RED.

STATUS OF MOTOR

When Motor is ON





<u>When Motor is OFF</u>

7. ADVANTAGES & DISADVANATGES

The agriculture sector fulfils demand of food of the nation. The agriculture which uses sensors and latest technologies such as IoT/cellular is known as smart agriculture or smart farming. The Smart Agriculture System is an IoT based device which is capable of automating the irrigation process by analysing the moisture of soil and the climate condition.

ADVANTAGES

- It allows farmers to maximize yields using minimum resources such as water, fertilizers etc.
- Mobile operated pumps save cost of electricity.
- It is cost effective method.
- It delivers high quality crop production.
- Real-Time Data and Production Insight
- Improved Livestock Farming.
- Remote Monitoring.
- Efficient and saves time.

DISADVANATGES

- The smart agriculture need availability on internet continuously.
- The smart farming-based equipment's require farmers to understand and learn the use of technology.
- Lesser employment of menial staff or unskilled workers.

8. APPLICATIONS OF SMART AGRICULTURE SYSTEM

Smart agriculture through the use of IoT Technologies will help farmers to reduce generated wastes and enhance productivity. It is basically a hi-tech system of growing food that is clean and is sustainable for the masses. It is the induction as well as the application of modern ICT (Information and Communication Technologies) into agriculture.

Some of the applications for IoT in agriculture are:

- Precision Farming
- Agriculture Drones
- Livestock Monitoring
- Smart Greenhouses

PRECISION FARMING	AGRICULTURE DRONES	LIVESTOCK MONITORING	SMART GREENHOUSES
• Precision farming or agriculture, is a farming management concept based on observing, measuring and responding to inter and intra-field variability in crops.	• Drones are being used in agriculture in order to enhance various agricultural practices. The major benefits of using drones include crop health imaging, mapping, ease of use, saves time, and the potential to increase yields	• It helps farmers to collect data regarding the location, well-being, and health of their cattle. The feasibility of ranchers is, to locate their cattle with the help of IoT based sensors helps in bringing down labor costs by a substantial amount.	• Greenhouse farming is a technique that enhances the yield of crops, vegetables, fruits etc. A smart greenhouse through IoT embedded systems not only monitors intelligently but also controls the climate.

9. CONCLUSION & FUTURE SCOPE

CONCLUSION

The proposed model explores the use of IoT in the agriculture sector. The objectives of this project "Smart Agriculture System" is to increase the crop production and to avoid the wastage of water. This smart agriculture system is feasible and cost effective. It also focuses on optimizing water resources which combats issues like water scarcity and ensures sustainability and monitors the environmental parameters. It also focuses on the utilization of IoT in agriculture and the solutions proposed in this paper will improve farming methods, increase productivity and lead to effective use of limited resources. A farmer should visualize his agricultural land's moisture content and the weather conditions from time to time and water level of source is sufficient or not. The agriculture field can be monitored and controlled by an android app at user end. Hence will have a good production of crops and great saving of irrigation water, stronger and healthier plants.

FUTURE SCOPE

The future scope of this project could be including variety of soil sensors like pH sensor, Rain sensor which helps in the predicting and analysing processes more accurate. We can also monitor the life cycle of the plants. Through smart agriculture system we can analysis the crop yield and can monitor the soil moisture and plant health.