PROJECT REPORT

INTRODUCTION

- **Overview**
  - Agriculture is a major source of income for the largest population in India and is a major contributor to the Indian economy.
  - In the past decade it is observed that there is not much crop development in the agriculture sector.
  - Food prices are continuously increasing because crop rate declined.
  - There are number of factor which handles this, it may be due to water waste, low soil fertility, Fertilizer abuse, climate change or diseases etc.
  - It is very essential to make effective intervention in agriculture and the solution is IOT in integration with wireless sensor network.
  - The Internet of things (IOT) is a method of connecting everything to the internet - it is connecting objects or things (such as car, home, electronic devices, etc.) which are previously not connected with each other.
  - The main purpose of IOT is to ensure the delivery of right information to right people at the right time.
  - In agriculture irrigation is the important factor as the monsoon rain falls are unpredictable and uncertain.
- **Purpose**
  - Simple an easy to install and configure.
  - Saving energy and resources, so that it can be utilized in a proper way and amount.
  - Farmers could smear the right amount of water at the right time by automatic irrigation.
  - Avoiding irrigation at the wrong time of day, reduce runoff from over watering saturated soils which will improve crop performance.
  - Automated irrigation system uses vales to turn motor ON and OFF. Motors can be automated easily by using controllers and no need of labor to turn motor ON an OFF.

- It is precise method for irrigation and a valuable tool for accurate soil moisture control in specialized greenhouse vegetable production.
- It is time saving, the human error elimination in adjusting available soil moisture levels.

LITERATURE SURVEY

- **Existing problem**
    - Smart Farming using the Internet of Thing [1]: This aims in the equipment of different sensors for measuring environmental parameters required for the growth of crops.
    - It includes node MCU and different sensors for executing and performing the whole process.
    - The features used in this system are to gather all the environmental data and give accurate data to the farmers so that they can take the most efficient decision related to farming.
    - The system will perform tasks such as sensing the soil moisture, temperature, and humidity.
    - It also indicates water level, detecting an intruder in the field and performing automation functions i.e. switching an electric motor on/off manually.
    - The system which is proposed has been tested, monitors the reading and obtains satisfying results which will enable the system to be beneficial in smart farming.
    - The sensors give reading such as the temperature reading, humidity reading, soil quality and water- level.
    - It gives automation settings such as a fan when the temperature is high giving status on and off and motor for sending water to plants.

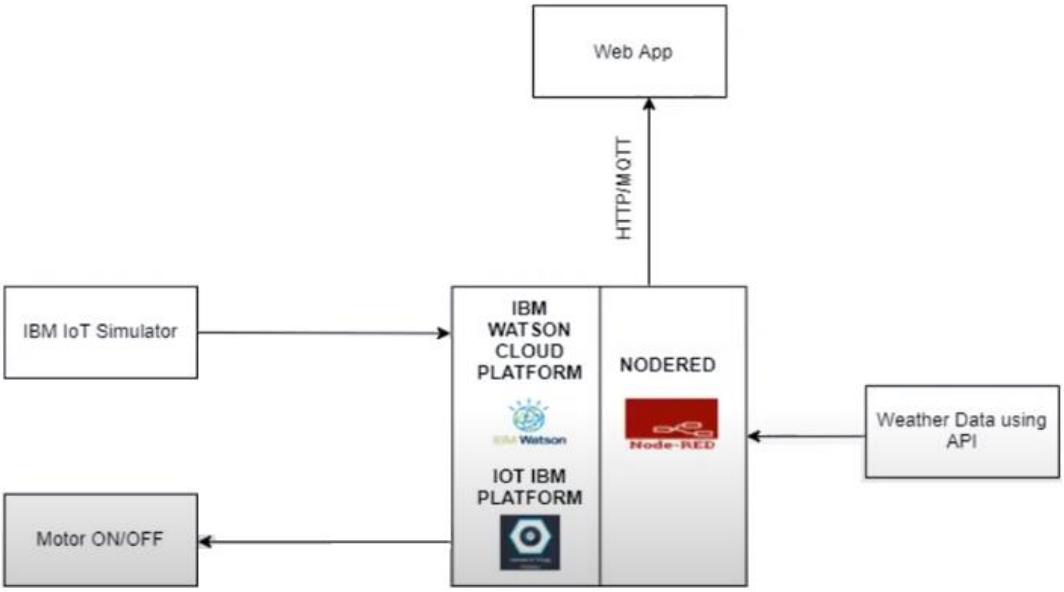
    - IoT BASED SMART AGRICULTURE [2]: Integrated system deals with all elements influencing the profitability.
    - The method aims in making horticulture excellent by efficiently utilizing computerization and IoT which uses GPS based remote controlled robots to perform field work such as weeding, splashing, dampness detecting, winged creature and creature startling, keeping carefulness, among other examples.
    - Excellent watering system with keen control and smart leadership depend on exact constant field information.

- It additionally incorporates the keen distribution center, for example, temperature upkeep, dampness support and burglary discovery in the stockroom by Controlling every of these activities will be finished by any remote gadget / PC associated with Internet and the actions will be performed by interfacing sensors, ZigBee modules, camera and actuators with small scale controller and raspberry pi.
- Demerits by these projects are: It's expensive to use in actual field although it is automotive and quick process.
- It causes weakening of radio recurrence (RF) signals by the organization of sensors dirt.

- **Proposed solution**
  - IoT is based on SMART AGRICULTURE SYSTEM is regarded as the IoT gadget focusing on Live Monitoring of Environmental data in terms of Temperature, Moisture and Humidity of atmosphere and the plant/crop.
  - The system provides the concept of "Plug and Sense" in which farmers can directly implement smart farming by such as putting the System on the field and getting Live Data feeds on various electronic devices using Web Application.
  - Moreover, the data generated via sensors can be easily shared and viewed by agriculture consultants anywhere remotely via Cloud Computing technology integration.
  - The system allows manually to turn the pumping motor ON and OFF on sensing the moisture content of the soil.

THEORITICAL ANALYSIS

- **Block diagram**

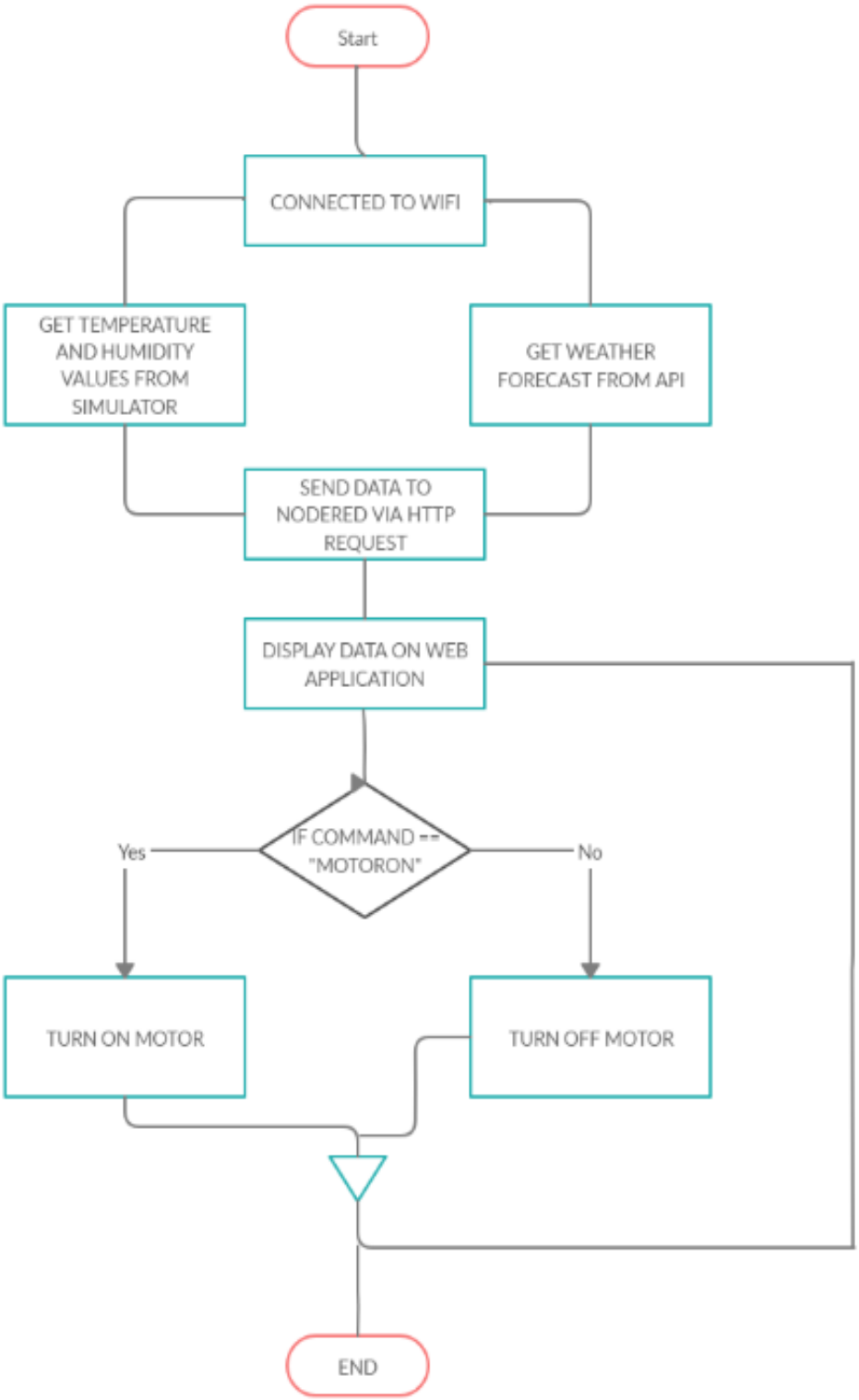


- **Software designing**
  - Creating IBM IOT PLATORM on IBM WATSON CLOUD.
  - Installing Nodered locally.
  - Developing Web Applications.
  - Fetching Weather Data using API.
  - Writing program in python language.

EXPERIMENTAL INVESTIGATIONS

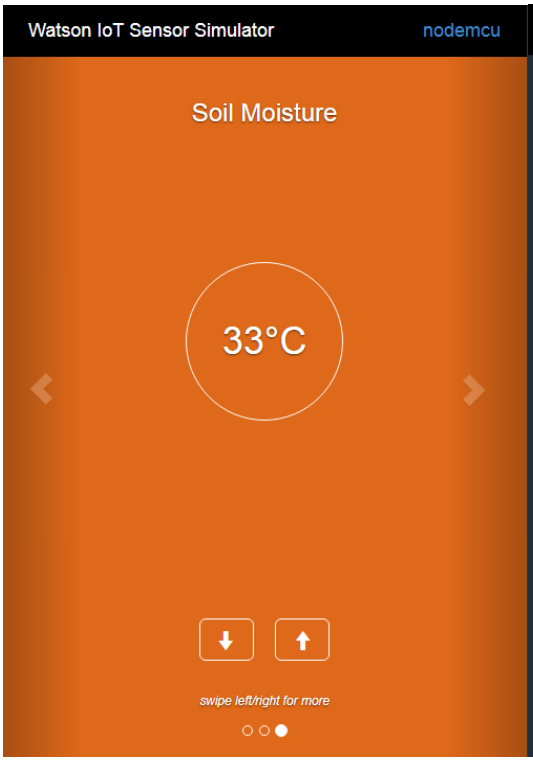
- After creating IBM IoT Platform, different cards which show Humidity, Temperature and Soil Moisture are created in form of linear graph so that we can analyze the changes.
- In the Nodered, creating proper flow and requesting HTTP request via Weather API, one can view the weather forecast and other parameters.
- If the farmer finds the necessity of watering the crops, the motor on command can be turned on which is available in the web application.
- The motor is turned on or off can be verified in the python console that the respective command is received.

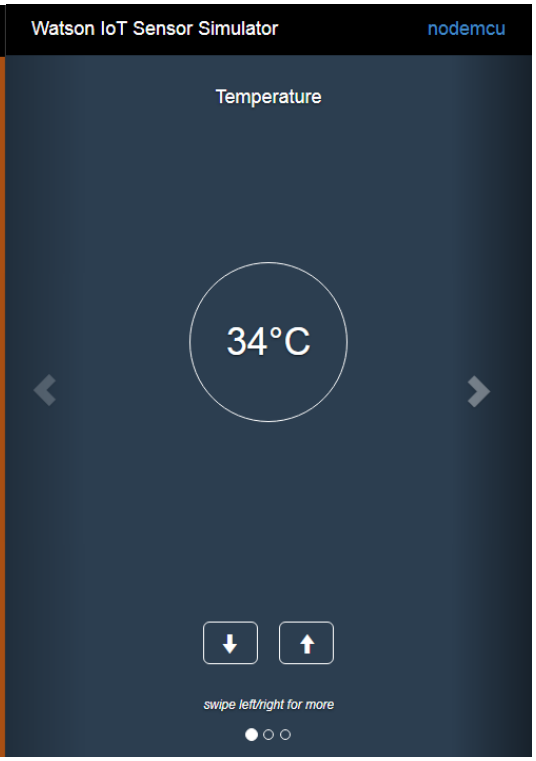
FLOWCHART

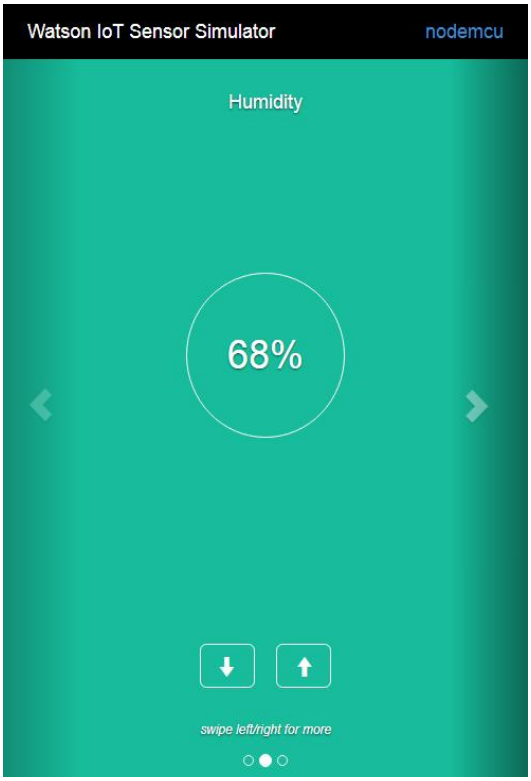

Start
CONNECTED TO WIFI
GET TEMPERATURE AND HUMIDITY VALUES FROM SIMULATOR
GET WEATHER FORECAST FROM API
SEND DATA TO NODERED VIA HTTP REQUEST
DISPLAY DATA ON WEB APPLICATION
IF COMMAND == "MOTORON"
Yes
No
TURN ON MOTOR
TURN OFF MOTOR
END

RESULT

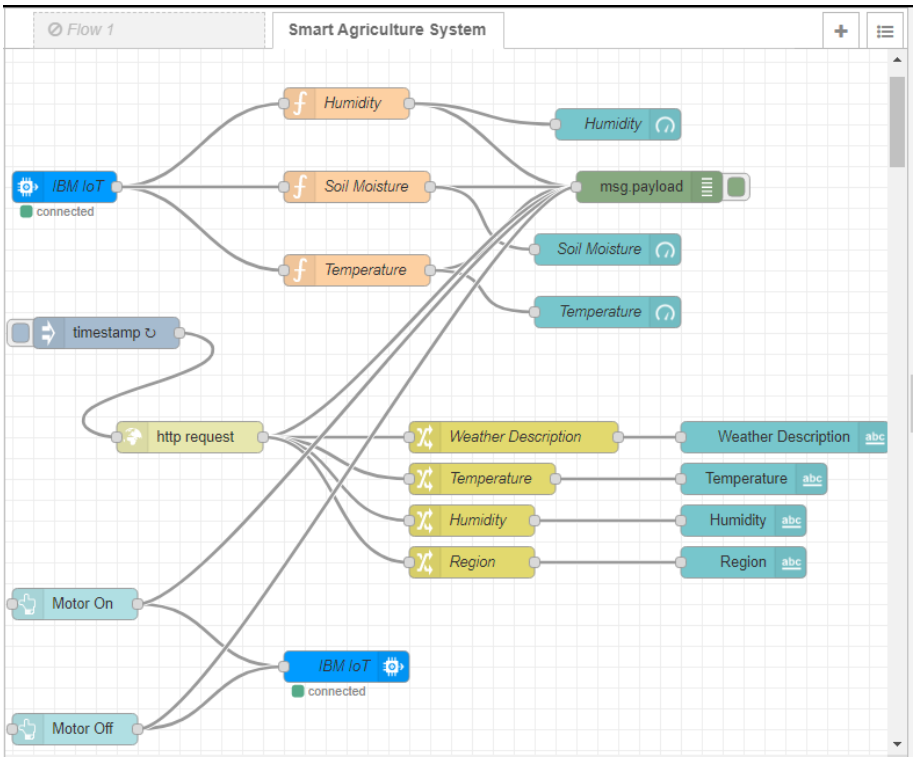
- The experimental results show that on connecting with the Simulator following pages are displayed:



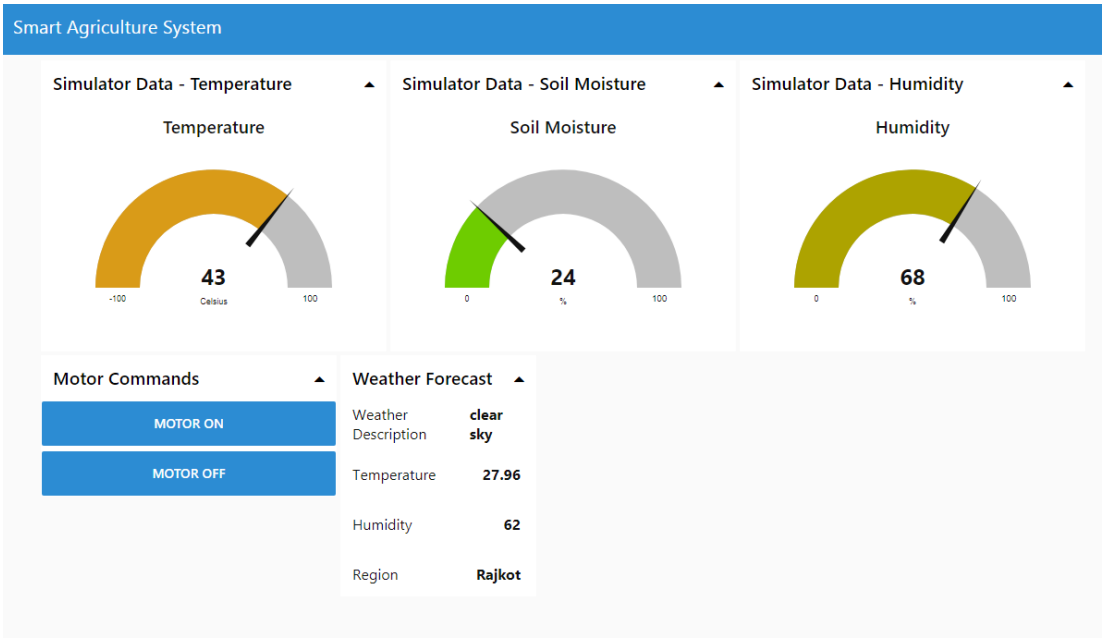




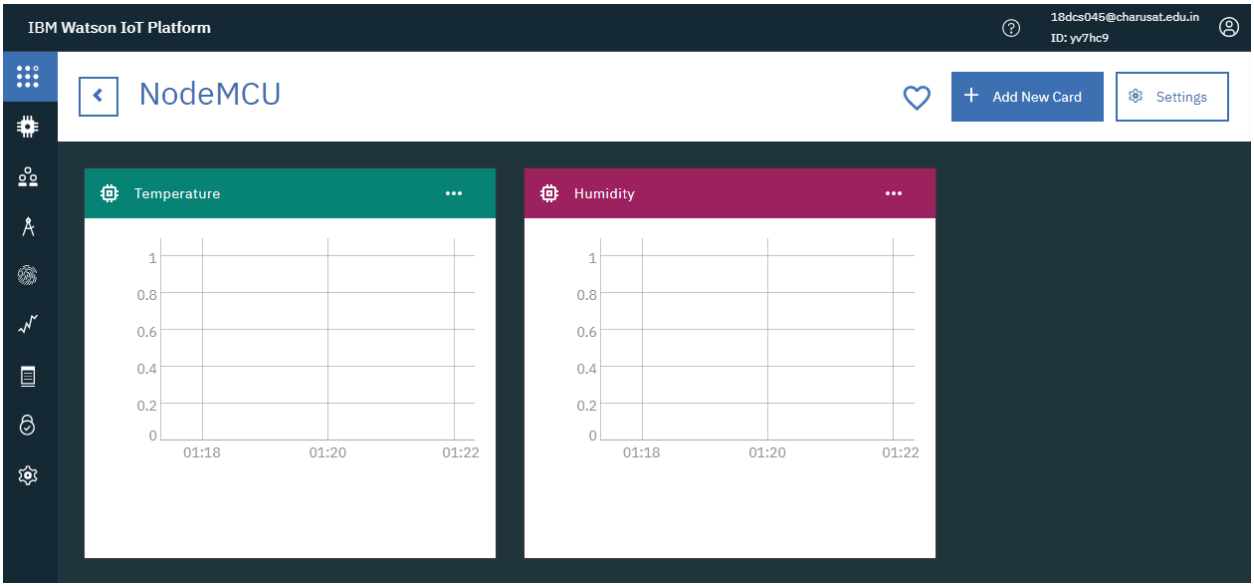
- The Nodered flow is as below:



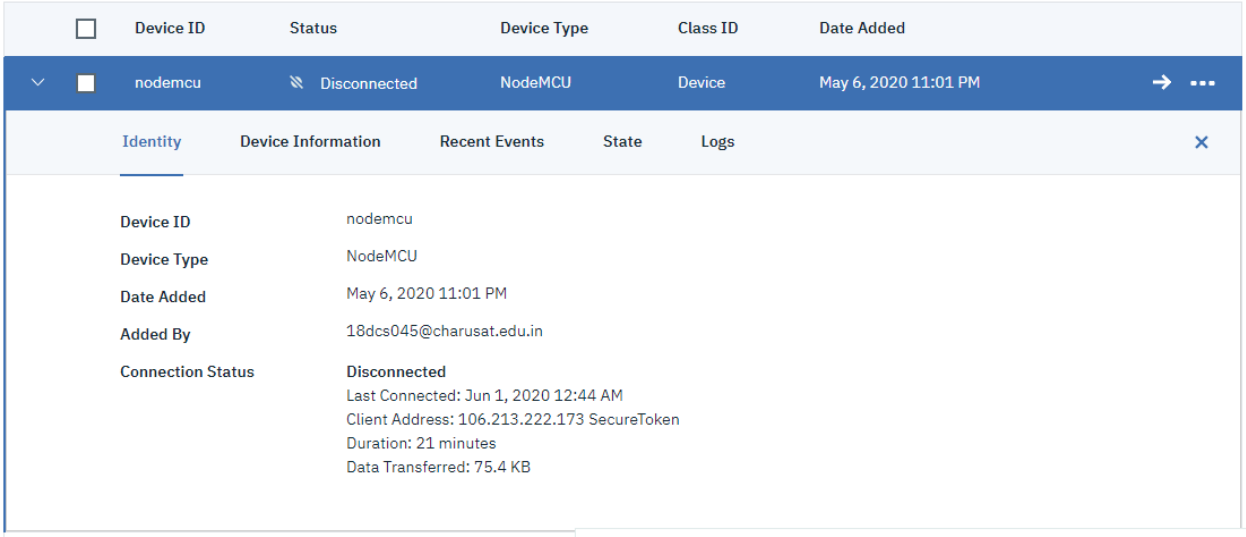
- The Dashboard of the Web Application is as follows:



- The Line charts of Temperature and Humidity values is as below:



- The device configuration details in the IoT platform:



ADVANTAGES & DISADVANTAGES

- Benefits of Smart Agriculture System are:
    - One of the excellent things about this branch of farming is that it allows for Soil Sensing. This aspect of smart farming gives room for you as a farmer to test your soil for information and also measure it for a wide range of important and nutritious constituents necessary in securing the best health of your farm produce.
    - Soil sensing is also employed to appropriately control the application of real-time variable rate equipment. This allows you to understand the scale of your grounds.
    - You also get to get important information about the amount of air and the levels of air, sound, humidity, and temperature of your environment.
    - Smart agriculture uses AI to improve the process of wireless monitoring, regulation and data collection.
    - With these inputs on your farm, all thanks to smart farming, you can be sure of high-quality crop production and delivery.

- Challenges faced by Smart Agriculture System are:
    - One huge disadvantage of smart farming is that it requires an unlimited or continuous internet connection to be successful. This means that in rural communities, especially in the developing countries where we have mass crop production, it is completely impossible to operate this farming method. In places where internet connections are frustratingly slow, smart farming will be impossibility.
    - Smart farming uses high techs that require technical skill and precision to make it a success. However, many farmers do not have these skills.
    - Even finding someone with this technical ability is difficult or even expensive to come by, at most.
    - And, this can be a discouraging factor that hinders numerous promising farmers from adopting it.

APPLICATIONS

- Using the IoT concept in the agriculture field will help farmers not only reduce waste but also increase in yield production varying from the quantity of fertilizer utilized to the quality of the production achieved.
- These days IoT has also been implemented in these following practices.
    - Crop Monitoring: Using IoT technique we can monitor the quality of crop.
    - Precision Farming: Precision farming is a farming practice that is more accurate and controlled. It deals with production of crop along with raising livestock.
    - Livestock Monitoring: With the help of sensor, health of the livestock can be monitored which will directly help in the yield production of good produced from them.
    - Agricultural drones: It is a good example for farming and in order to improve the various agricultural practices.

CONCLUSION

- IoT based SMART AGRICULTURE SYSTEM for Live Monitoring of Temperature. Humidity and Soil Moisture has been proposed using Arduino and Cloud Computing.
- The System has high efficiency and accuracy in fetching the live data of temperature and soil moisture.
- The IoT based on the smart agriculture system being proposed 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 percent accurate results.

FUTURE SCOPE

- Future work would be focused on implementing devices/appliances which use solar energy.
- Increasing sensors on this system to fetch more data especially about Pest Control and by also integrating GPS module in this system to enhance this Agriculture IoT Technology to full-fledged Agriculture Precision ready product.
- Also a variety of soil sensors like pH sensor, rain sensor and then collecting and storing the data on a cloud server could be included. This would make the predicting and analyzing processes more accurately.
- It also includes making different data mining algorithms suitable for data analysis in agriculture.

BIBILOGRAPHY

- **APPENDIX**
  - Source code:

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

#Provide your IBM Watson Device Credentials
organization = "yv7hc9" #replace the ORG ID
deviceType = "NodeMCU" #replace the Device type
deviceId = "nodemcu" #replace Device ID
authMethod = "token"
authToken = "(NOa@QG3dbUeRWj3LA" #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()
```

- **[1]: H. Kothiya ,Rathinkumar. and L. Patel ,Karan. and Prof. Jayswal., Hardik .S., 2018.,Smart farming using IoT. Publication: November 2015**
- **[2]: Gondchawar, N. and Kawitkar, R.S., 2016. IoT based smart Agriculture. International**
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