A PROJECT REPORT ON

SMART IRRIGATION SYSYTEM

Submitted in fulfilment of the requirement for the award of the degree of

BACHELOR OF ENGINEERING

In

ELECTRONICS & COMMUNICATION ENGINEERING

By

Mohd Shuaib Malik (1709005451016)

Mohammed Saqlain (1709005451015)

Sachin Gupta (1709005451021)

Manish Kumar (1709005451012)

(2017-2021)

Department of Electronics & Communication Engineering

INSTITUTE OF ENGINEERING AND TECHNOLOGY

Dr. BHIM RAO AMBEDKAR UNIVERSITY, KHANDARI

AGRA (282002)

ABSTRACT

The project focus on reducing the wastage of water and minimizing the labour on field for irrigation as scarcity of water is increasing day by day. The project aims at saving time and avoiding problems like constant observation. The project helpful in agriculture field, parks and lawns. The main objective of our project is to monitor the soil's moisture during dry and wet condition with the help of soil moisture sensor and also monitor the humidity and temperature, irrigate when it needed with the help of automatic water inlet setup and also know the pH value of water. Also collect the data and send to the operator mobile with the help of Internet of things (IoT). This undertaking utilizes the Raspberry Pi 3 model B.

Keywords: Irrigation, Agriculture, Moisture, Humidity, Internet of Things (IoT), Raspberry Pi 3 Model B

ACKNOWLEDGEMENT

It is our privilege to express our gratitude and respect to all those who guided us in completion of the project.

Firstly, we are grateful to our “Institute of Engineering & Technology” for providing us congenial atmosphere in order together information about our project.

We wish to express our gratitude to “**Prof. V.K Saraswat, Director, Institute of Engineering & Technology”** for their inspiring and commendable support throughout the project execution. We would like to thank Dr. Greesh Kumar Singh, Co-Ordinator, Faculty of Electronic and Communication Engineering for this continuous guidance and assistance.

We would like to thank our internal **Project guide Dr. Naman Garg, Project Guider, Faculty of Electronic & Communication Engineering** for their help, teaching and invaluable guidance.

Here, we thank from heart’s deepest core, everybody who has helped us at work. In the true sense, besides our guides we in indebted to our friends at I.E.T for their constant help & invaluable on all occasions when they were most needed.

DECLARATION BY THE SCHOLAR

I hereby declare that the project work being presented in this report entitled "**SMART IRRIGATION SYSTEM USING RASPBERRY PI**" submitted in the department of **Electronic & Communication Engineering, Institute of Engineering & Technology, Khandari, Agra** is the authentic work carried out by our team members under the guidance of **Er. Naman Garg,** Department of Electronics & Communication Engineering, Institute of Engineering & Technology, Khandari, Agra.

Signature of Scholars

Mohd Shuaib Malik …………….

Mohammed Saqlain …………….

Sachin Gupta …………….

Manish Kumar ……………

SUPERVISOR'S CERTIFICATE

This is to certify that the work reported in the Bachelor of Engineering in Electronics & Communication Engineering project entitled **"Smart Irrigation System using Raspberry Pi"** submitted by **Mohd Shuaib Malik (1709005451016), Mohammed Saqlain (1709005451015), Sachin Gupta (1709005451021), Manish Kumar (1709005451012) at Institute of Engineering & Technology, Agra** is a bonafide record of his original work carried out in under my supervision. The work has not been submitted elsewhere for any other degree or diploma.

Signature

Dr. Naman Garg

Assistant Professor

Electronics & Communication Engineering

LIST OF ACRONYMNS AND ABBEREVIATION

IOT	Internet of Things
VNC	Virtual Network Computing
IP	Internet Protocol
pH	Potential of Hydrogen
DC	Direct Current
DHT	Digital Temperature & Humidity
HDMI	High-Definition Multimedia Interface
CSI	Camera Serial Interface
DSI	Display Serial Interface
GPIO	General Purpose Input Output
LCD	Liquid Crystal Display
LED	Light Emitting Diode
SD Card	Secure Digital Card
NO	Normally Open
NC	Normally Closed
VCC	Voltage Common Collector
GND	Ground

LIST OF FIGURES

TABLE OF CONTENTS

Contents

CHAPTER 1

INTRODUCTION

CHAPTER 2

METHODOLOGY & HARDWARE COMPONENTS

CHAPTER-1

INTRODUCTION

1.1 INTRODUCTION

Agriculture is the strength of Indian economy. The 60% of Indian population work in industry, contributing about 18 % to India's GDP. India ranks first in the world with highest net cropped area followed by US and China. However for agriculture water consumption is more than rainfall every year. Earlier the crop yielding was very high because of the ground water level were high. In the present time, to reduce the water consumption and increasing in the yield is a big challenge. The food demands are increasing day by day due to increase in population growth. By considering and predicting environmental circumstances, farm yield can be increased. Crop quality is based on data collecting from field such as soil moisture, ambient temperature, humidity and pH value. Advanced tools and technology can be used to increased farm production. Developing IOT technologies can help to collect large amount of environmental and crop recital data.

Our aim is to develop a IOT based controlled smart irrigation system to provide irrigation system which is automatic for the plants which help in saving water and money. The main objective is to apply the system for improvement health of the soil and hence the plant via multiple sensors like humidity sensor, temperature sensor, soil moisture sensor etc. Appropriate soil water level is necessary perquisite for optimum plant growth. Also, water being an essential element for life sustains, there is the necessity to avoid its undue used. Irrigation is a dominant consumer of water. This cause for the need to regulate the water supply for irrigation purposes. Fields should neither be over irrigated nor under irrigated. The objective of this is to desi8gn a simple, easy to install methodology to monitor and indicate the level of soil moisture that is continuously controlled in order to achieve maximum plant growth and simultaneously optimized the available irrigation resources on monitoring on the cloud server. The system is developed to monitor the environmental conditions such as temperature, soil moisture content, humidity of the air and water level of agriculture land for controlling the irrigation. The real time conditions sensed data to is send to the cloud server for storing and decision making and controlling actions for future also.

1.2 AIM

This design a model of automatic irrigation system which is based on Raspberry Pi. Various sensors are placed in paddy field. Sensors sense water level continuously and give the information to farmer through a cloud server webpage. Farmers can see the level of moisture and pH value without going in paddy field. If the water level reaches to at danger level, automatically motor will be off without conformation of farmer.

The aim of this is to modernize agriculture technology by programming components and built the necessary component for the system. The system is real time based and extracts the exact condition of paddy field.

1.3 PROPOSED SYSTEM

This system is combination of Hardware and software components. The hardware part consists of Raspberry pi, Arduino and different sensors like soil moisture sensor, temperature & humidity sensor, pH sensor whereas the software part consists of Things speak an open-source software which allows users to communicate with internet enabled devices using Internet of Things. The things speak consist of signals and a database in which readings are displayed from the sensors and are inserted using the hardware raspberry pi. The improvement in irrigation system using the Internet of Things is a solution to achieve water conservation as well as the improvement in irrigation process. This system tries to automate the process of the irrigation on the farmland by monitoring the soil; water level of the soil relative to the plant being cultivated and the adaptively sprinkling water to simulate the effect of rainfall.

1.4 BLOCK DIAGRAM

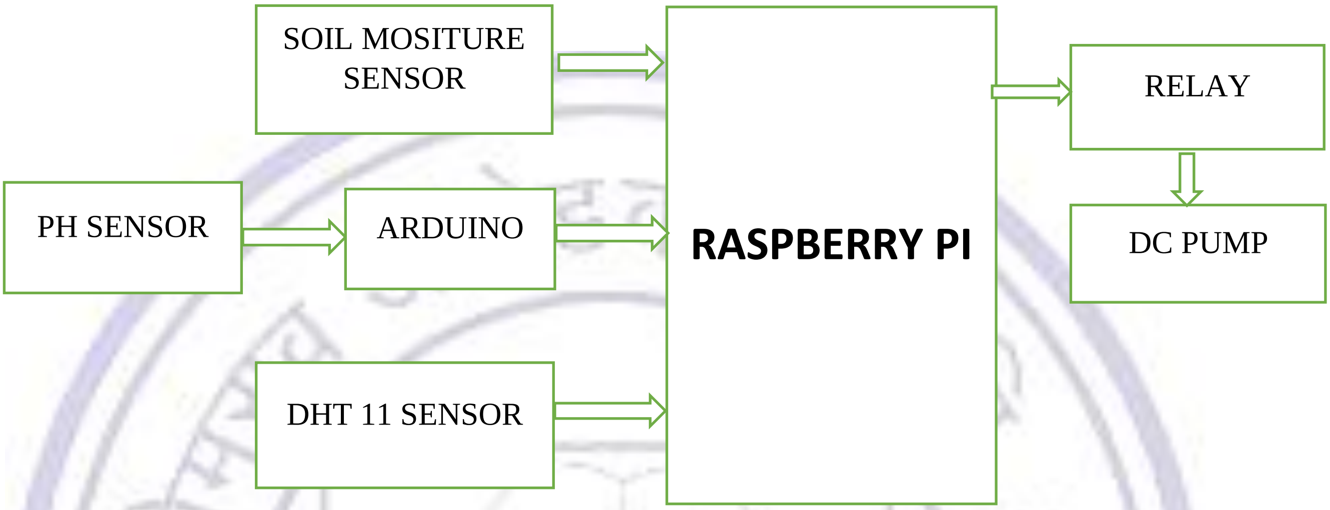


Figure 1.1 Block Diagram

1.5 WORK FLOW OF THE SYSTEM

Step 1: Start

Step 2: The system can be initializing on the raspberry Pi.

Step 3: The pH sensor is constantly checking the pH value of the water.

Step 4: The soil moisture sensor checks the soil moisture level constantly.

Step 5: The DHT11 sensor constantly sense the temperature and humidity of the field and updates the data in the web server.

Step 6: If the soil becomes dry, then the relay which is connected to the Raspberry Pi will turn on the motor to wet the field.

Step 7: If the step 6 is completed, it will go to the step 4.

CHAPTER 2

METHODOLOGY & HARDWARE COMPONENTS

2.1 METHODOLOGY

In this chapter, the objectives are to learn, develop and furnish the project. To see, step-wise how things are implemented and put together to bring the project live. Our edible food items and everything is produced through a system which is called irrigation system. The main objective is to take the irrigation, a next step further. The major parameters to be measured, to make it smart is to monitor the temperature and humidity (presence of rain) and then control the watering system through the submersible pump. And, all these sensors and pump are connected through the Raspberry Pi. In simple words, on one side, the Pi monitors the Temperature and Humidity though the respective sensors. And, on the other hand Pi checks the condition and judges if the watering is necessary or not.

The following steps guides through the procedure undertaken to make Irrigation Smart:

Step1:

In this above proposal different types of sensors (i.e., Temperature, moisture, soil & pH sensor) are used to detect the required scarcity of water in the soil for proper undergoing of the process, that is, for proper irrigation.

Step2:

Required action by the help of controller (i.e., Raspberry pi 3 model b+) is to be taken for the deficit of the physical parameters of the soil for a healthy process.

Step3:

An autonomous system is implemented here for taking the action by supplying adequate amount of raw materials (i.e. water) through the pump which is indeed controlled by the Raspberry Pi itself.

Step4:

It repeats the above steps if again there is a scarcity of water in the field.

HARDWARE COMPONENTS

2.2 RASPBERRY PI

The raspberry pi is a very cheap computer that runs Linux, but it also provides via set of GPIO pins, allowing you to control electronic components for physical computing and explore the Internet of Things (IOT). We use raspberry pi 3 B+ model. The GPIO pins figure is also shown below.

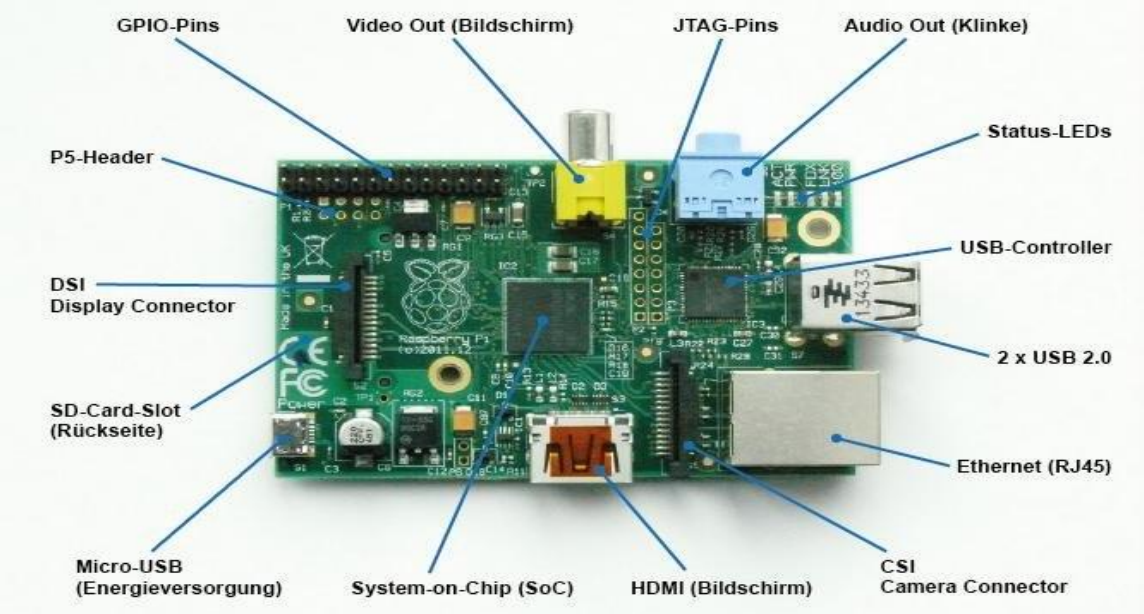


Figure 2. 1 Raspberry Pi

Some hardware components shown above are mention below –

1. HDMI (high-definition multimedia interface) – It is used for transmitting uncompressed video or digital audio data to the computer monitor, digital tv etc. Generally, this HDMI port helps to connect raspberry pi to the digital television.

2. CSI Camera Interface – CSI interface (camera serial interface) provides a connection in between Broadcom processor and pi camera. This interface provides electrical connections between two devices.

3. DSI Display Interface – DSI (Display serial interface) display interface is used for connecting LCD to the raspberry pi using 15 pin ribbon cable. DSI provides fast high-resolution display interface specially used for sending video data directly from GPIO to LCD.

4. Composite Video and Audio Output – The composite video and audio output port along with audio signal to the audio/ video systems.

5. Power LED – It is a red colored LED which is used for power indication. This LED will turn ON when power is connected to the Raspberry Pi. It is connected to 5V directly and will start blinking whenever the supply voltage drops below 4.63V.

6. ACT PWR – ACT PWR is green LED which shows the SD card activity.

7. SD Card Slot – In this slot we put our SD card for installing an operating system in Raspberry Pi.

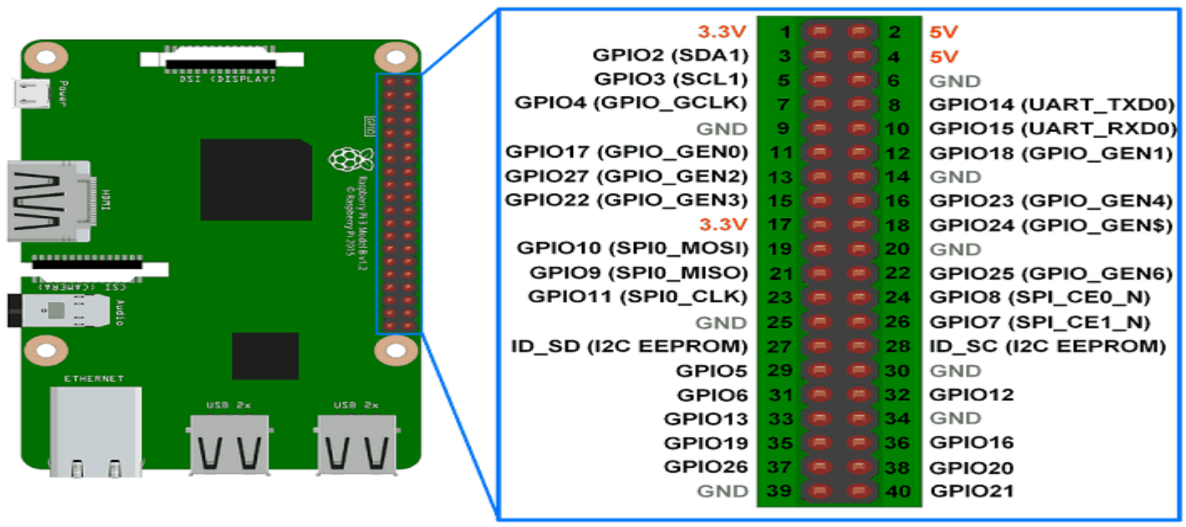


Figure 2. 2 Raspberry Pi GPIO Pins

2.3 ARDUINO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

Arduino comprises of both a physical programmable circuit board (commonly known as a microcontroller) and a programming software, or IDE (Integrated Development Environment) that can be run on a PC, used to compose and transfer PC code to the circuit board. It can be done by using the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. Unlike other programmable circuit boards, the Arduino does not require a different equipment (Called a software engineer) to upload code to the circuit board, one can essentially utilize a USB link. Also, the Arduino IDE utilizes a rearranged rendition of C++, making it simpler to figure out how to program. In a word, Arduino make the functions of the micro-controller into a more accessible package. The Uno is one of the more prevalent boards in the Arduino family and an extraordinary option for the beginners.

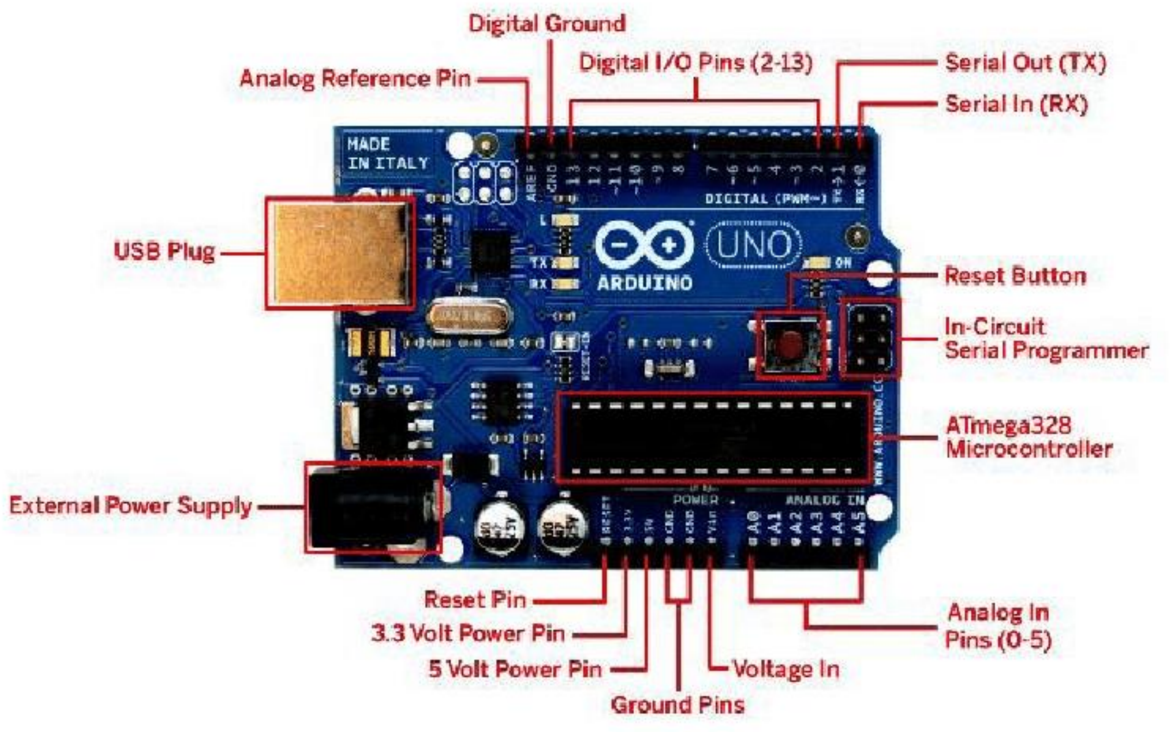


Figure 2. 3 Arduino

Features of the Arduino UNO:

Microcontroller: ATmega328

Operating Voltage: 5V

Input Voltage (recommended): 7-12V

Input Voltage (limits): 6-20V

Digital I/O Pins: 14 (of which 6 provide PWM output)

Analog Input Pins: 6

DC Current per I/O Pin: 40 mA

DC Current for 3.3V Pin: 50 mA

Flash Memory: 32 KB of which 0.5 KB used by bootloader

SRAM: 2 KB (ATmega328)

EEPROM: 1 KB (ATmega328)

Interfacing of Raspberry pi and Arduino through Serial Connection:

PI has only 26 GPIO pins and zero ADC channels, so when projects with analog outputs are being furnished, PI cannot do all the interactions alone. So more output pins are needed with additional functions, for adding more functions to PI, a communication between PI and UNO is established. With that all the function of UNO can be used as they were PI functions. Although there are many boards on Arduino platform, but Arduino Uno got many Appreciations, for its ease of doing projects.

Arduino Uno setup:

Connect the UNO to the PC first and then write the program in the Arduino IDE software and upload the program to the UNO. Then disconnect the UNO from PC. Attach the UNO to the PI after programming**.**

Now the program here initializes the Serial Communication of UNO. When the button attached to the UNO is pressed, the UNO sends few characters to the PI serially through USB port.

Raspberry Pi setup:

After that a program for PI is written to receive this data being sent by UNO serially.

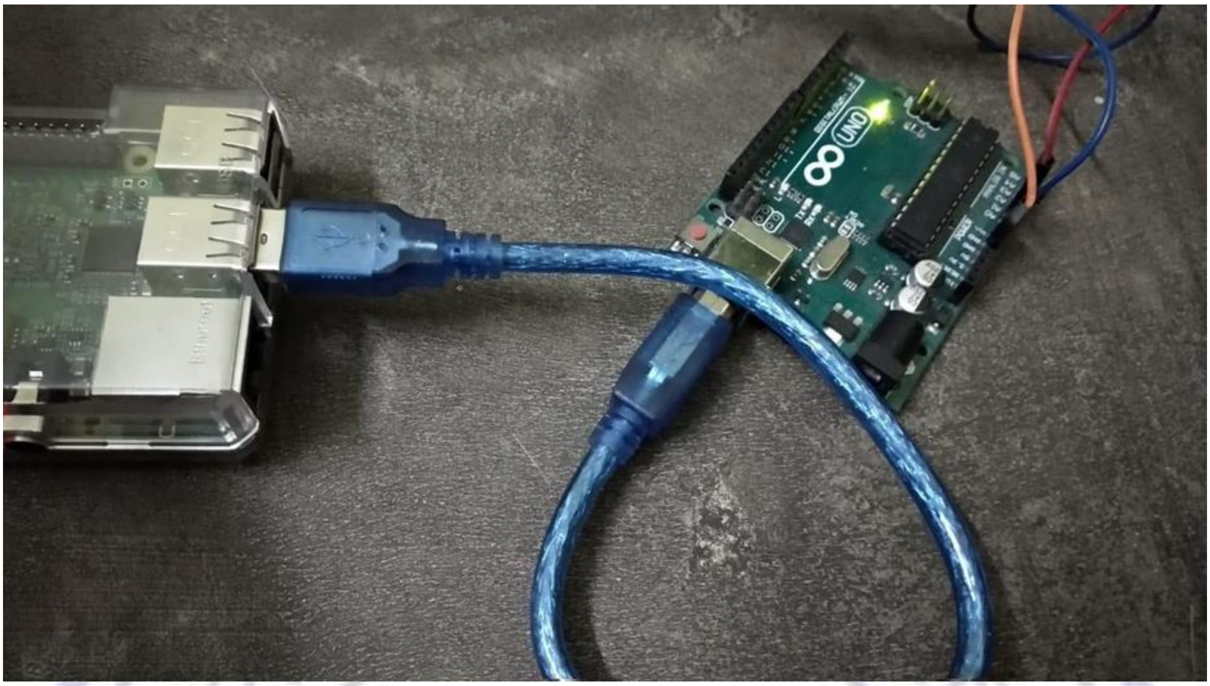


Figure 2.4 Raspberry and Arduino Interfacing.

The above picture shows the real time interfacing between Raspberry Pi and Arduino Uno. The interfacing was done through the open source Arduino software (IDE).

2.4 SOIL MOISTURE SENSOR

There are some sensors for the Raspberry Pi that can measure humidity, temperature and other values. Nevertheless, these modules are almost exclusively suitable for the air and not intended for use in the earth. For some projects, such as an automatic plant supply, the moisture of the soil must be measured, then, e.g., Refilled with water. When resistive soil moisture sensor is used, the digital reading is considered. The output i.e.; digital value is taken i.e., 1 or 0. When there is no moisture or our soil is dry then it gives a digital value 0 whereas when there is a moisture or our soil is wet then it gives a digital value 1.

The crop field will be monitored continuously by the Raspberry Pi and if the dampness content receives 1 then the motor goes to off state and stops watering the plants. The data is sent to the cloud and can be monitored by using Thingspeak, this is helpful in automated irrigation.

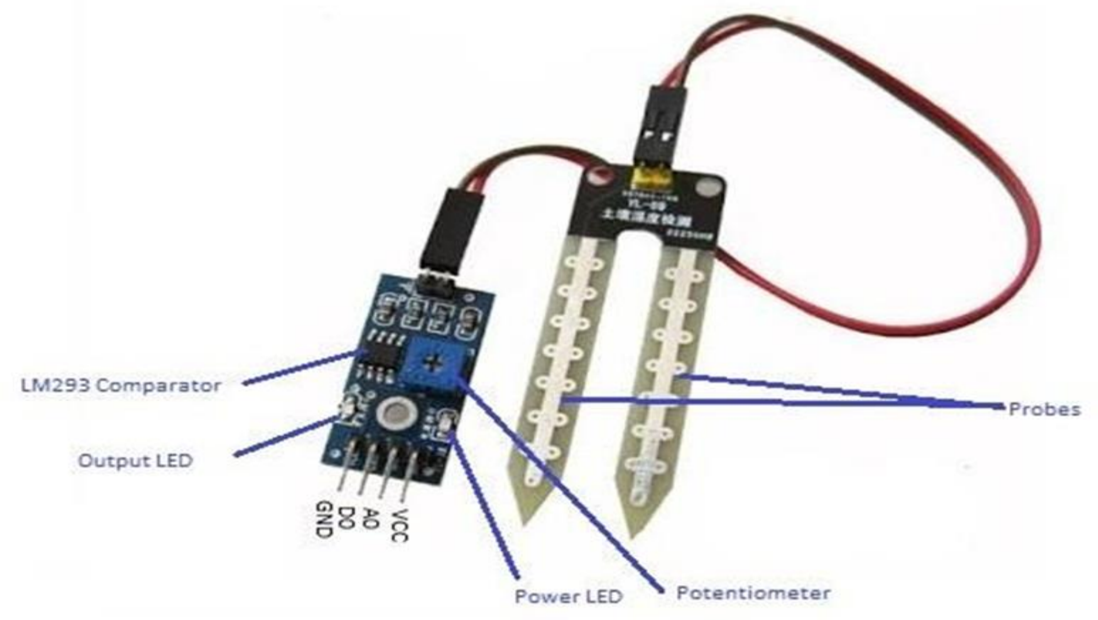


Figure 2. 5 Soil Moisture Sensor

2.5 DHT 11 HUMIDITY & TEMPERATURE 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.

2.6 HUMIDITY

The percentage of water present in the air is termed as humidity. This type of measurement relies on two electrical conductors with a non-conductive polymer film laying between them to create an electrical field between them. Moisture from the air collects on the film and causes changes in the voltage levels between the two plates. This change is then converted into a digital measurement of the air's relative humidity after taking the air temperature into account. The DHT11 calculates relative humidity by measuring the electrical resistance between two electrodes. The humidity sensing component of the DHT11 is a moisture holding substrate with the electrodes applied to the surface. When water vapor is absorbed by the substrate, ions are released by the substrate which increases the conductivity between the electrodes. The change in resistance between the two electrodes is proportional to the relative humidity. Higher relative humidity decreases the resistance between the electrodes while lower relative humidity increases the resistance between the electrodes.

The DHT11 converts the resistance measurement to relative humidity on a chip mounted to the back of the unit and transmits the humidity and temperature readings directly to the Raspberry Pi.

2.7 TEMPERATURE

For measuring temperature this sensor uses a Negative Temperature coefficient thermistor, which causes a decrease in its resistance value with increase in temperature. To get larger resistance value even for the smallest change in temperature, this sensor is usually made up of semiconductor ceramics or polymers. The temperature range of DHT11 is from 0 to 50 degree Celsius with a 2-degree accuracy.

This sensor is used to record the atmospheric temperature. There is a different atmospheric temperature needed for the different crops like for rice (20 - 21°C), wheat (20 - 25 °C), sugarcane (32 - 35°C) etc. So, this sensor measuring the temperature of the field and sent it to the cloud.

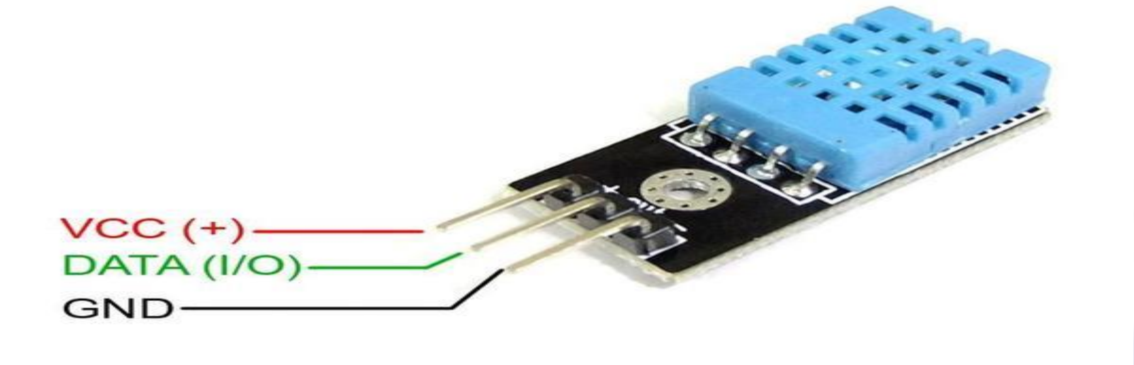


Figure 2. 6 DHT 11 Sensor

2.8 pH SENSOR

A pH meter is used to determine the acidity or alkalinity of the solution. pH is the concentration of hydrogen ions in the solution. A solution containing more H+ ions remain acidic while the solution containing more OH- ions remains alkaline. pH value of solutions ranges from 1 to 14.

The solution having pH value 1 will be the highly acidic and with pH value 14 will be highly basic. The acidity and alkalinity of any solution depend upon the concentration of hydrogen ions (H+) and hydroxyl ions (OH-) respectively. A neutral solution as pure water has pH 7.

pH meter is used to determine the pH of different solutions in pharmaceuticals. It is more accurate method then the pH strip. A pH meter contains a pH probe that passes the electrical signals to the pH meter and pH meter displays the pH value of the solution.

The glass pH probe contains two electrodes, a sensor electrode and a reference electrode. These electrodes are in the form of glass tubes one contains pH 7 buffer and other contains saturated potassium chloride solution. The sensor electrode bulb is made up of porous glass or permeable glass membrane coated with silica and metal salts.

A silver wire coated with silver chloride is immersed in pH 7 buffer in the bulb. Another silver wire coated with silver chloride is immersed in the saturated potassium chloride solution in reference electrode as shown in the figure.

When the probe is placed in a solution to measure the pH, hydrogen ions accumulate around the bulb and replace the metal ions from the bulb.

This exchange of ions generates some electric flow that is captured by the silver wire.

The voltage of this electric flow is measured by the pH meter by converting it into pH value by comparing the generated voltage with the reference electrode.

Increase in acidity of the solution has a greater concentration of hydrogen ions that increases the voltage. This increased voltage decreases the pH reading in pH meter.

In the same manner, an increase in alkalinity decreases the hydrogen ions or increases in hydroxyl ions concentration also decrease the voltage and increase the pH value in pH meter.

The overall working principle of pH sensor and pH meter depends upon the exchange of ions from sample solution to the inner solution (pH 7 buffer) of glass electrode through the glass membrane. The porosity of the glass membrane decreases with the continuous use that decreases the performance of the probe.

Ph of soil is used to know the type of soil whether it is acidic type of soil or basic type of soil. This can be known by the pH value of the soil. The pH value of soil varies from 0 to 14. If the pH value of soil is in between 0 to 7 it is of acidic type. If the pH value of soil is 7 then it is neutral type and if it is in between 7 to 14 then it is basic type of soil. Based on the pH value we can suggest the farmer the type of crop to be used.

For most plants, the optimum pH range is from 5.5 to 7.0, but some plants will grow in more acid soil or may require a more alkaline level. The pH is not an indication of fertility, but it does affect the availability of fertilizer nutrients and water for irrigation should have a pH between 5.0 and 7.0.

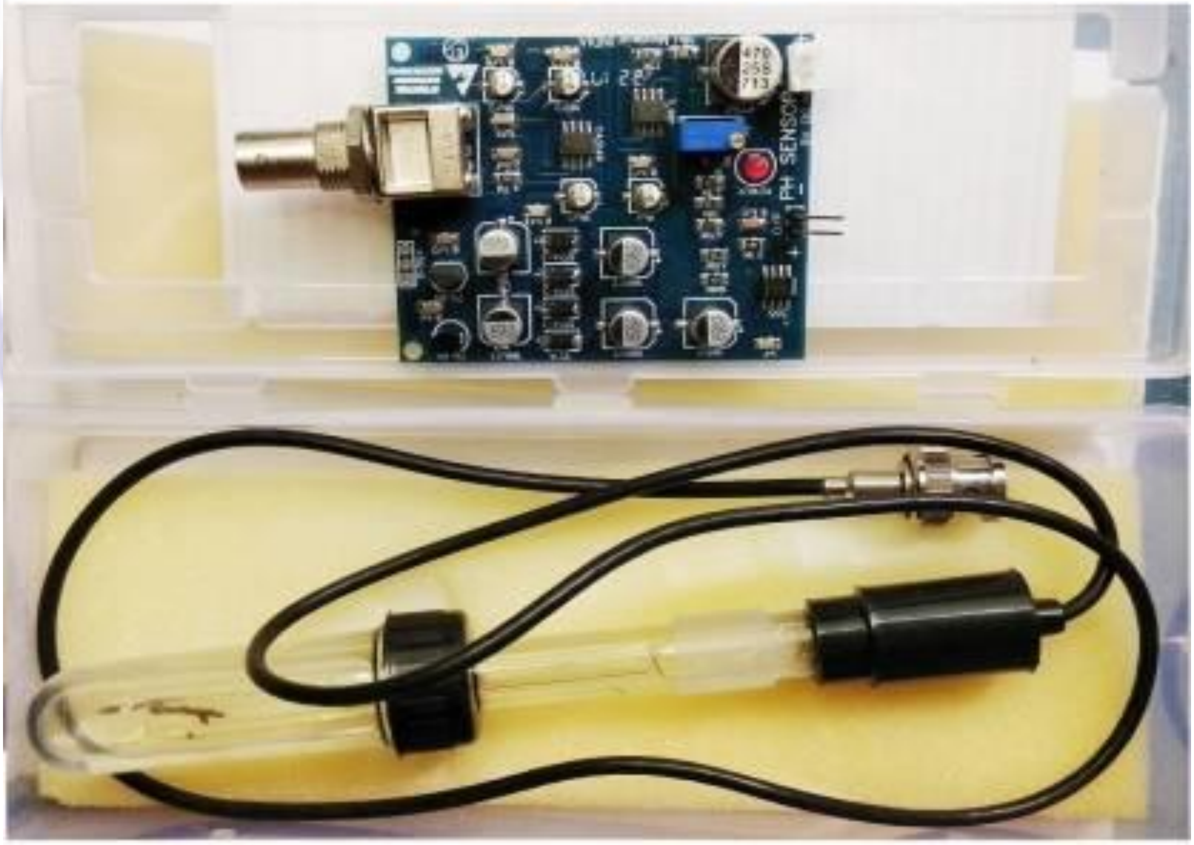


Figure 2. 7 pH Sensor

2.9 SD- CARD

A Raspberry Pi basically uses a microSD card as a hard drive and to store any information. SD cards come in three physical sizes. The Raspberry Pi A and B use the largest one; the mini-SD card and the MicroSD card can be used in those models, but you will need an adapter / holder to fit it. The Raspberry Pi B+ and Raspberry Pi 2 Model B (second generation) require the smallest one, the MicroSD. SD cards come in a range of storage sizes. You will likely need more than 2 GB. Since the SD card holds all the information to run a Raspberry Pi from the operating system to applications, very small SD cards are simply not reasonable even if they work with a RasPi. So we are using a 32 GB fast SD card.

Figure 2. 8 SD Card

2.10 RELAY MODULE

A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an electrical circuit. A simple relay consists of wire coil wrapped around a soft iron core, or solenoid, an iron yoke that delivers a low reluctance path for magnetic flux, a movable iron armature and one or more sets of contacts. The movable armature is hinged to the yoke and linked to one or more set of the moving contacts. Held in place by a spring, the armature leaves a gap in the magnetic circuit when the relay is de-energized. While in this position, one of the two sets of contacts is closed while the other set remains open. When electrical current is passed through a coil, it generates a magnetic field that in turn activates the armature. This movement of the movable contacts makes or breaks a connection with the fixed contact. When the relay is de-energized, the sets of contacts that were closed, open and breaks the connection and vice versa if the contacts were open. When switching off the current to the coil, the armature is returned, by force, to its relaxed position. This force is usually provided by a spring, but gravity can also be used in certain applications. Most power relays are manufactured to operate in a quick manner. We are using relay module for ON/OFF the pump for water supply.

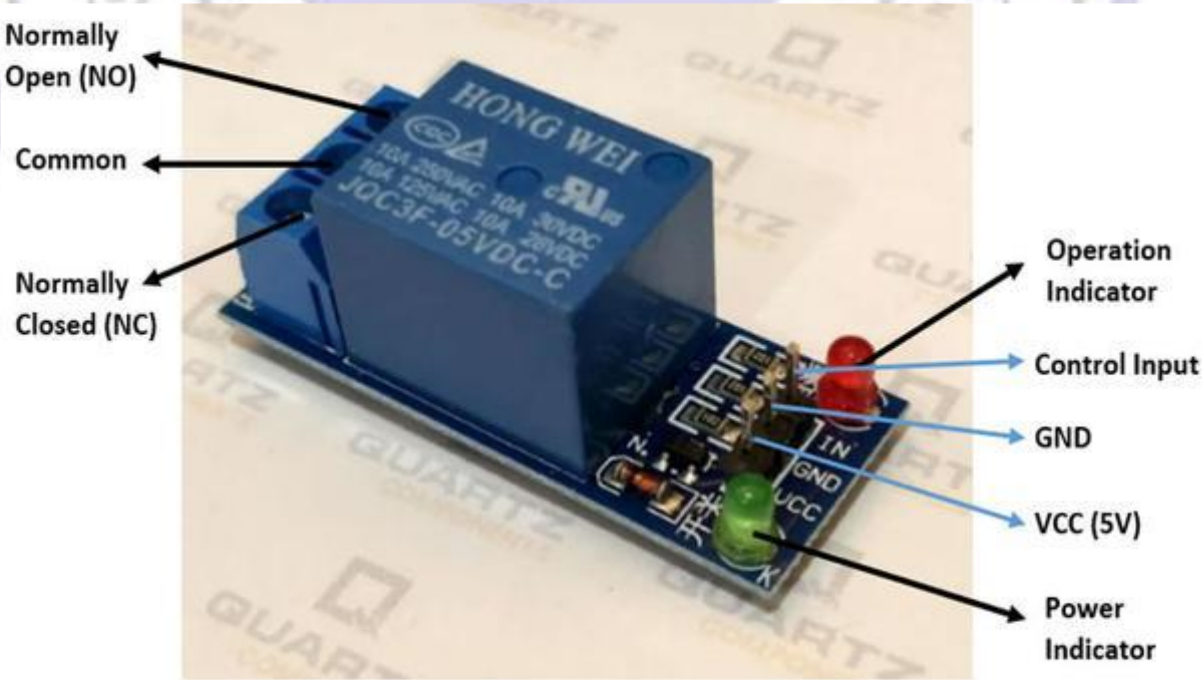


Figure 2. 9 Relay Module

2.11 USB CABLE

The term USB stands for "Universal Serial Bus". USB cable assemblies are some of the most popular cable types available, used mostly to connect computers to peripheral devices such as cameras, camcorders, printers, scanners, and more. We are using USB cable to gives power supply to the raspberry pi from a laptop or from power adapter.

Figure 2. 10 USB Cable

2.12 ARDUINO CABLE

USB cable type A/B. Use it to connect Arduino Uno, Arduino Mega 2560, Arduino 101 or any board with the USB female A port of your computer. Cable length is approximately 1m. Cable colour and shape may vary slightly from image as our stock rotates.

Figure 2. 11 Arduino Cable

2.13 PUMP

The water pump can be defined as a pump which uses the principles like mechanical as well as hydraulic throughout a piping system and to make sufficient force for its future use. They have been approximately in one structure otherwise another because of early civilization. At present these pumps are utilized within a wide range of housing, farming, municipal, and manufacturing applications. We are using a water pump for suppling the water when soil is dry.

Figure 2. 12Pump

2.14 9V BATTERY

The 9V battery is an extremely common battery that was first used in transistor radios. It features a rectangular prism shape that utilizes a pair of snap connectors which are located at the top of the battery. A wide array of both large and small battery manufacturers produces versions of the 9V battery. Possible chemistries of primary (non-rechargeable) 9V batteries include Alkaline, Carbon-Zinc (Heavy Duty), Lithium. Possible chemistries of secondary (rechargeable) 9V batteries include nickel-cadmium (NiCd), nickel-metal hydride (NiMH), and lithium ion. The performance and application of the battery can vary greatly between different chemistries, meaning that some chemistries are better suited for some applications over others. We are using 9V battery for supplying power to the water pump.

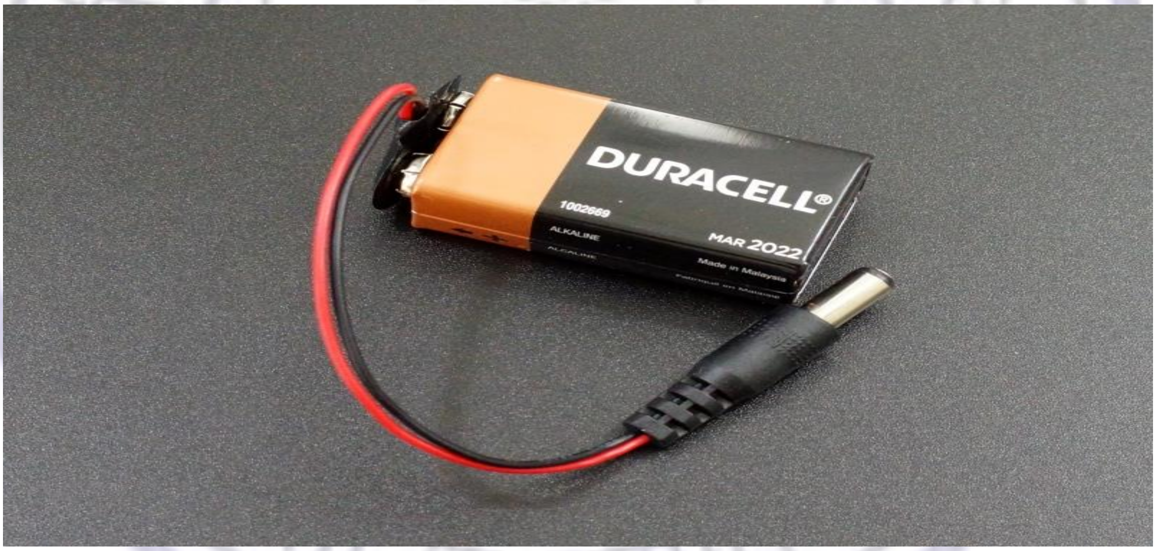


Figure 2. 13 9V Battery

2.15 JUMPER WIRE

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. We are using male-to-male, female-to-female and male-to-female wires.

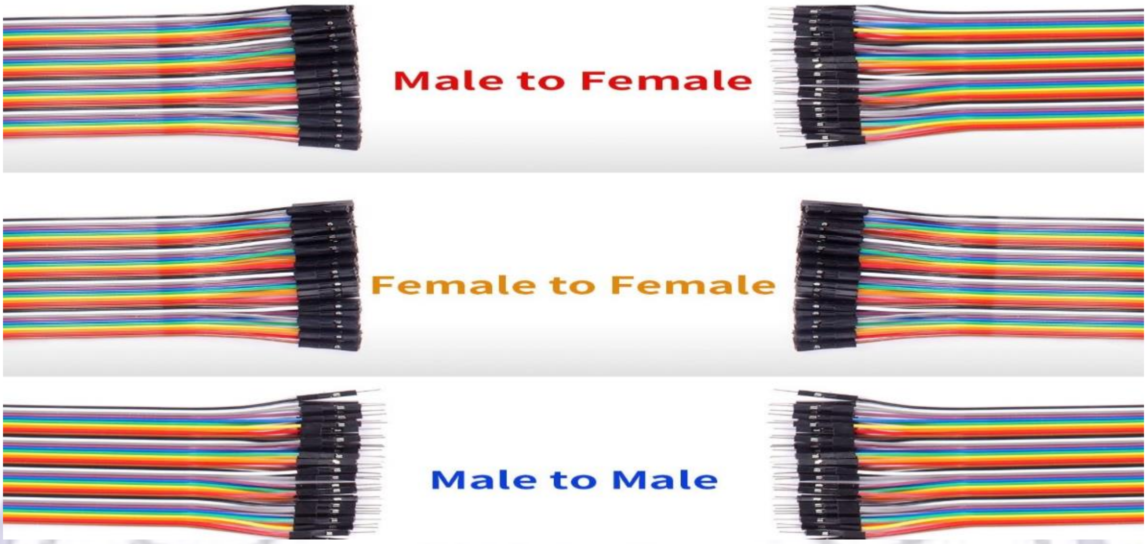


Figure 2. 14 Jumper Wire

2.16 BREADBOARD

A breadboard is a widely used tool to design and test circuit. You do not need to solder wires and components to make a circuit while using a bread board. It is easier to mount components & reuse them. Since, components are not soldered you can change your circuit design at any point without any hassle. It consists of an array of conductive metal clips encased in a box made of white ABS plastic, where each clip is insulated with another clips. There are a number of holes on the plastic box, arranged in a particular fashion. A typical bread board layout consists of two types of region also called strips. Bus strips and socket strips. Bus strips are usually used to provide power supply to the circuit. It consists of two columns, one for power voltage and other for ground. We are using Breadboard for making connection of power supply to the relay and sensors.

Figure 2. 15 Breadboard

CHAPTER 3

SOFTWARE DESCRIPTION

3.1 INTRODUCTION

We use many software's in this project. First, we configured our Raspberry Pi by using many software's like Putty, VNC server, Python IDLE.

3.2 SOFTWARE USED

Description of software's used in this project from initial:

1. **SD Card Formatter**

   By using this software, we format our SD card for booting & storing Raspbian operating system.

2. **Etcher**

   For transferring the boot file to the SD card from our laptop.

3. **Putty**

   We using this software for give command to the raspberry pi.

4. **IP Scanner**

   By using this software, we find the IP address of our raspberry Pi.

5. **VNC Server**

   For sharing the screen of our laptop, to the raspberry pi we using VNC server with the help of IP address of our Raspberry Pi.

   Steps for configuration of Raspberry Pi 3 B+ with VNC client:

   - Sharing internet by using Wi-Fi.
   - Setting Up the VNC Server to Connect Your Raspberry Pi to a Laptop Display
   - Starting VNC Server on Pi
   - Setting up the Client Side (Laptop)
   - Running VNC Server during Startup in the Raspberry Pi GUI. These are the following steps to run VNC:

- Step1: went to command prompt
- Step2: type- sudonano<filename>.py
- Step3: wrote the python code and saved the code by pressing control X then press y.
- Step4: again, went to command format
- Step5: type- python <filename>.py

6. **Raspbian Operating System**

Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run. However, Raspbian provides more than a pure OS: it comes with over 35,000 packages, pre-compiled software bundled in a nice format for easy installation on your Raspberry Pi.

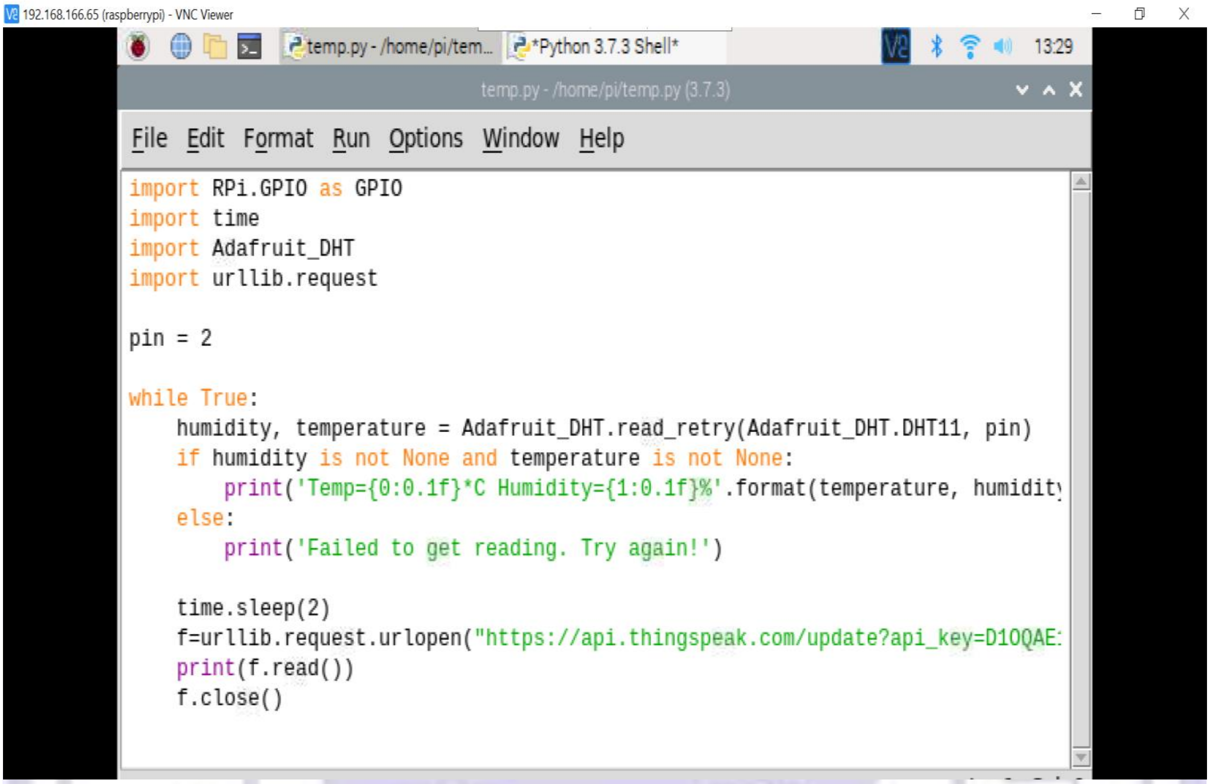
The initial build of over 35,000 Raspbian packages, optimized for best performance on the Raspberry Pi, was completed in June of 2012. However, Raspbian is still under active development with an emphasis on improving the stability and performance of as many Debian packages as possible.

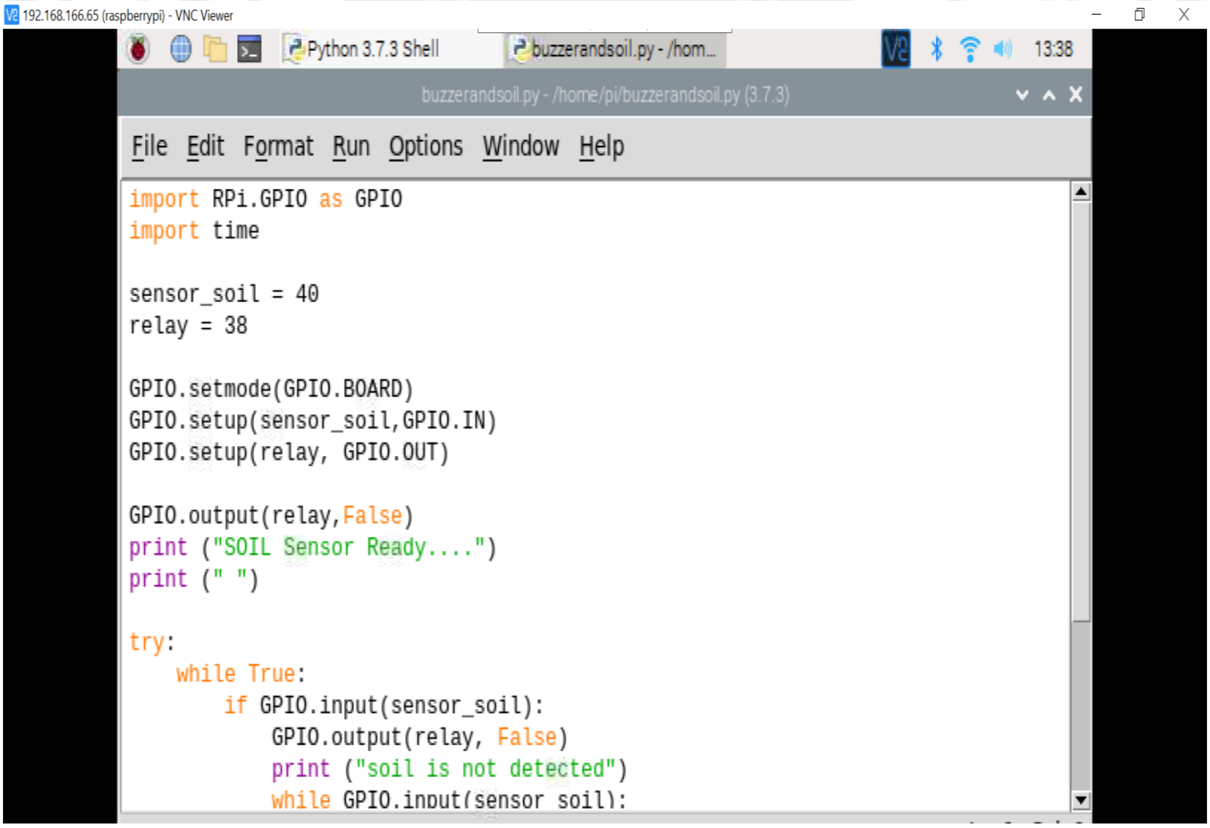
7. **Thingsspeak**

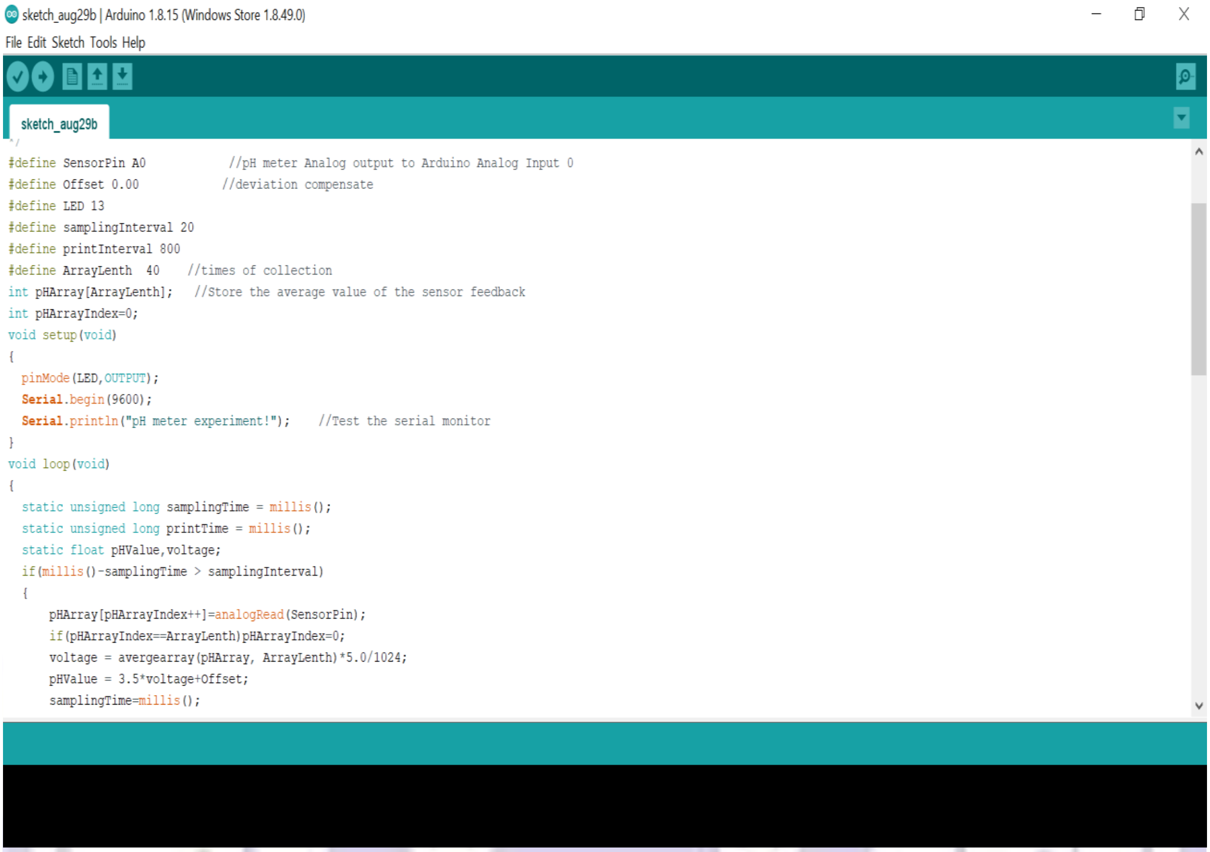
ThingSpeak is an open-source software written in Ruby which allows users to communicate with internet enabled devices. It facilitates data access, retrieval and logging of data by providing an API to both the devices and social network websites. ThingSpeak was originally launched by ioBridge in 2010 as a service in support of IoT applications. ThingSpeak has integrated support from the numerical computing software MATLAB from MathWorks, allowing ThingSpeak users to analyze and visualize uploaded data using MATLAB without requiring the purchase of a MATLAB license from MathWorks.

3.3 PROGRAMMING

Some programming screenshots:

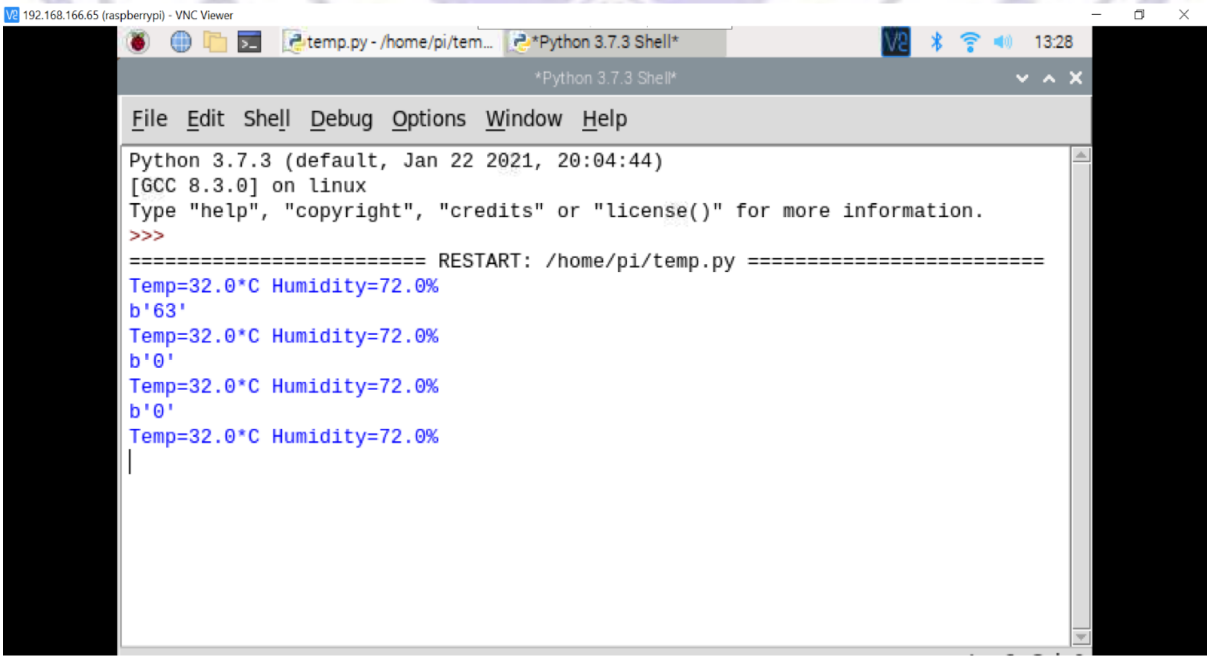


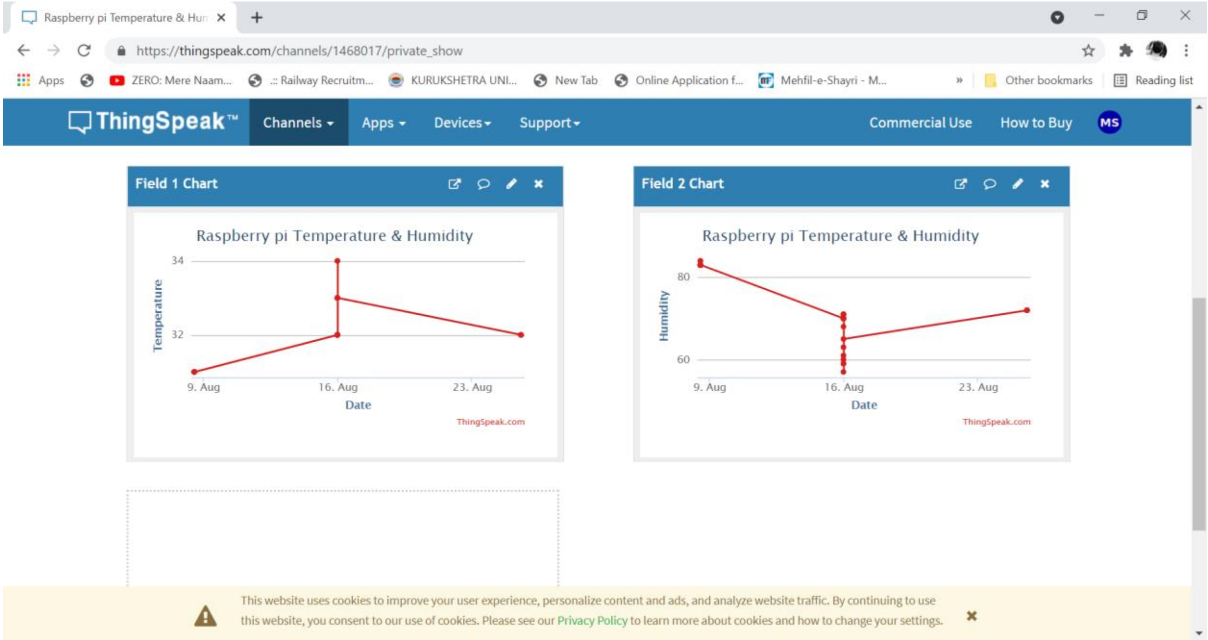




3.4 RESULT

Some result screenshots:




Raspberry pi Temperature & Hum
https://thingspeak.com/channels/1468017/private_show
ThingSpeak™
Channels
Apps
Devices
Support
Commercial Use
How to Buy
Field 1 Chart
Raspberry pi Temperature & Humidity
Temperature
34
32
9. Aug
16. Aug
23. Aug
Date
ThingSpeak.com
Field 2 Chart
Raspberry pi Temperature & Humidity
Humidity
80
60
9. Aug
16. Aug
23. Aug
Date
ThingSpeak.com
This website uses cookies to improve your user experience, personalize content and ads, and analyze website traffic. By continuing to use this website, you consent to our use of cookies. Please see our Privacy Policy to learn more about cookies and how to change your settings.

CHAPTER 4

CIRCUIT FABRICATION

4.1 FRONT VIEW

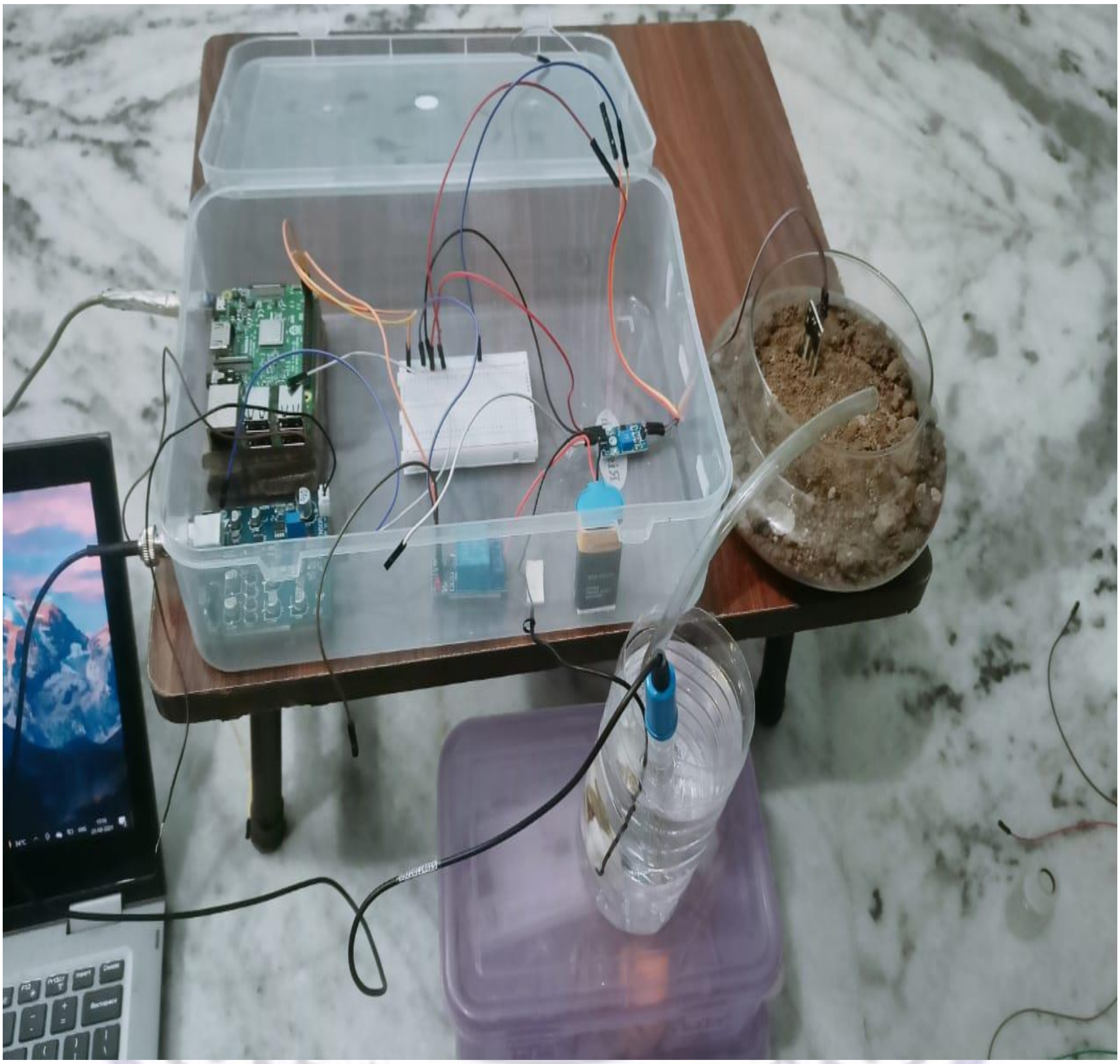


Figure 4. 1 Front View of Smart Irrigation System

4.2 SIDE VIEW

Figure 4. 2 Side View of Smart Irrigation System

4.3 ADVANTAGE

Traditional watering methods can waste as much as 50% of the water used due to inefficiencies in irrigation, evaporation and overwatering. Smart irrigation systems use sensors for real-time or historical data to inform watering routines and modify watering schedules to improve efficiency. There are two important aspects of smart irrigation: control types -- the way the irrigation is controlled -- and delivery types -- the type of water delivery systems used.

- Smart irrigation systems use local soil moisture data drawn from sensors in the ground to support informed decisions about watering schedules. Users can configure these systems to manage irrigation on demand.
- The major advantages of a smart irrigation system is that precision watering in smart irrigation also deals with efficiencies in the delivery of the water. There are generally four types of delivery: surface, sprinklers, trickle and subsurface methods.
- Surface irrigation is the most traditional method, and it distributes water through irrigation ditches, letting gravity do the work. Sprinklers distribute water through the air like rain and can be fixed or mobile. Trickle irrigation spreads water very locally to the ground surface. Subsurface methods are buried next to the plant's root zone and apply water below the ground. Trickle systems and subsurface methods generally save the most water given their ability to reduce loss to evaporation.
- It will help you have better control of your field and irrigation needs as well as peace of mind that the smart system can make decisions independently if you are away.
- It will help in save a significant amount of money on your water bills because through intelligent control and automation, your smart irrigation system will optimize resources so that everything gets what it needs without needless waste.

- We have all seen many places in the country that have experienced droughts and we know that our water resources are precious. With smart irrigation systems we can be better stewards of our resources which is better for the environment. The opportunity to save dramatically, have better control and be more eco-friendly.
- It can provide high accuracy water supply and avoid water from wastage.
- Due to automatically handling, user requires less man power.
- This system helps to produce good quality of crops and improves economic condition.

4.4 LIMITATIONS OF THE CIRCUIT

- The primary disadvantage associated with a smart irrigation is the expense. These systems can be quite costly depending on the size of the field. Furthermore, portions of the field will have to be dug up to install pipework and attach it to the plumbing system of the home. This can equate to days or weeks without use of the yard.
- Even the most efficient smart systems can have their pitfalls. Wind can wreak havoc on sprinklers, directing water in the wrong direction. Underground pests may damage water-delivery systems, resulting in water pooling or broken parts. The repairs to fix an irrigation system can be much more costly than replacing a damaged garden hose.

CHAPTER 5

CONCLUSION & FUTURE SCOPE

5.1 CONCLUSION

By completing this project, a smart irrigation system has been implemented using raspberry pi 3B+ module. It is an automated system and beneficial for mankind. This project proposes a design for smart home garden irrigation system that implements ready-to-use, energy-efficient, and cost-effective devices.

1. The implemented system is integrated with multi-sensors such as soil moisture sensors, humidity and temperature sensors, pH sensors.

2. By using the Internet of Things (IoT), we can see the graphic representation of sensors on our mobile.

3. This proposed system managed to reduce cost, minimize waste water, and reduce physical human interface.

4. The entire system is monitored and controlled by the power full credit card sized microcomputer called Raspberry Pi.

5. The system is capable of automatic watering of plants depending upon certain parameters.

5.2 FUTURE SCOPE

The future scope of this project can be comprehended in many aspects such as to add camera module to detect whether the plants are getting enough resources and whether they are growing without any resistances. Camera module clicks picture and send it through mail. A water meter can be installed to estimate the amount of water used for irrigation and thus giving a cost estimation. Further, it also reduces the investment of farmers. In addition to the excess cost of water, labour is becoming more and more expensive. The proposed irrigation system will be very efficient in areas like house gardens, office premises, buildings etc. where watering plants at regular interval matters. This system also presents a smart drip irrigation system to water plants using devices like raspberry pi, Arduino microcontrollers. This type of agriculture application of Internet of things in the real-world environment is necessary to know the effect of the environment on such system. So is always better to know the risks beforehand. As per future perspective, this system can be the more intelligent system which predicts user actions, nutrient level of the plants, time to harvest, etc. With using Machine Learning algorithms more advancements can be done in the future which will help farmer a lot and water consumption can also be reduced in agriculture.

REFERENCES

[1] Y.G.Gawali, D.S.Chaudhuri, H.C.Chaudhuri, “Review paper on Automated irrigation system using WSN”, IJARECE Volume 5, Issue 6, June 2016.

[2] A.Joshi,L.Ali, “Survey on auto irrigation system”,IEEE Catalog Number CFP17D81- POD,March 2017.

[3] T.J.Kazmierski, SSRG International Journal of Electronics and Communication Engineering. March 2017.

[4]D. Rane, P.R.Indurkar, “Review paper on Automatic irrigation system using RF module”,IJAICT vol 1, Issue 9, January 2015.

[5] B.K.Chate,.J.G.Rana,”Smart irrigation system using Raspberry pi”, IRJET, vol 3 issue 5, May 2016.

[6] B.H.Fouchal,O.Zytoune,D.Aboutajdine, “Drip Irrigation System using Wireless Sensor Networks”,Volume 44, Issue 4, July 2018.

[7] J.Gutiérrez, J.Francisco Villa-Medina et al. “Automated Irrigation System Using a Wireless Sensor Network and GPRS Module”,IEEE 63(1):166-176, January 2014.

[8] N.Agrawal, S.Singhal, “Smart Drip Irrigation System using Raspberry pi and Arduino”,IJIRCCE Volume 5, Special Issue 4,June 2017.

[9] G.Ashok, G.Rajasekar, “Smart Drip Irrigation System using Raspberry Pi and Arduino”,IJSETR 1742, Issue 3, March 2018.

[10] P.S.Shwetha, “Survey on automated irrigation system.”,TROINDIA Issue 2, April 2017.

[11] K.J.Vanaja, A.Suresh, S.Srilatha, K.V.Kumar,M.Bharath, “IOT based Agriculture System Using NodeMCU”, IRJET Volume 5, Issue 3, March 2018

[12] J.Gutiérrez, J.Francisco Villa-Medina et al. “Automated Irrigation System Using a Wireless Sensor Network and GPRS Module”,IEEE 63(1):166-176, January 2014

[13] P. B.Chikankar, D.Mehetre, S.Das, “An Automatic Irrigation System using ZigBee in Wireless Sensor Network”,Volume 5, Issue 4,April 2017.

[14] S.Jadhav, S.Hambarde,”Android based Automated Irrigation System using Raspberry Pi”,IJSR Volume 5,Issue 6, June 2016.

[15] Indian Journal of Science and Technology, Vol 9(17), DOI: 10.17485/ijst/2016/v9i17/93048, May 2016

[16] International Journal of Advanced Research in Computer and Communication Engineering, Vol. 5, Issue 6, June 2016

[17] National Conference on Product Design (NCPD 2016), July 2016

[18] International Journal of Scientific Research in Computer Science, Engineering and Information Technology, IJSRCSEIT , Volume 2 ,Issue 3 ,ISSN : 2456-3307,2017

[19] 3rd National Conference on Intelligent Information and Computing Technologies, IICT ‘17

[20] POROUS CLAY CONES FOR THE AUTO-IRRIGATION OF POTTED PLANTS By, BURTON E. LIVINGSTON,The Plant World, Vol. 21, No. 8 (AUGUST, 1918), pp. 202-208, Wiley on behalf of the Ecological Society of America

[21] International Journal of Information Research and Review ,Vol. 05, Issue, 04, pp.5415- 5419, April, 2018.