SMART AGRICULTURE SYSTEM

BASED ON

INTERNET OF THINGS

SUBMITTED TO:
Smartinternz
(Smartbridge)

SUBMITTED BY:
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B.Tech(mechatronics) 3rd year
Inter under Smartinternz

CERTIFICATE

I hereby submit the project report entitled **SMART AGRICULTURE SYSTEM BASED ON INTERNET OF THINGS (IOT)** in Smartinternz (Smartbridge) under the supervision of **Mr. Durgaprasad**, Smartinternz.

Mansi Kukreja

Mr. Durgaprasad

(Mentor)

Acknowledgement

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CONTENTS

CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

Agriculture is the art and science of cultivating the soil, growing crops and raising livestock. The main source of food for the population of the world is agriculture. Agriculture provides most of the world's food and fabrics. For decades, agriculture has been associated with the production of essential food crops. At present, agriculture above and beyond farming includes forestry, dairy, fruit cultivation, poultry, beekeeping, mushroom, arbitrary, etc. Today, processing, marketing, and distribution of crops and livestock products, etc. are all acknowledged as part of current agriculture. Thus, agriculture could be referred to as the production, processing, promotion, and distribution of agricultural products. Agriculture plays a critical role in the entire life of a given economy. Agriculture is the backbone of the economic system of a country. In addition to providing food and raw material, agriculture also provides employment opportunities to a very large percentage of the population. But the farmers of our country who are responsible for cultivating crops for the people are struggling and facing many problems.

1.2 PURPOSE

The objective of this report is to propose a Smart Agriculture System based on IOT which will enable farmers to access live data of Temperature of their crop, Humidity and Soil moisture of their farms and weather condition of the area and control the motor or say the irrigation system of their land from a smartphone application. The purpose of this project is to enable farmers to monitor their farms and operate the motor while sitting at their homes or maybe while they are out somewhere and cannot come to the field.

CHAPTER 2

LITERATURE SURVEY

2.1 EXISTING PROBLEM

The Indian farmer is a living idol of India, they are the most hardworking farmers around the world & always busy, working hard for their crops, during day and night. India is called the land of farmers, as most of the people of the country are directly or indirectly involved in the agriculture sector. A farmer who grows crops has responsibility for making the land for harvesting the crops, sowing the seeds, irrigation and taking care of it. For this purpose, the farmers have to walk long distances every day to their farms and they need to stay in sun at their farms for the whole day and keep a check on the crops that the crops don't dry and water them when required. Because of this they cannot get involved in other works as they have to stay in farms and therefore depend only on farming for their source of income.

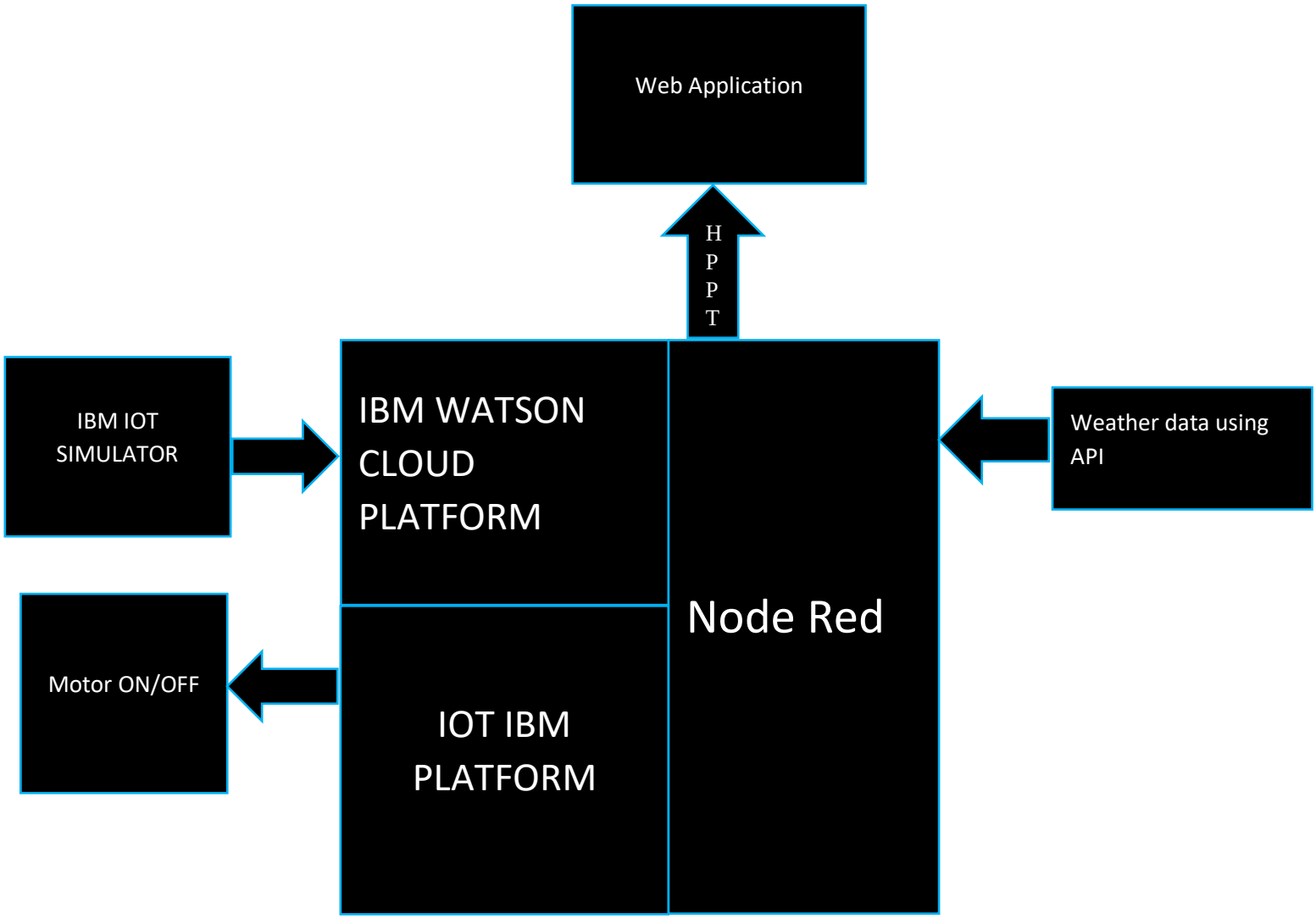
2.2 PROPOSED SOLUTION

The smart agriculture system using Internet of Things (IOT) is a project that has a collection of sensors installed in the farm and an application which can be used on any android smartphone. This application gives the live updates of the temperature, humidity and soil moisture of the farms as sensed by the installed sensors. Also, it gives the weather forecast of the area and using this information the farmers can analyse the state of the farm and the crops and according to this they can control the motor or say the irrigation system of the farm using the same application. This project thus allows the farms to stay at faraway places and still take care of their crops and farms.

CHAPTER 3

THEORITICAL ANALYSIS

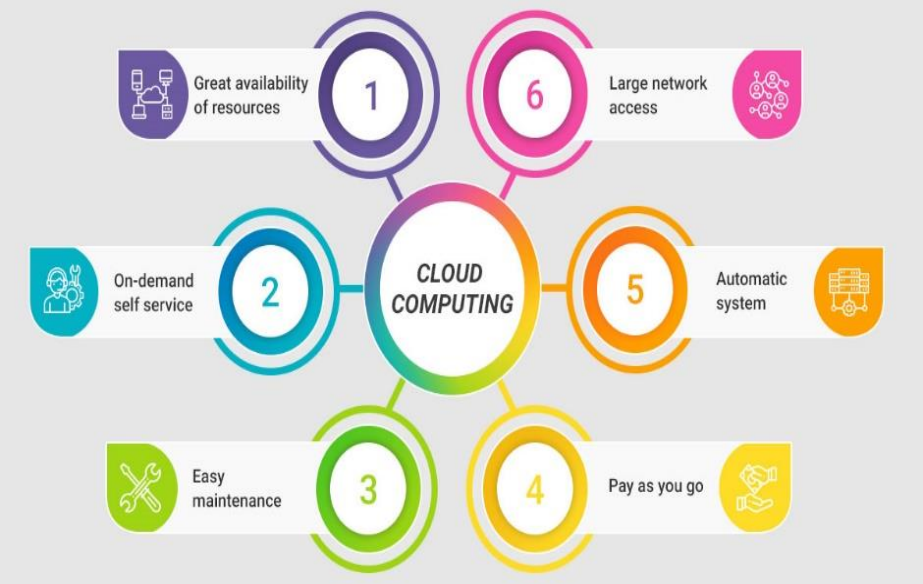
3.1 BLOCK DIAGRAM



3.2 SOFTWARE DESIGNING

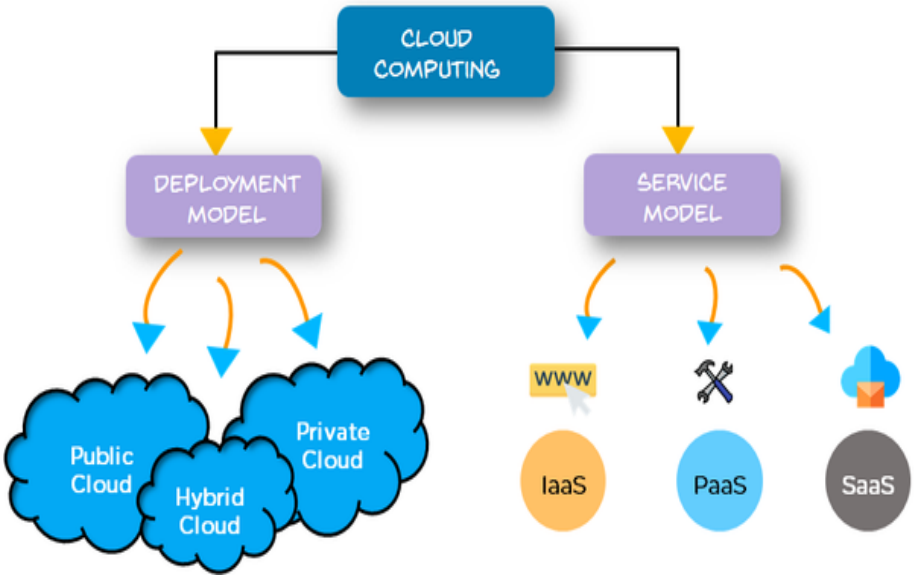
CLOUD COMPUTING

Cloud computing is a technology that enables the reusability of IT resources for storing large databases, developing and hosting complex applications, and expanding computational power and other services on demand without direct active management by the user. The term is generally used to describe data centres available to many users over the internet. Eliminating or reducing investments on large-scale infrastructure and software, coupled with the pay-per-use model, significantly reduces IT costs.



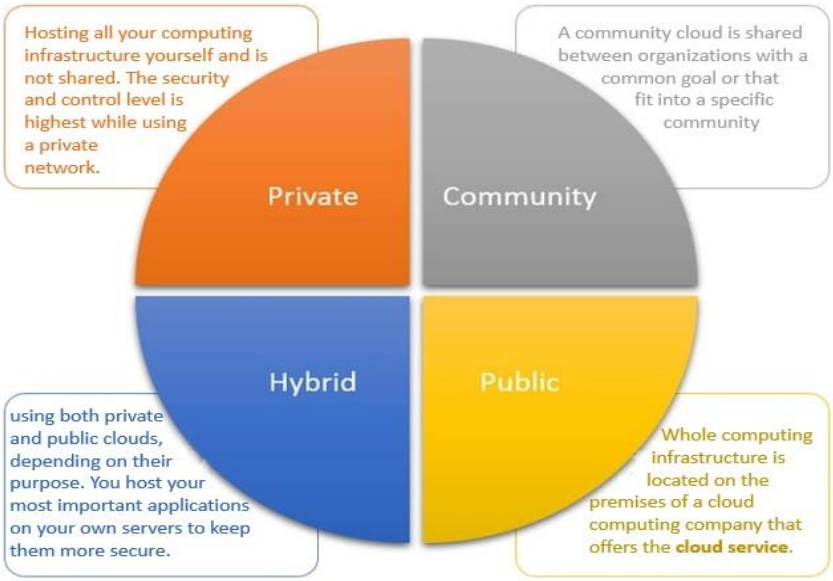
CLASSIFICATION:
The cloud computing can be classified on the basis of:

1. Cloud deployment model
2. Service offered



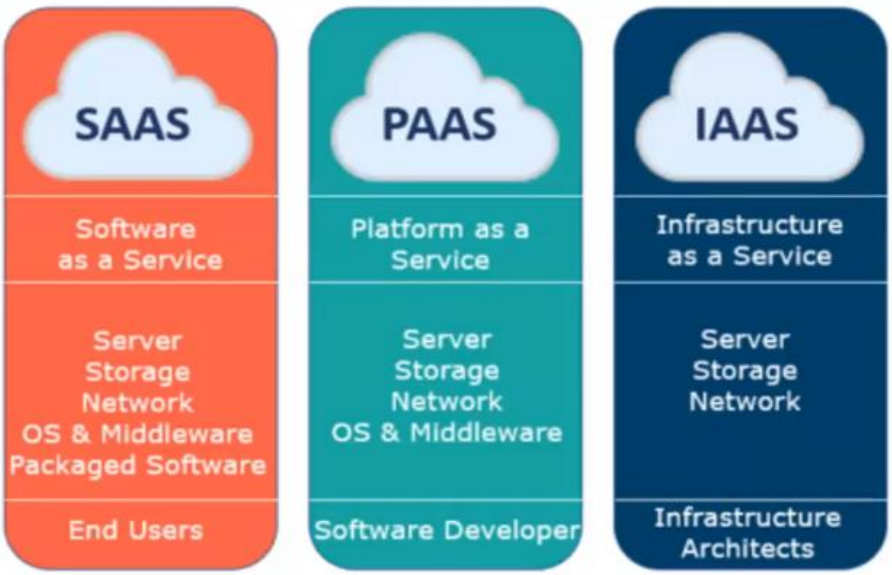
Based on cloud deployment model:

- Public,
- Private,
- Hybrid
- Community Cloud



Based on a service offered:

- **IAAS** (Infrastructure-as-a-Service)
- **PAAS**(Platform-as-a-Service)
- **SAAS**(Software-as-a-Service)



IBM CLOUD (formerly IBM Bluemix and IBM SoftLayer)

IBM Cloud is a suite of cloud computing services from IBM that offers both platform as a service (PAAS) and infrastructure as a service (IAAS).With IBM Cloud IaaS, organizations can deploy and access virtualized IT resources -- such as compute power, storage and networking over the internet. For compute, organizations can choose between bare-metal or virtual servers.

With IBM Cloud PAAS- which is based on the open source cloud platform Cloud Foundry - developers can use IBM services to create, manage, run and deploy various types of applications for the public cloud, as well as for local or on-premises environments. IBM Cloud supports various programming languages, such as Java, Node.js, PHP and Python and extends to support other languages.

IBM WATSON IOT PLATFORM

Watson is IBM's suite of enterprise-ready AI services, applications and tooling. IBM Watson IoT Platform is a managed, cloud-hosted service designed to make it simple to derive value from your IoT devices. Watson IoT Platform and its additional add on services - Blockchain service and analytic service - enable organizations to capture and explore data for devices, equipment, and machines, and discover insights that can drive better decision-making.

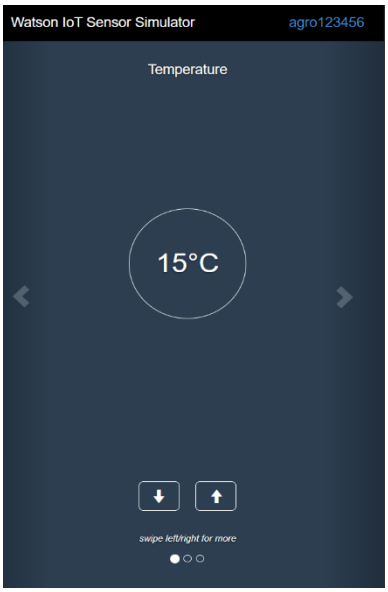
Features of IBM Watson IOT platform:

- Capture data in real time
  It processes IOT data instantly to help identify valuable insights related to device

behaviour and operations in the field and spot trends before they impact the bottom line.

- Optimize operation and resources
  It reduces operational expense by understanding your IOT devices to operate them more effectively and efficiently. It also visualizes your IOT data to better plan your operations and increase productivity.
- Increase revenue
  It uses improved business insight and bidirectional communication with the end user to introduce innovative new products and services.
- Analytics
  It enriches, augment and interact with your IOT data from the IOT platform with analytics using simplified data ingestion and curation.
- Blockchain service
  It increases trust and transparency by enabling IOT assets to validate provenance and events in a trusted, immutable ledger with the blockchain service add-on.

IBM SIMULATOR



IBM simulator allow you to explore circuits for future hardware, rapidly prototype circuits you are designing for real hardware, and characterize noise response and sensitivity of a circuit.

It allows to test and optimize any circuit and solutions on IBM's high-performance simulators locally or on the cloud and compare them to real quantum devices in a streamlined environment.

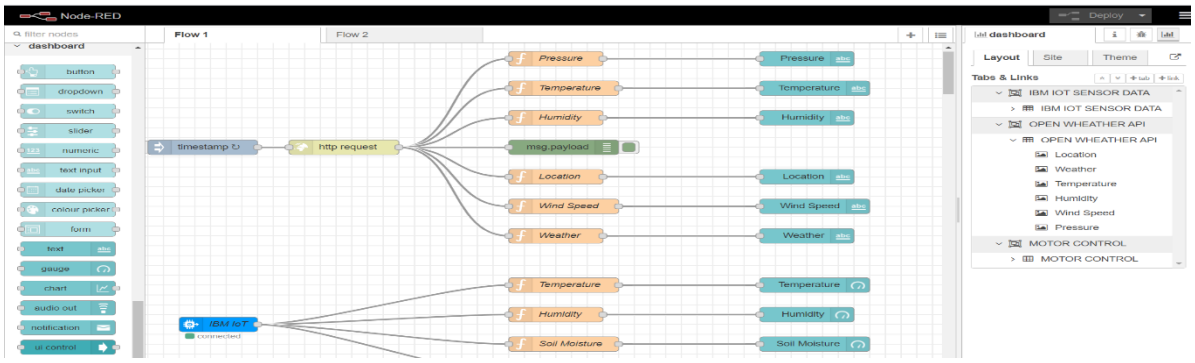
NODE-RED

Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways. It provides a browser-based editor that makes it easy to wire together flows using the wide range of nodes in the palette flows using the wide range of nodes in the palette that can be deployed to its runtime in a single-click.

JavaScript functions can be created within the editor using a rich text editor.

The light-weight runtime is built on Node.js, taking full advantage of its event-driven, non-blocking model. This makes it ideal to run at the edge of the network on low-cost hardware such as the Raspberry Pi as well as in the cloud. With over 225,000 modules in Node's package repository, it is easy to extend the range of palette nodes to add new capabilities.

The flows created in Node-RED are stored using JSON which can be easily imported and exported for sharing with others. An online flow library allows you to share your best flows with the world.



The **node-red dashboard** is an add-on module that lets you create live dashboards. It is an optional module and not installed by default.

CHAPTER 4

EXPERIMENTAL INVESTIGATIONS

Initialize instances in IBM cloud

- Create IBM cloud account.
- Sign in to your account.
  You are redirected to the IBM cloud dashboard.
- Get to the catalog.
- Create an instance for the Internet of Things platform.

Set up IBM Watson IOT Platform

- Launch the service.
- Go in the Devices Tab.
    1. Create a device type.
    2. Add your device.
    3. Generate the authentication token.
    4. Remember to note down all the information (Organization id, device type, device id, authentication method and authentication token) and keep it safe.
- Go in the Apps Tab.
    1. Generate API key and API authentication token.
    2. keep it safely noted.
- Go to Devices Tab
    1. Switch the device simulation to on mode.
    2. Create simulation and register the device.
- Go in the Boards Tab.
    1. Create a board.
    2. Add a card.

CONNECT IBM IOT SIMULATOR

- In google type IBM IOT sensor or type https://watson-iot-sensor-simulator.mybluemix.net/ in url.
- Enter device information to connect to IOT platform (the information of the device added in IBM cloud).

Node-RED

- Install node-red.
- Steps to open node-red
    1. Open command prompt
    2. Type node-red and then enter.
    3. Open browser and type **'http://localhost1800'** in the url.
- In the node-red install IBM IOT nodes and node-red dashboard.
- To open node-red dashboard type **'http://localhost1800/ui'** in the url.
- Using IBM IOT input node connect IBM IOT sensor to node-red to give Temperature, Humidity and soil moisture.

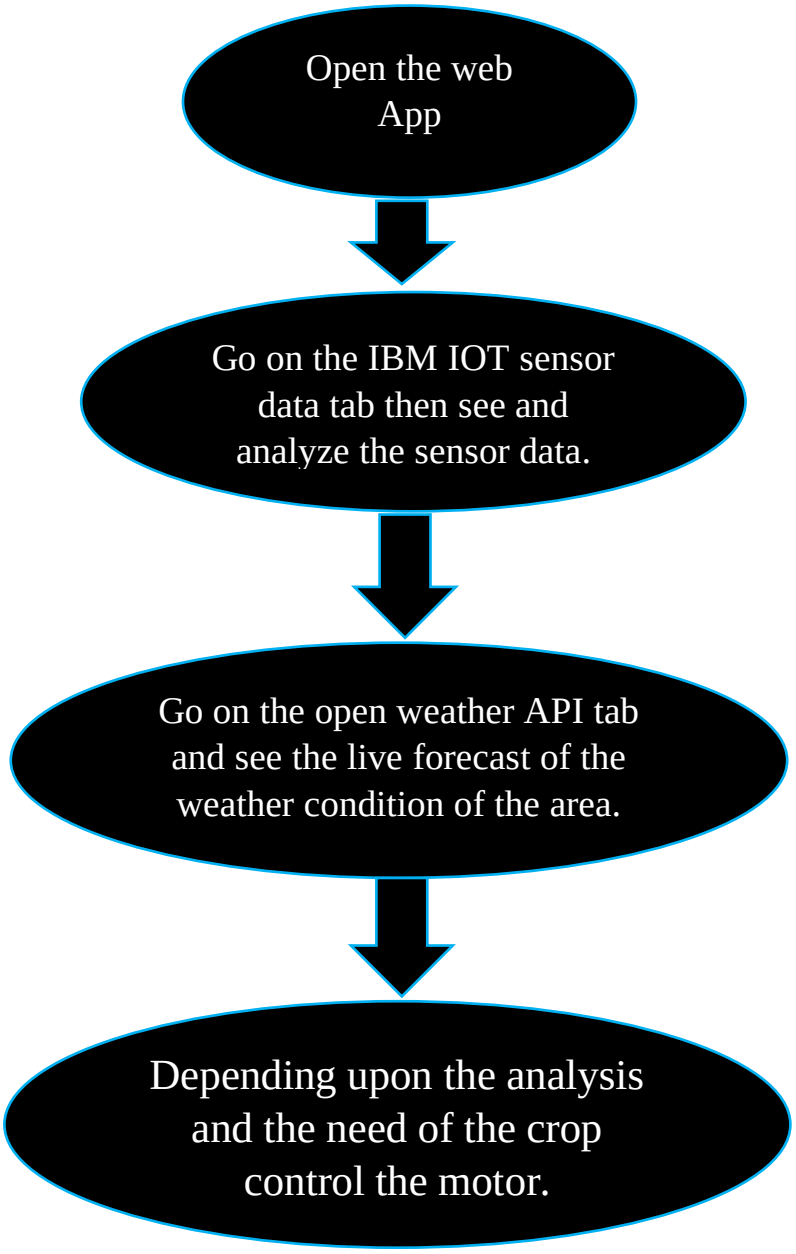
- Using IBM IOT output node to two button nodes for motor control i.e. motor on and motor off.
- Using HTTP request node connect open weather API with node-red to give live updates of the weather.
- All these nodes can be graphically viewed in node-red dashboard.

PYTHON

- Install python IDE.
- Write a python code to control the motor buttons.

CHAPTER 5

FLOWCHART



CHAPTER 6

RESULT

The purpose of this **SMART AGRICULTURE SYSTEM BASED ON IOT** was to create a system using sensors like temperature sensor, humidity sensor and soil moisture sensor and to connect this to a common platform where they can access the live weather forecast and control irrigation system. An application for the farmers using which they can control the irrigation (or motor) system of their land from any place around the world by analysing the data of sensor and weather is successfully created.

CHAPTER 7

ADVANTAGES & DISADVANTAGES

Advantages

1. It allows farmers to maximize yields using minimum resources such as water, fertilizers, seeds etc.

2. Smartphone operated pumps save cost of electricity.

3. These improves data collection process and helps in wireless monitoring and control.

4. It is cost effective method.

Disadvantages

1. The smart agriculture needs availability of internet continuously. Rural part of most of the developing countries do not fulfil this requirement. Moreover, internet connection is slower.

2. The smart agriculture-based equipment requires farmers to understand and learn the use of technology. This is major challenge in adopting smart agriculture at large scale across the countries.

3. Small farmers may not be able to afford this technology.

CHAPTER 8

APPLICATIONS

In Smart agriculture system based on IOT, the system is built for monitoring the crop field with the help of sensors (humidity, temperature, soil moisture) and controlling the irrigation system. The farmers can monitor the field conditions from anywhere. Smart agriculture system based on IOT is highly efficient when compared with the conventional approach.

The applications of IoT-based smart farming not only target conventional, large farming operations, but could also be new levers to uplift other growing or common trends in agricultural like organic farming, family farming (complex or small spaces, particular cattle and/or cultures, preservation of particular or high-quality varieties, etc.), and enhance highly transparent farming.

In terms of environmental issues, IoT-based smart farming can provide great benefits including more efficient water usage, or optimization of inputs and treatments.

CHAPTER 9

CONCLUSION

IoT enabled agriculture has helped implement modern technological solutions to time tested knowledge. This has helped bridge the gap between production and quality and quantity yield. Data Ingested by obtaining and importing information from the multiple sensors for real time use or storage in a database ensures swift action and less damage to the crops. Large landowners and small farmers must understand the potential of IoT in agriculture by installing smart technologies to increase competitiveness and sustainability in their productions. With the population growing rapidly, the demand can be successfully met if the farmers implement agricultural IoT solutions in a prosperous manner.

CHAPTER 10

FUTURE SCOPE

1. Precision agriculture

Precision agriculture can be thought of as anything that makes farming practice more controlled and accurate when it comes to raising livestock and growing crops. In this approach of farm management, a key component is the use of IT and various items like sensors, control systems, robotics, autonomous vehicles, automated hardware, variable rate technology, and so on.

2. Agricultural Drones

Technology has changed over time and agricultural drones are a very good example of this. Today, agriculture is one of the major industries to incorporate drones. Drones are being used in agriculture in order to enhance various agricultural practices. The ways ground-based and aerial-based drones are being used in agriculture are crop health assessment, irrigation, crop monitoring, crop spraying, planting, and soil and field analysis.

3. Smart Greenhouses

Greenhouse farming is a methodology that helps in enhancing the yield of vegetables, fruits, crops, etc. Greenhouses control the environmental parameters through manual intervention or a proportional control mechanism. A smart greenhouse can be designed with the help of IoT; this design intelligently monitors as well as controls the climate, eliminating the need for manual intervention.

4. Livestock Monitoring

Large farm owners can utilize wireless IoT applications to collect data regarding the location, well-being, and health of their cattle. This information helps them in identifying animals that are sick so they can be separated from the herd, thereby preventing the spread of disease. It also lowers labour costs as ranchers can locate their cattle with the help of IoT based sensors.

CHAPTER 11

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