REVA UNIVERSITY
Bengaluru, India

A Mini Project Report on

"Smart Garden"

Submitted

In partial fulfilment of the requirement for the VI Semester of Bachelor of Technology in Computer Science and Engineering during the academic year 2018-19

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CERTIFICATE

This is to certify that the mini project entitled "Smart Garden" is a bonafide work carried out by **Aishwarya AV, Aishwarya Gajanana Naik, Akshita Srikanth, A.Sai Vinutha** bearing **R16CS015, R16CS016, R16CS032, R16CS035** respectively in partial fulfilment of 6th semester of Computer Science and Engineering program of Bachelor of Technology, REVA University during the academic year 2018-19. It is certified that all the corrections/suggestions indicated for internal assessment have been incorporated in the report deposited in the school library. The mini-project report has been approved as it satisfies the academic requirements in respect of mini-project prescribed for the 6th semester of CSE program.

Signature of the Guide

(Surendra Babu KN)

Signature of the Director

(Dr. Sunilkumar S. Manvi)

Signature of External

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ABSTRACT

We wanted to start gardening, but we knew we wouldn't keep up the regular schedule of watering the plants and making sure that they remain healthy. So, we recruited a micro-controller and suite of sensors to help with this tasks. Watering is the most important cultural practice and most labor intensive task in daily gardening operation. Watering systems ease the burden of getting water to plants when they need it. Knowing when and how much to water is two important aspects of watering process.Smart Garden is a plant environmental monitoring system. It monitors the soil moisture, air temperature, and air humidity of your plant(s) and automatically waters the plant based on the data received by sensors.The user only requires to plug in the system and the plants will be watered with respect to its soil moisture , weather temperature , humidity and air quality .Thing-speak is used to view those sensor data from remote location.

CHAPTER 1

INTRODUCTION

Automation rules the world nowadays. It is a technique of using computers or mobile phones in monitoring and controlling the simple parameters of day to day life. The standard of our life will be nourished by the practice of using automation for simple things. Using the concept of IOT we make sensors to communicate with each other which are powerful in automation. The important aspect of this prototype is that it saves cost and ensures safety. When people try to make plantings and set up their own garden, they were cautious in maintenance at only in their beginning stages. As days go on due to lack of maintenance the plants get destroyed. This prototype will help people to automatically monitor the parameters and ensures maintenance of the garden. It plays a vital role and serves as a good companion for plants. IOT provides solutions for various problems and it allows things to be sensed or controlled remotely in network infrastructure.

IoT (Internet of Things) is often referred to as Internet of Objects, since IoT will transform anything-including ourselves. This bold statement is given by considering the impact of internet on education, business, communication, science and humanity, etc.
Smart Garden is a plant environmental monitoring system. It monitors the soil moisture, air temperature, and air humidity of your plant(s) and automatically waters the plant based on the data received by sensors. Thing-speak is used to view those sensor data from remote location.

1.1 MOTIVATION

The motivation for this project is drawn from various perspectives , which includes the gardeners working in the garden who need to regularly monitor the plants in the garden and require to water the plants with accurate amount . The manual labor work of watering each plant is greatly reduced by implementing an automatic watering system with respect to environmental conditions .

While maintaining a home garden , there will occur situations when due to busy day-to-day schedule we might forget to water the plants on time. In order to avoid such situations we decided to build a automatic watering system which is smart .

Plants require water only when it lacks moisture content , we might extensively water the plants which might cause water overflow and lead to rotting of plant roots , therefore our smart watering system with the help of soil moisture sensor counters this problem.

Plants play a vital role in our lives . In order to have healthy growing plants around us we need to nurture them and provide with adequate nutrients.

Furthermore we can have a digital monitoring system of the various environmental conditions of the garden which can be viewed from anywhere.

1.2 OBJECTIVES

The objectives of our smart garden are crisp and simple.Listed below are the objectives of our project.

- To monitor the soil moisture content in the pot.
- To detect the humidity of the air in the space.
- To verify the quality of air in the space.
- To water the plants timely with respect to above factors
- To give online update of your garden.
- Continuously monitoring the sensors.
- To reduce human intervention.
- Save water and money.
- Save your customers money.
- Make maintaining yard easy and convenient.
- Minimize the infrastructure to store and carry water.
- Protect the water resources for future generations.
- Lowered operation costs.

This leads to higher comfortability, water using efficiency and less human supervision effort. This project proposes a cloud based Internet of Things (IoT) smart garden monitoring and irrigation system using Arduino Uno. The watering requirement for a plant can be adjusted by monitoring the soil moisture.

CHAPTER 2

LITERATURE SURVEY

Primary investigation is carried out under the following stages, such as Understanding the existing approaches, Understanding the requirements, developing an abstract for the system.

“Agro-Sense: Precision Agriculture using Sensor-based Wireless Mesh Networks”, In this paper, soil moisture sensor, temperature and humidity sensors placed in root zone of plant and transmit data to android application. Threshold value of soil moisture sensor that was programmed into a microcontroller to control water quantity. Temperature, humidity and soil moisture values are displayed on the android application. This paper on **"Automatic Irrigation System on Sensing Soil Moisture Content"** is intended to create an automated irrigation mechanism which turns the pumping motor ON and OFF on detecting the dampness content of the earth. In this paper only soil moisture value is considered but proposed project provided extension to this existed project by adding temperature and humidity values.

“ Remote Monitoring in Agricultural Greenhouse Using Wireless Sensor and Short Message Service (SMS)”.In this paper they are sending data via sms but proposed system sends the values to mobile application. This proposed paper is arduino based remote irrigation system developed for the agricultural plantation, which is placed at the remote location and required water provides for plantation when the humidity of the soil goes below the set-point value. But in this we did not aware about the soil moisture level so to overcome this drawback proposed system included with extra feature soil moisture value and temperature value which displayed on the farmer mobile application .

“Irrigation Control System Using Android and GSM for Efficient Use of Water and Power” this system made use of GSM to control the system which may cost more so to overcome that proposed system used arduino yun board which already consist of in build wifi module . “Microcontroller based Controlled Irrigation System for Plantation” In this paper old generation with lesser memory microcontroller is used to control the system but proposed system made use of arduino yun board which is user friendly and it helps to dump the programs easily. “A wireless application of drip irrigation automation supported

by soil moisture sensors" in this paper irrigation is carried out using soil moisture values but extend to this proposed system displays temperature and humidity values. By referring all above papers it is found that no such systems are existed with all integrated features but proposed system includes these all features such as displaying temperature, humidity and soil moisture values and also automatic switching on and off of motor by considering soil moisture values.

"Automated Irrigation System Using a Wireless Sensor Network and GPRS Module",IEEE .The paper aims at optimizing water use for agricultural crops. An algorithm was developed with threshold values of temperature and soil moisture that was programmed into a microcontroller-based gateway to control water quantity. The system was powered by photovoltaic panels and had a duplex communication link based on a cellular-Internet interface that allowed for data inspection and irrigation scheduling to be programmed through a web page. The issue is that the investment in electric power supply would be expensive.

"Real- Time Automation and Monitoring System for Modernized Agriculture", It reviews the state of art wireless sensor technology in agriculture.Based on the value of soil moisture sensor the water sprinkler works during the period of water scarcity. Once the field is sprinkled with adequate water, the water sprinkler is switched off. Hereby water can be conserved. Also the value of soil pH sensor is sent to the the farmer via SMS using GSM modem.The issue is that it provides only precision values that is not accurate and is not cost efficient.

CHAPTER 3
SYSTEM DESIGN AND ANALYSIS

Design of a system explains temperature, humidity and soil moisture values using flow chart.

TEMPERATURE AND HUMIDITY SENSOR

The DHT11 is a basic, digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin(no analog pins needed). Humidity sensors are used for measuring moisture content in the atmosphere. Then current temperature, humidity values are send to the microcontroller, those values will display in the users android app. This below Figure 3.1 shows the sensed values of temperature and humidity.

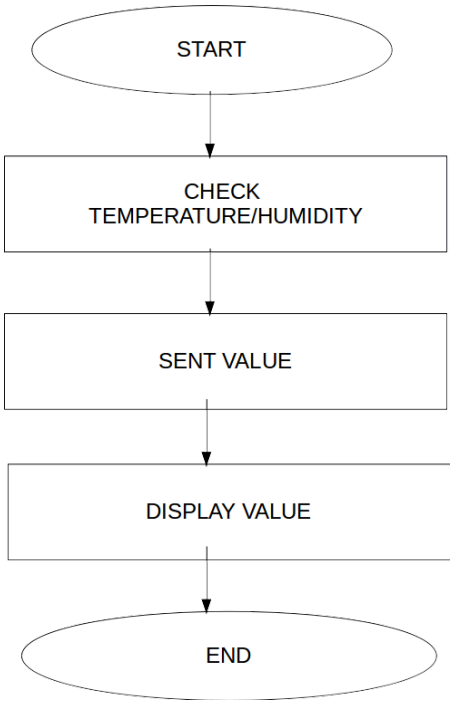

FIGURE 3.1 Flowchart for temperature/Humidity sensor

SOIL MOISTURE SENSOR

Soil moisture sensors measure the water content in soil. Moisture in the soil is an important component in the atmospheric water cycle.Sensor module outputs a high level of resistance when the soil moisture is low. It has both digital and analog outputs. Digital

output is simple to use, but it is not as accurate as analog output based on moisture level motor gets turn on/off automatically.

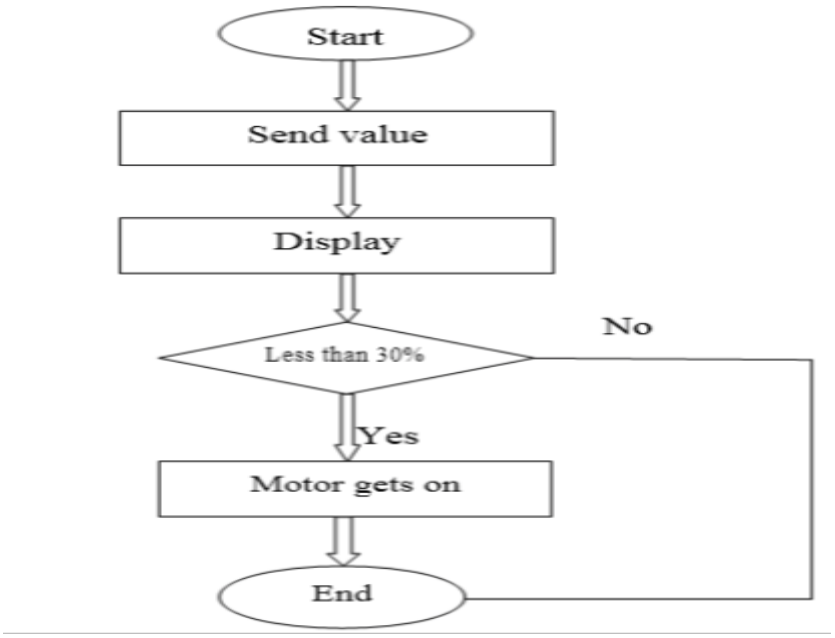

FIGURE 3.2 Flowchart for Soil moisture sensor

This below Figure 3.3 is a overall block diagram of arduino based smart garden system which consist of three sensors which are connected to controller and sensed values from these sensors are send to 16x2 LCD display and thingspeak .

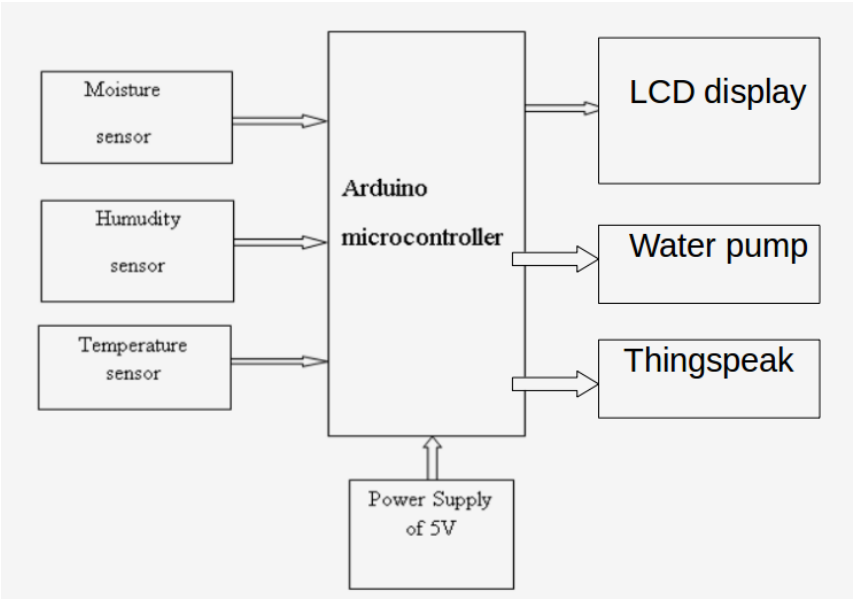

FIGURE 3.3 Block diagram of Smart Garden

CHAPTER 4

SYSTEM REQUIREMENTS

4.1 SOFTWARE REQUIREMENTS

1. **Arduino IDE :** Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.
2. **Thingspeak :** According to its developers, "ThingSpeak is an open source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP protocol over the Internet or via a Local Area Network. ThingSpeak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates". ThingSpeak was originally launched by ioBridge in 2010 as a service in support of IoT applications. ThingSpeak has integrated support from the numerical computing software Matlab from Math works. Allowing ThingSpeak users to analyze and visualize uploaded data using Matlab without requiring the purchase of a Matlab license from Math works. ThingSpeak has a close relationship with Math works. In fact, all of the ThingSpeak documentation is incorporated into the Math works' Matlab documentation site and even enabling registered Math works user accounts as valid login credentials on the ThingSpeak website. The terms of service and privacy policy of ThingSpeak.com are between the agreeing user and Math works.

4.2 HARDWARE REQUIREMENTS

1. **Arduino UNO Board** : The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.
2. **DHT11 Temperature and Humidity Sensor :**The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed).
3. **Soil Moisture sensor**:Soil moisture sensors typically refer to sensors that estimate volumetric water content.
4. **ESP ESP8266 ESP-01 :** The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.
5. **Rotary potentiometer :** Rotary potentiometer (the most common type) vary their resistive value as a result of an angular movement. Rotating a knob or dial attached to the shaft causes the internal wiper to sweep around a curved resistive element. The most common use of a rotary potentiometer is the volume-control pot.
6. **Jumper wires**
7. **Resistor 221 ohm**
8. **Resistor 100 ohm**
9. **Breadboard**
10. **Adafruit Standard LCD 16x2**
11. **IN4007 – High voltage, high current rated diode**
12. **LED**
13. **DC MOTOR**

CHAPTER 5

METHODOLOGY

1.ELECTRONIC DESIGN

The hardware components are connected as per the circuit below .

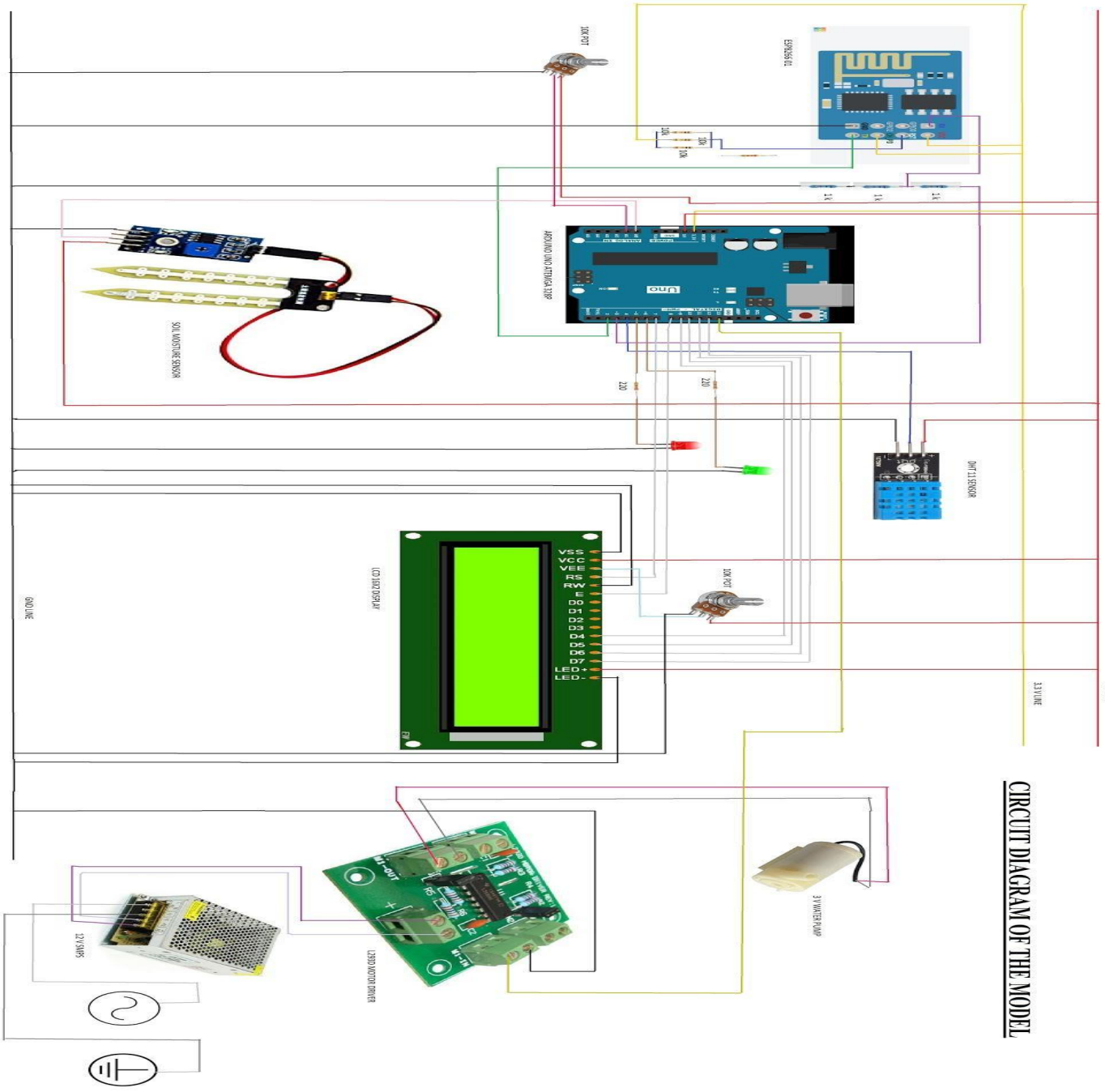

Figure 4.1 : Circuit diagram

CHAPTER 6

EXPERIMENTAL RESULTS

1.EXPERIMENTAL SETUP

Figure 6.1 : Experimental setup

2.VIEW ON THINGSPEAK

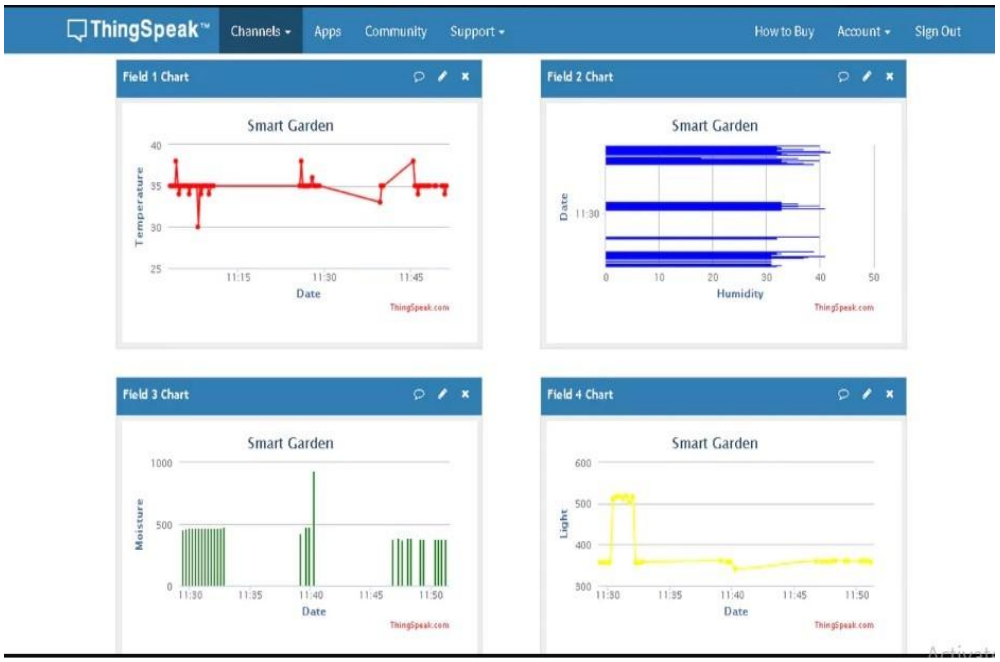

Figure 6.2:Live data on Thingspeak

CHAPTER -7

APPLICATIONS

With the adoption of IoT in various areas like Industry, Homes and even Cities, huge potential is seen to make everything Intelligent and Smart. Even the Agricultural sector is also adopting IoT technology these days and this in turn has led to the development of "AGRICULTURAL Internet of Things (IoT)".The system is designed to sense soil moisture, amount of light falling on the plants and water flow rate. When the moisture content in the soil is too low, the system will give command to start a pump and water the soil.

1. Indoor gardening.
2. Automatic watering of plants.
3. Online updates of garden.
4. Easy and schematic gardening.
5. Can be implemented at schools, offices, malls,apartments,etc.

6. Can be used to replace manual watering of plants.
7. Crop Water Management
8. Precision Agriculture
9. Integrated Pest Management or Control (IPM/C)

CONCLUSION

Thus the system is useful to monitor the parameters for gardening such as temperature, humidity , moisture, leaf growth, spray the water and pesticides through the motor pump via IOT module. The system reduces the manual work, man power. This setup was carried out using Arduino UNO, Temperature and Humidity sensor, soil moisture sensor. The Thing Speak page can be developed to control the system through the mobile. Damage caused by predators is reduced and also be used to increase the productivity. In Future, new hardware, like the corn-tending robot, is making strides by pairing Data-collecting software with robotics to fertilize the corn, apply seed cover-crops, And collect information in order to maximize yields and minimize wastes. IoT sensors capable of providing farmers with information about crop yields, pest infestation and soil nutrition are invaluable to production and offer the precise data.

With more advancement in the field of IoT expected in the coming years, these systems can be more efficient, much faster and less costlier. In the Future, this system can be made as an intelligent system, where in the system predicts user actions, rainfall pattern,

time to harvest, animal intruder in the field and communicating the information through advanced technology like IoMT can be implemented so that agricultural system can be made independent of human operation and in turn quality and huge quantity yield can be obtained.

FUTURE ENHANCEMENT

In future the system can be included with more number of sensors like metal and sound sensors in order to make the agricultural field intrusion free. In future the same system can also be developed to sense the amount of nutrients required and to supply the same in correct quantities. A detailed study of effect of foliage surrounding plants on scattering of the wireless signals can be carried out so as to decrease the number of extra nodes.

Future work would be focused more on increasing sensors on this stick to fetch more data especially with regard to Pest Control and by also integrating GPS module in this IoT Stick to enhance this Agriculture IoT Technology to full-fledged Agriculture Precision ready product.

A new method, an apparatus and a computer program product for wireless sensor network are provided for displaying environmental parameters useful for agriculture in rural area.

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