AUTOMATED MONITORING AND CONTROLLING GREENHOUSE SYSTEM

[1]Andhare Megha, [2]Chitte Aishwarya, [3]Dange pournima , [4]Prof. Khot S.T. Guide
Department Of Electronics And Telecommunication Engineering
Bharati Vidyapeeth's College Of Engineering For Women, Pune-43
Savitribai Phule Pune University, Pune

ABSTRACT

Greenhouses are climate-controlled structures with walls and roof specially designed for off season growing of plants. Most greenhouse systems use manual systems for monitoring the temperature and humidity which can cause discomfort to the worker as they are bound to visit the greenhouse every day and manually control them. Also, a lot of problems can occur as it affects the production rate because the temperature and humidity must be constantly monitored to ensure the good yield of the plants. Internet of Things is one of the latest advances in Information and Communication Technologies, providing global connectivity and management of sensors, devices, users with information. So, the combination of IOT and embedded technology has helped in bringing solutions to many of the existing practical problems over the years. The sensors used here are YL69 moisture sensor and DHT11 (Temperature & Humidity sensor). From the data received, Raspberry PI3 automatically controls Moisture, Temperature, Humidity efficiently inside the greenhouse by actuating an irrigating pipe, cooling fan, and sliding windows respectively according to the required conditions of the crops to achieve maximum growth and yield. The recorded temperature and humidity are stored in a cloud Database (Thing Speak), and the results are displayed in a web page, from where the user can view them directly.

Introduction

The following project presents the Automated Monitoring and controlling greenhouse system. The greenhouse monitoring and controlling can be done by using various technologies. These technologies are used to yield higher growth of plants and production of new plants. This is our main basic objective of our project. In this project there are three sensors we are used temperature sensor, humidity sensor, soil moisture sensor. These three sensors are used to check temperature, humidity, soil moisture. this project is automated control system with latest electronic technology. In this project we are using AT MEGA 328P microcontroller because of the automatic working of this project it reduces the manpower. If any condition crosses certain limits,a message will be sent to the registered number through GSM module. The microcontroller will automatically turn on the motor if the soil moisture is less than value, The prototype was tested under various combination of inputs in our laboratory and the experimental results were found as expected. Agriculture is a major part of our lives as human beings. A lot of research has been carried out to be able to develop a monitored and controlled greenhouse system/environment that will help in solving the main problems relating to agriculture which is to enable the increase in the crops being cultivated all year round in the comfort of a small space like the home, and also to reduce human interaction in a small-scale greenhouse environment. So accordingly, an automated greenhouse monitoring and control system was proposed for the sole purpose stated above. The methodology used in building the greenhouse monitoring and control system is a wired connection.

The system was built using several connection wires, sensors, LCD, a cooling system, a power bank, LEDs, LDRs, Arduino board among a few other components. The result obtained was a fully functioning system that was set to

monitor the greenhouse environment.

Keywords—Greenhouse, Monitoring and Control, Arduino.

OBJECTIVES.

The objectives of the project are

1) To develop a remote controlling and monitoring system for greenhouse applications.

2) To understand the working principle of typical greenhouse control system and its main parameters.

3) To provide an effective solution to the existence problem related to the greenhouse control system technology by applying tools and techniques of problem solving.

4) To apply tuning methods to the controller and analyze the results to come out with the best controller's configuration.

5) To monitor all agriculture parameter on mobile using IOT. 6)To turn on/off Automatic agriculture pump using.

7)To save water wastage.

METHODOLOGY

Model Description

1. Temperature and Humidity sensor

DHT11 is a Humidity and Temperature Sensor, which generates calibrated digital output. DHT11 can be interface with any microcontroller like Arduino, Raspberry Pi, etc. and get instantaneous results. DHT11 is a low-cost humidity and temperature sensor which provides high reliability and long-term stability.

It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and outputs a digital signal on the data pin (no analog input pins needed). It's very simple to use, and libraries and sample codes are available for Arduino and Raspberry Pi.

This module makes is easy to connect the DHT11 sensor to an Arduino or microcontroller as includes the pull up resistor required to use the sensor. Only three connections are required to be made to use the sensor - Vcc, Gnd and Output.

It has high reliability and excellent long-term stability, thanks to the exclusive digital signal acquisition technique and temperature & humidity sensing technology.

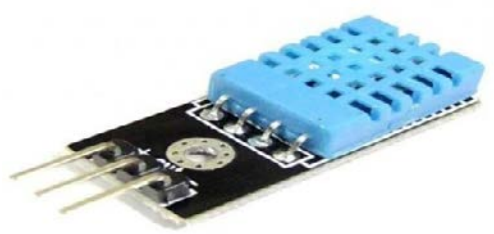


Figure 1.1 Temperature and Humidity Sensor

2. Soil Moisture Sensor:

Soil Moisture Sensor measures the volumetric water content in soil. The direct measurement of free-soil moisture requires removing, drying, and weighing of a sample. Soil Moisture Sensor measures the volumetric water content indirectly by using some other properties of the soil. Such as electric resistance, dielectric constant, or interactions with neutrons, as a proxy for the moisture content.

The connection between the purposeful property and soil doused state must be balanced and may move subordinate upon natural components, for instance, soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the earth suddenness and is used for remote seeing in hydrology and creating. Steady test instruments can be used by farmers or plant stars. Soil wetness sensors generally induce sensors that check volumetric water content.

Another class of sensors measure another property of dampness in soils called water potential; these sensors are for the most part implied as soil water potential sensors. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity.

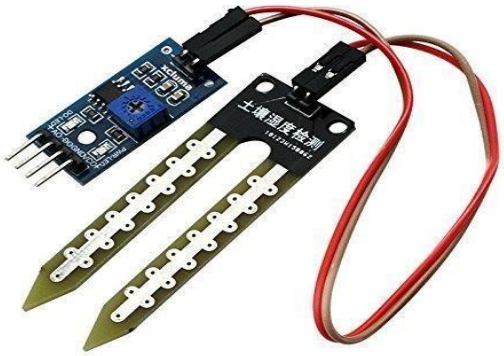


Figure 1.2 Soil Moisture Sensor

3. Relay: -

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations.

Relay is an electromechanical device that uses an electric current to open or close the contact of a switch. The single channel relay module is much more than just a plain relay, it comprises of components that make switching and connection easier and act as indicators to show if the module is powered and id the relay is active or not.

It is having following features:
In high voltage and power system, the higher current is controlled by the lower one. Wide scope of controllable Voltage.
Have the capacity to manage high load current, that could attain 240V, 10A with Normally-open (NO) and normally closed (NC)contacts.

Board has a power indicator (Red LED) and relay status (Green LED) for debugging.

Figure 1.3 Relay

4. Pump:

It is a micro submersible pump which works on dc 3-6v with cost efficient and portable. It can take around 120 liters for every hour with extremely low current utilization. Water level should be higher as if the motor is used without water, it can harm the parts of this device due to overheating. There are many applications such as controlled fountain water flow, hydroponic systems, controlled garden watering system.

Figure 1.4 Water Pump

5. Three Terminal Voltage Regulator:

A three terminal voltage regulator is a regulator in which the output voltage is set at some predetermined value. Such regulators do not require an external feedback connection. Hence, only three terminals are required for device of such types, input (Vin) output (Vo) and a ground terminal. Since the regulator operates at a preset output voltage the current limiting resistor is also internal to the device. The main advantages of such regulators are the simplicity of connections to the external circuit and the minimum of external components. Fig. Shows the basic circuit configuration of the three terminal voltage regulators. Although, the three terminal regulators offer only fixed output voltages, there are wide variety of voltages available, both positive and negative. The output current ranges from 100 mA to 3

Figure 1.5 Three terminal voltage regulator

6. LCD Display:

This display contains two internal byte wise resisters, one for the commands (RS=0) and second for character to be displayed (RS=1). It also contains a user programmed RAM area (the character RAM) that can be programmed to generate any desired character that can form using a dot matrix. To distinguish between these two data areas, the hex command byte 80H will be used to signify that display RAM address 00H is chosen. Port 1 is used to furnish the command or data byte, and ports 3.2 to 3.4

furnish register select and read/write levels. The display takes varying.

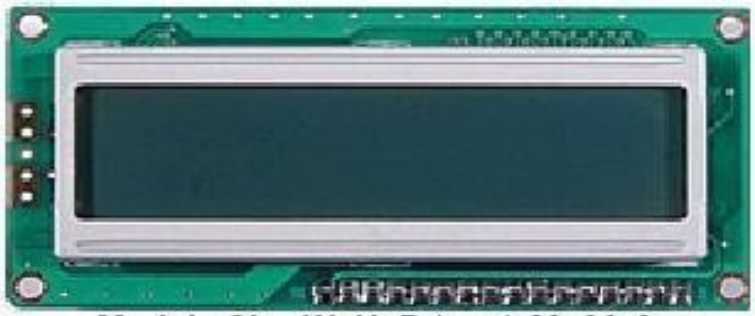
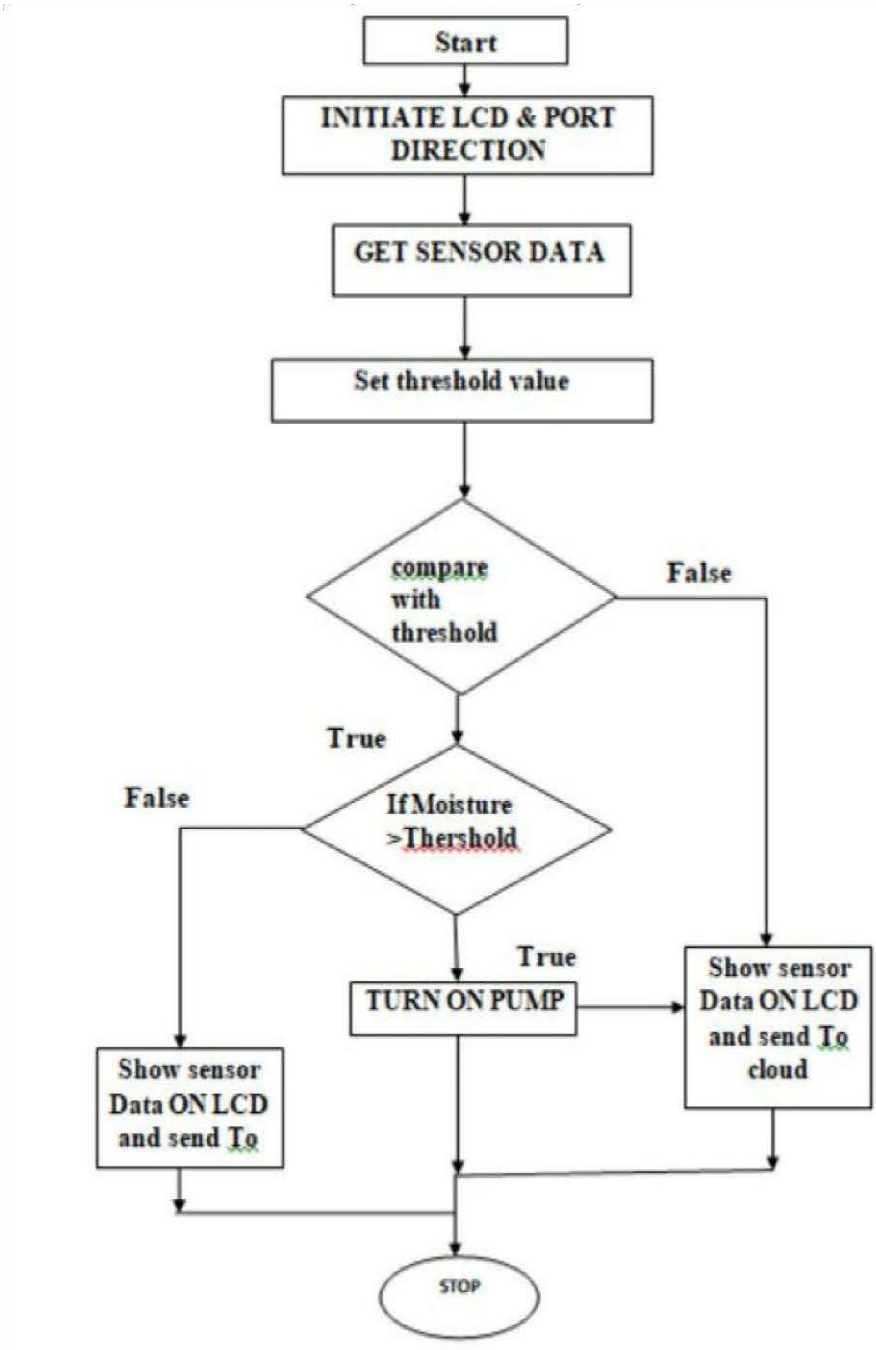
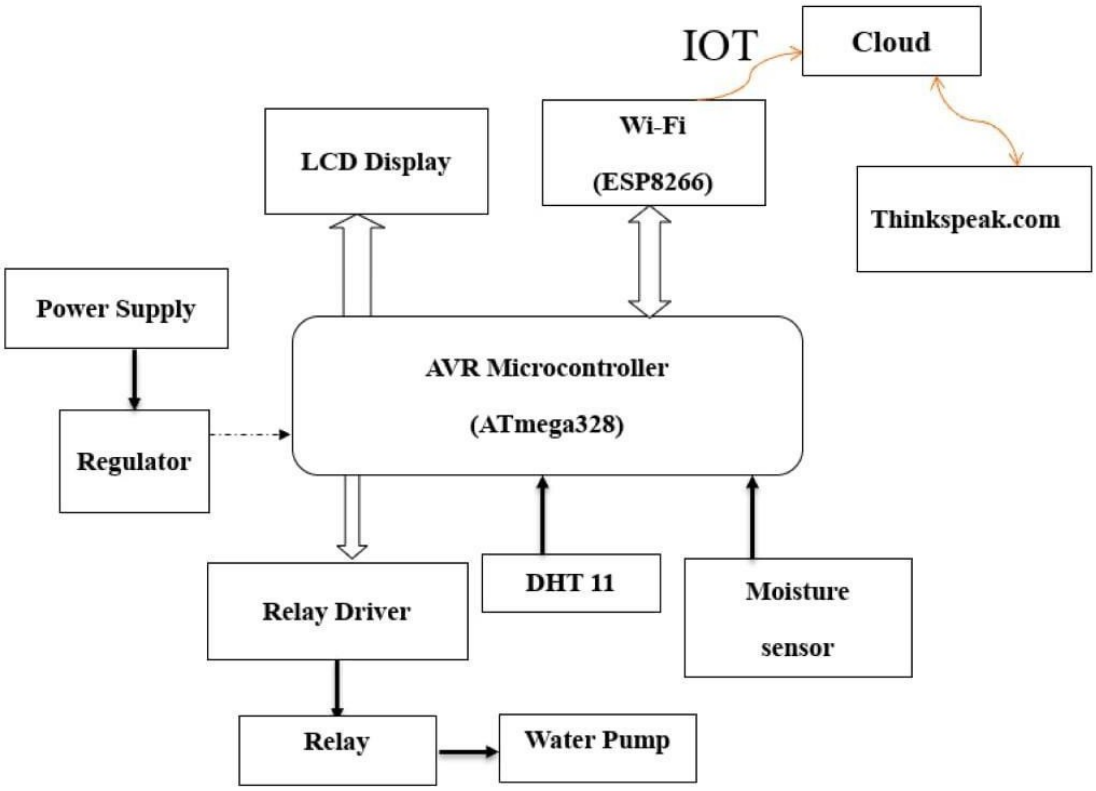


Figure 1.6 LCD Display

Flowchart



BLOCK DIAGRAM:



IOT and Arduino based Greenhouse Environment Monitoring and Controlling project use four sensors to detect the Temperature, Light, Humidity and soli moisture in the greenhouse.Temperature Sensor is used to detect the temperature inside the greenhouse. Reading from the sensor is sent to the microcontroller is connected to different relays. One of the relays is connected to a blower.if the temperature is above or below the threshold value, the microcontroller would send signals to turn ON the relay which would, in real-time, be a shade that would reduce the of sunlight. For demo purpose we have connected a DC motor to replicate a shade. Similarly,the humidity value and the soil moisture sensor(two probes dug in the soil).if the humidity value detected by the sensor is above the threshold value OR if the soil moisture reduced, the microcontroller would turn on the blower to decrease the humidity and will open the water outlet to increase the moisture in the soil.

At the same time, data regarding these parameters are sent to the IOT module,The data sent to the IOT is sent at regular intervals irrespective of any threshold mismatch found.

ESP8266 is a chip used for connecting microcontroller to the wi-fi network and make TCP/IP connections and send data. Data,which is sensed by these sensors, is then sent to the IOT. The pre-requiste for this project is that the wi-fi module should be connected to a wi-fi zone or a hotspot.

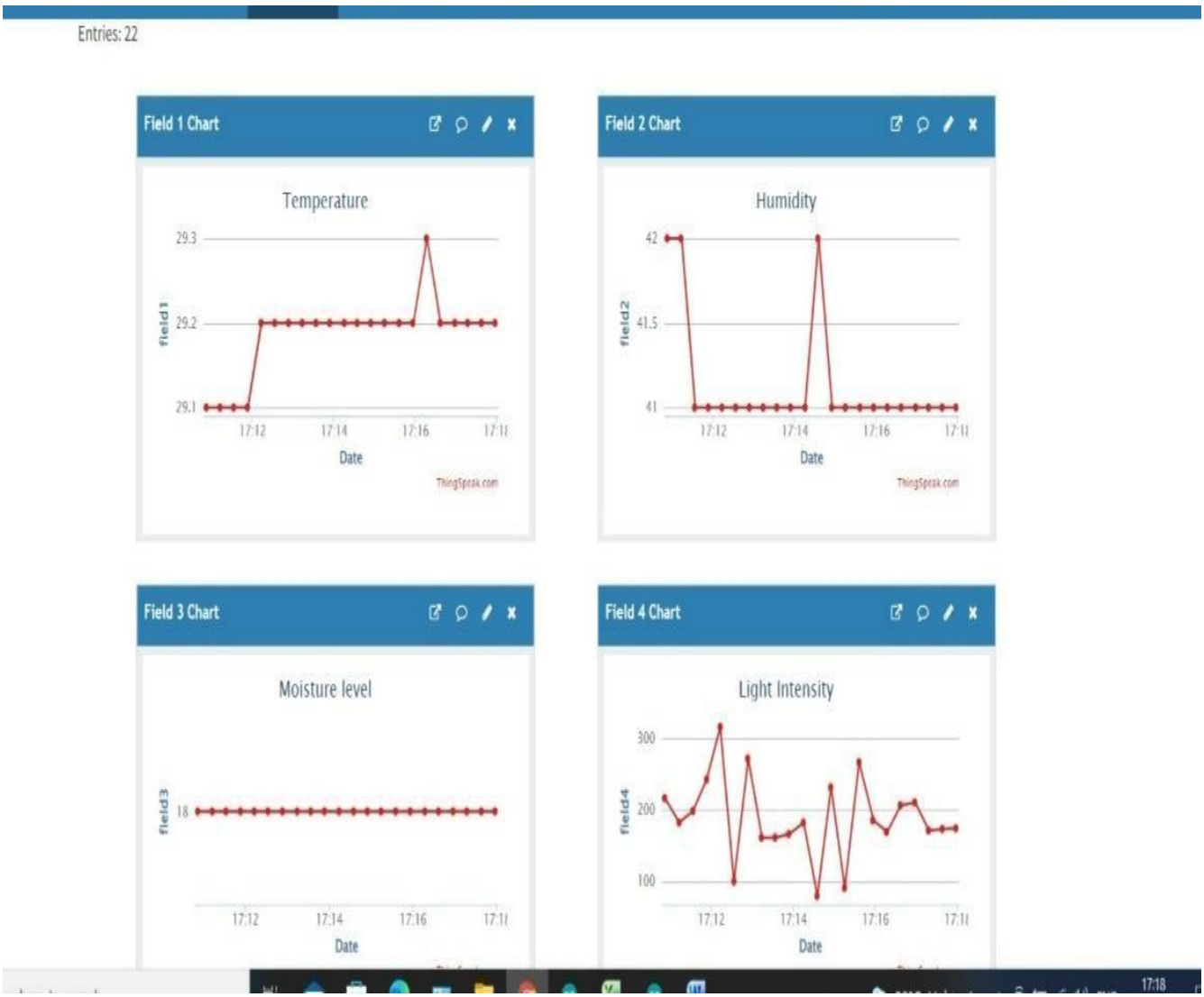
Algorithm:

1) Start
2) Initiate ports and Sensor.
3) Read sensor data.
4) Set threshold value of each sensor.
5) Check given data compare with threshold value.

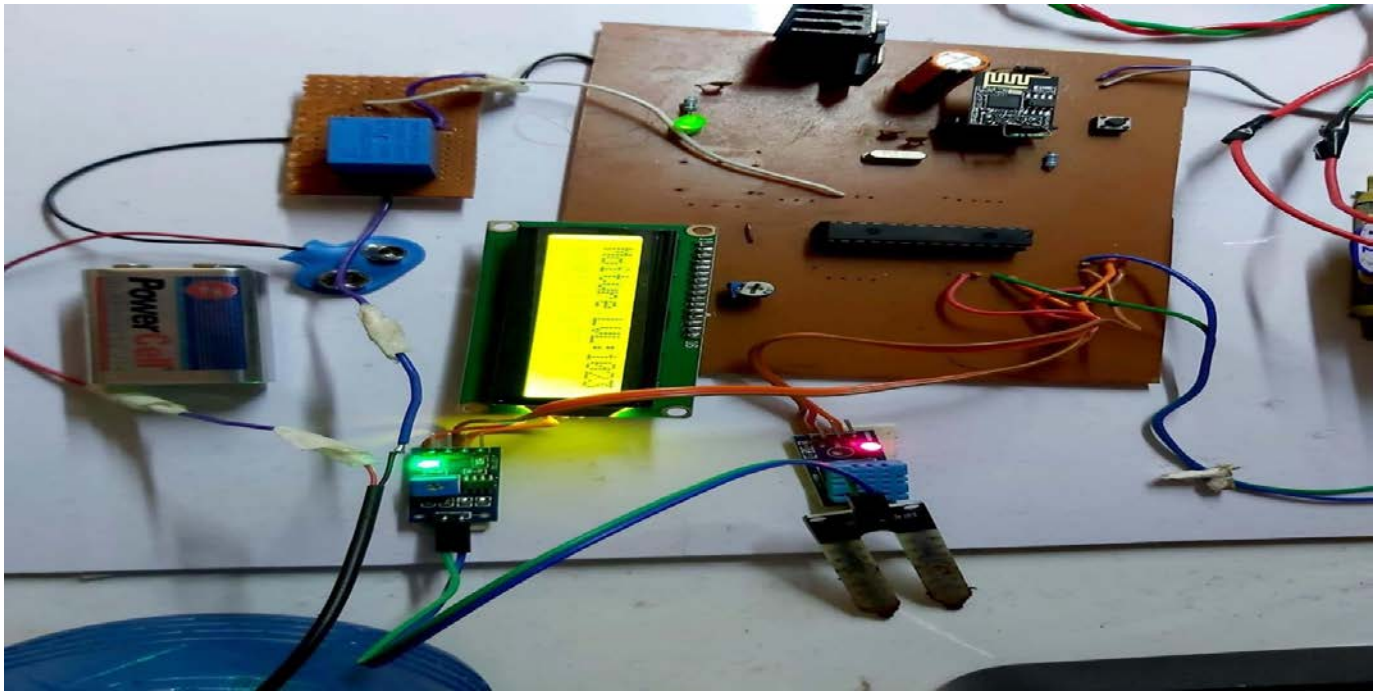
7) If threshold exceed then turn ON/ Off Pump.

6) Show data on LCD and send cloud data.
7) Stop

RESULTS



HAEDWARE DESIGN



Sr No.	Components	Description
1	Microcontoller AT Mega 328	1. High Performance, Low Power AVR 2. Advanced RISC Architecture 3. 131 Powerful in structures 4. 32*8 General Purpose working Registers 5. On chip 2 cycle Multiplier 6. Fully static Operators
2	DHT11	1. 3 to 5V power and I/0
		2. 2.5 mA max current use during conversion 3. Good for 20-80% humidity readings with 5% accuracy 4. Good for 0-50C temperature reading +-2 C accuracy 5. No more than 1Hz sampling rate (once every second) 6. 4 pins with 0.1” spacing
3	Soil Moisture sensor	1. Operating Voltage: 3.3V to 5VDC 2. Operating Current:15mA 3. Output Digital: 0V to 5V, Adjustable trigger level from preset 4. Output Analog: 0V to 5V based on infrared radiation 5. LEDs indicating output and power 6. Small cheap and easily available
4	5V Signal Channel Relay Module	1. Supply Voltage: 3.75V to 6V 2. Quiescent Current:2mA 3. Current when the relay is active:70mA 4. Relay maximum contact voltage: 250VAC or 30VDC 5. Relay maximum current:10A

5	Pump	1. DC Voltage :2.5-6V 2. Maximum Lift: 40-110cm 3. Flow Rate: 80-120L/H
6	Breadboard	1. 2 Distribution Strips, 200tie-points 2. 630 plastics with color legend
		3. ABS plastic with color legend 4. Ratings: 300/3 to 5AmpsT
7	Temperature and humidity sensor	1. Power Supply 3.3~5.5V DC 2. Output : 4 pin single row 3.Measurement Range -90%RH, 20
		Temperature 0~50 ℃ 1. Accuracy ±5%RH Humidity + ±2℃ Temperature + 2. Resolution : Humidity 1% RH 3. Interchangeability : Fully Interchangeable 4.Long-Term Stability ±1%RH/yea

Table 1.1.1

SOFTWARE DESIGN

Sr No.	**Name**	**Description**
1	Operating System	1. Windows7,8,10 2. Linux
2	Arduino IDE	1. Support Windows, Mac, OS, Xilinx 2. Also support the programming Languages Cand C++
3	Programming Language	C

Table 1.1.2

CONCLUSION

The primary applications for this project are for farmers and gardeners who do not have enough time to water their crops/plants. It also covers those farmers who are wasteful of water during irrigation. The project can be extended to greenhouse where manual supervision is far and few in between. The principle can be extended to create fully automated gardens and farmlands.

REFERENCES

1. S. Sivachandran, K. Balakrishnan, K. Navin, “Real Time Embedded Based Soil Analyzer”, International Research Journal of Engineering and Technology (IRJET). Volume: 3 Issue 3 |March 2014
2. Anand Nayyar, Er. Vikram Puri, “IoT Based Smart Sensors for Live Temperature and Moisture Monitoring using Arduino, Cloud Computing & Solar Technology” May2015
3. Chandan kumar sahu, Pramitee Behera, “A Low-Cost Smart Irrigation Control System”, IEEE sponsored 2nd International conference on electronics and communication system (ICECS2015)
4. Apurva C. Pusatkar, Vijay S. Gulhane, “Implementation of Wireless Sensor Network for Real Time Monitoring of Agriculture”, International research journal of engineering and technology (IRJET). Volume: 03 issue: 05 |May-2016
5. Mrs. T. Vineela, J. NagaHarini, Ch. Kiranma, G. Harshitha, B.AdiLaksh, “IoT Based Agriculture Monitoring and Smart Irrigation System Using Raspberry Pi”, International Research Journal 0f Engineering and Technology (IRJET).
6. Harshal Meharkure, ParagYelore, SheetalIsrani, “Application of IOT Based System for Advance Agriculture in India”, International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE) Vol. 3,2015.
7. R. Balamurali, K. Kathiravan, “An Analysis of Various Routing Protocols for Precision Agriculture using Wireless Sensor Network”, IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural Development (TIAR2015).