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CHAPTER -1

INTRODUCTION

Project Title: **Iot based Smart Agriculture Monitoring System**.

Food is a major source of living for every living being. Agriculture is measured as the basis of life for humans. The main basis of food grain and additional raw materials. It shows a vital role for the advancement of countries' budgets. It also delivers large employment opportunities to the people. Growth of agriculture sectors is very essential for the growth of the financial condition of a country. Tactlessly many farmers are using the old-style method of farming which affects low spring of crops and fruits and vegetables. But whatever mechanization has been applied and humans are being switched by programmed machines. The yielding has been upgraded. Most of the papers indicate the use of wireless sensor networks which gathers the data from unlike types of sensors and then sends it to the main server using wireless rules.

Here we are trying to provide the farmers a smart way to monitor their field with the help of ongrowing advanced technology. By this we believe the management of the field will be easier and ….

The Internet of Things (IoT) describes the network of physical objects—“things”—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. These devices range from ordinary household objects to sophisticated industrial tools.

The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction

The Internet of Things has a wide-ranging impact on human life and work. It allows machines to do more heavy lifting, take over tedious tasks and make life more healthy, productive, and comfortable.

How does IoT work?

An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although people can interact with the devices -- for instance, to set them up, give them instructions or access the data.

1.1 OBJECTIVE

- ☐ To develop a system:
- ☐ To make farmers more relaxed and provide a better environment.
- ☐ To make farmers more advanced and friendly with technology but keeping in mind that it helps the environment.

One of the largest livelihood providers in India is agriculture. Agriculture plays an essential role in supporting human life. The rise in population is proportional to increase in agriculture production. Basically, agriculture production depends upon the seasonal situation which does not have enough water resources. To get beneficial results in agriculture and to overcome the problem, an IoT based smart agriculture monitoring system is employed.

Global and regional scale agriculture monitoring systems aim to provide up-to-date information regarding food production , in IOT-based smart farming a system is built for monitoring the crop field with the help of sensors like humidity, soil moisture, air quality etc. the farmer can monitor the field conditions anywhere.

The main objective of this system/project is to monitor the field smartly and efficiently using technology and also to reduce farmers time spent on monitoring the field manually

1.2 PROBLEM DEFINITION

The problem shop-owners are facing that there is no system which is cheap and yet useful for the shop-owners to keep an eye on the products while sitting at the counter and when someone is there or not they need to turn on all the lights while there is no one in the store to over come all this problem of lack of security and wastage of electricity

SURVEY OF EXISTING SYSTEM

In this current present system agricultural land is is controlled with few sensors and microcontrollers. The following sensors are soil moisture sensor, ultrasonic sensor. In the current existing system the soil moisture sensor will detect soil moisture content that is water content in the soil and turn on the water motor. But there is no automatic control of the water motor. In the existing system there is no use of a humidity sensor for detecting humidity in the existing environment. Automation in the existing system is not available .

1.3 PROBLEM SOLUTION

- Our proposed solution for the problem statement given above is that , The soil moisture sensor measures wetness content in the soil. The Arduino UNO microcontroller used to receive input from various sensors and it can be controlled automatically. When the soil moisture sensor goes low the waterpump will be on and it exceeds defined levels of the water motor will turn off automatically.

- We can constantly monitor the growth of a crop using ultrasonic sensors. The farmers did not need to go to their field, they could remotely monitor and control using the application .

- The advantage of using the proposed system is that the water irrigation can be automatically done .

CHAPTER -2
Background and Literature Survey

LITERATURE SURVEY

Literature survey is the most important step in the design and development of a prototype. We have referred several papers for understanding the problems faced in agriculture using existing systems by calculating the performance and by improving the performance. The papers include comparative analysis of several solutions for the problems faced in the agriculture field. This section includes a brief description of work done by various scholars that helped us in designing the prototype for the project.

2.1 DESIGN AND FABRICATIONS OF SOLAR PANEL

- This paper focuses on the building of solar tracking systems using stepper motors. Solar Tracking is a device in which Sona apparels are fixed which follows the indication of the sun through the sky confirming the extreme amount of sunlight will reflect the panel all throughout the day. The Solar tracking will try to direct the total best angle of interaction of light from the sun.

- An in depth outline to the solar panel and solar tracker is defined. Solar tracking is separated into two main classes: software and hardware. It is more sectioned into four main functions. The method of tracking the mounts, driver, motor, power source of the solar tracking system is similarly described.

2.2 MOISTURE SENSING AUTOMATIC PLANT WATERING

This research focuses on an automated plant watering system that evaluates and measures the current temperature before supplying the required amount of water to the plant. It reduces the amount of water used while also keeping plants healthy. The rising need for food necessitates rapid advancements in food production technology. In our country, India, where agriculture is the main source of income and the climate is harsh, we are still unable to fully utilize agricultural resources. The fundamental problem is a lack of knowledge about land scarcity in relation to reservoir water.
The unplanned use of water, which wastes a substantial amount of water, is one of the main reasons behind this. As a result of the system adjustment, plants can be simply watered and cared for by an automatic plant irrigation system

CHAPTER - 3
Required Specification

3.1 TECHNOLOGY

- To run this project we work on Arduino IDE and Blynk software.

Arduino IDE

INTRODUCTION

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them. The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board. The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards.

Arduino is an open-source physical computing platform based on a simple I/O board and a development environment that implements the processing language. Arduino can be used to develop stand- alone interactive objects or can be connected to software on your computer.

UPLOADING

Before you can submit your drawing, you must first pick the relevant items from the Tools> Board and Tools> Port menus. The panels that follow have been defined. Once you've chosen the proper hole and board, click the Upload button on the toolbar or choose Upload from the file menu. The current Arduino automatically rearranges and begins loading. With older boards (pre-Diecimila) that do not have automatic reset, you must first hit the keyboard reset button before you can begin loading. When the drawing is loaded, the LEDs RX and TX on most boards will blink. The Arduino Software (IDE) displays the message or signals a problem after the download is complete. If you insert a sketch, using a small programme called the Arduino bootloader, which is loaded to your board onto the Smart Agriculture using IOT 2020-2021 DEPARTMENT OF ECE, NHCE

37 microcontroller. You can upload code without any other hardware. As soon as the board changes, the boot loader is active for a few instants and before starting which sketch the microcontroller has lately been uploaded. The committed LED is blinked once the gumboot loader starts.

LIBRARIES

Libraries Deliver additional functions aimed at sketching, e.g. hardware work or numbers manipulation. Choose it from the Plan > Importation Library blackboard in instruction to custom a public library in a sketch. This inserts the top of the draught with one or more "#" statements and collects the library with your sketch. Since collections are uploaded to the board using drawing, the sum of galaxies they occupy increases. If you need to delete your sketch from the top of your code, simply delete its #include statements. The reference contains a list of libraries. Some libraries have Arduino software included. Others are available for download from various sources or via the Library Manager. Can introduce a library from a zip file from version 1.0.5 of the IDE, and use it in an open draft. For the installation of a third party library see these instructions.

SERIAL MONITOR

If you need to delete your sketch from the top of your code, simply delete its #include statements. The reference contains a list of libraries. Some libraries have Arduino software included. Others are available for download from various sources or via the Library Manager. You can weight a library after a zip file from version 1.0.5 of the IDE, and use it in an exposed sketch. Aimed at the installation of a third party library see these instructions.

LANGUAGE SUPPORT

Arduino (IDE) has been translated into more than 30 languages since version 1.0.1. The IDE loads in your operating system's chosen language by default. Twitch the Arduino and open the preference gap if you wish to change linguistic manually. A drop-down tariff is available next to the Editor Language Languages supported. Choose from the menu your favorite language and resume the software to use the language designated. The Arduino defaults to English if your operating scheme language is not reinforced. By choosing the scheme evasion from the corrector language pop-up, you can reappear the software to its evasion setting, by choosing its language based on your working system. When you restart the Arduino programme, this setting will take effect (IDE). Likewise, you must reboot arduino software to upgrade to the new evasion language after changing configurations of your operating system.

BOARDS

The selection of the board has two consequences: It sets the parameters for accumulating and inserting sketches and sets the folder and rage settings used in the scald boot loader knowledge. Some panel definitions only differ in the later, so you lack to check it earlier by burning the bootloader even if the board selection has been downloaded successfully. A comparison table can be found here between the different boards. The integral provision for boards in the next list is provided by Arduino Software (IDE), all founded on the AVR Essential. The boards comprised in the standard fixing allow the increasing Smart Agriculture using IOT 2020-2021 DEPARTMENT OF ECE, NHCE 38 Number of new panels to be supported based on dissimilar

Blynk Software

Blynk is an IoT platform for iOS or Android smartphones that is used to control Arduino, Raspberry Pi and NodeMCU via the Internet. This application is used to create a graphical interface or human machine interface (HMI) by compiling and providing the appropriate address on the available widgets.

Blynk was built for the Internet of Things. The hardware may be operated from a distance, sensor data can be shown, data can be recorded and visualized, and so on.
There are three primary components to the platform: Blynk App - Allows you to create beautiful interfaces for your projects by combining numerous widgets from our library. All smartphone hardware transportations are touched by the Blynk Server. You can crowd

a local Blynk secluded server or use our Blynk Cloud. It's a free and exposed source, and it can effortlessly grip thousands of plans. It can smoothly run on a Raspberry Pi.

Blynk Libraries - Allow server connection and the dispensation of all inward and outward-bound instructions on all general hardware stages with Blynk Libraries.

Features

Similar API & UI for all supported hardware & devices Connection to the cloud using: WiFi Bluetooth and BLE Ethernet USB (Serial) GSM Set of easy-to-use Widgets Direct pin manipulation with no code writing Easy to integrate and add new functionality using virtual pins History data monitoring via SuperChart widget Device-to-Device communication using Bridge Widget Sending emails, tweets, push notifications, etc

3.2 HARDWARE REQUIREMENTS

The Hardware required for this project are –

1. Node MCU
2. Male/Female Wire
3. Arduino UNO
4. Humidity and temperature Sensor (DHT11)
5. Soil Moisture Sensor
6. Water pump
7. Relay
8. Solar Panel
9. Breadboard

NodeMCU

NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module.Later, support for the ESP32 32-bit MCU was added.

Overview

NodeMCU is an open source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). The term "NodeMCU" strictly speaking refers to the firmware rather than the associated development kits.

Both the firmware and prototyping board designs are open source.

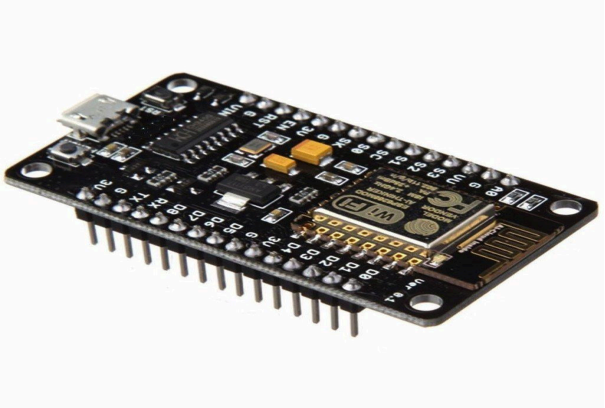
The firmware uses the Lua scripting language. The firmware is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS. Due to resource constraints, users need to select the modules relevant for their project and build a firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented.

The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications

Programming Model

The NodeMCU programming model is similar to that of Node.js, only in Lua. It is asynchronous and event-driven. Many functions, therefore, have parameters for callback functions.

connect to WiFi access point (DO NOT save config to flash)
wifi.setmode(wifi.STATION)
station_cfg={}
station_cfg.ssid = "SSID"
station_cfg.pwd = "password"
station_cfg.save = false
wifi.sta.config(station_cfg)



Male/Female Wire

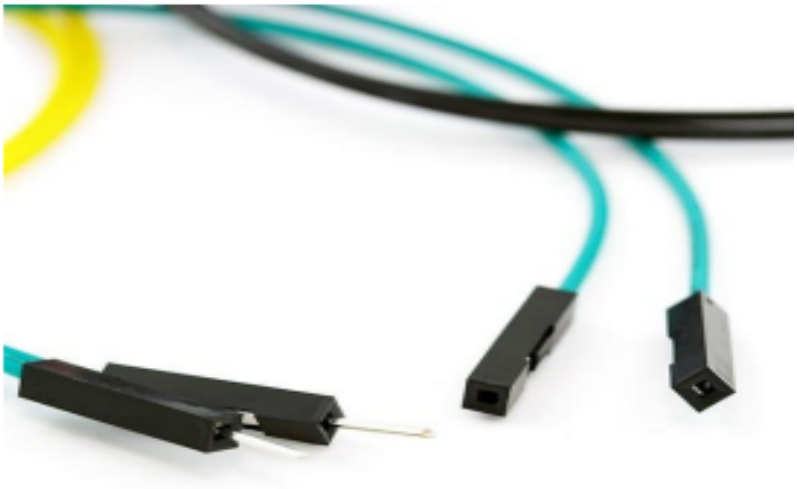
Male Wire

A male connector is commonly referred to as a plug and has a solid pin for a center conductor. A female connector is commonly referred to as a jack and has a center conductor with a hole in it to accept the male pin.

Female Wire

A female connector is a connector attached to a wire, cable, or piece of hardware, having one or more recessed holes with electrical terminals inside, and constructed in such a way that a plug with exposed conductors (male connector) can be inserted snugly into it to ensure a reliable physical and electrical connection . A female connector is also known as a jack, outlet, or receptacle. This type of connector can be recognized by the fact that, when it is disconnected or removed, the electrical conductors are not directly exposed, and therefore are not likely to make accidental contact with external objects or conductors.

The most common female connector is a two- or three-prong electrical outlet, also known as a wall outlet. Other often-encountered examples include telephone jacks , the jacks for headsets, the chassis connectors for coaxial cable, and some D-shell connectors for computer serial and parallel ports.

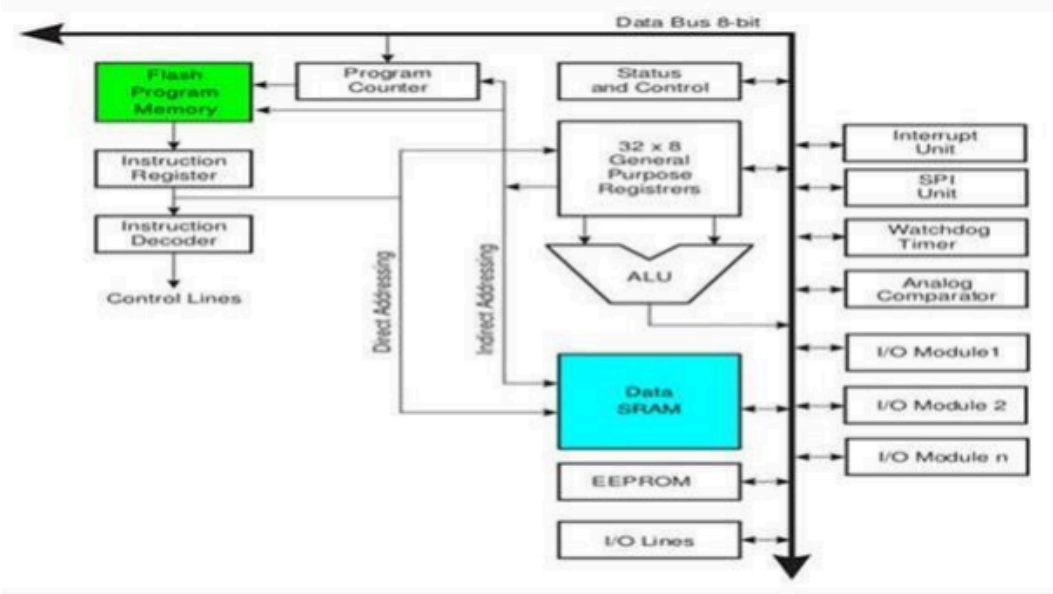


Arduino UNO Microcontroller

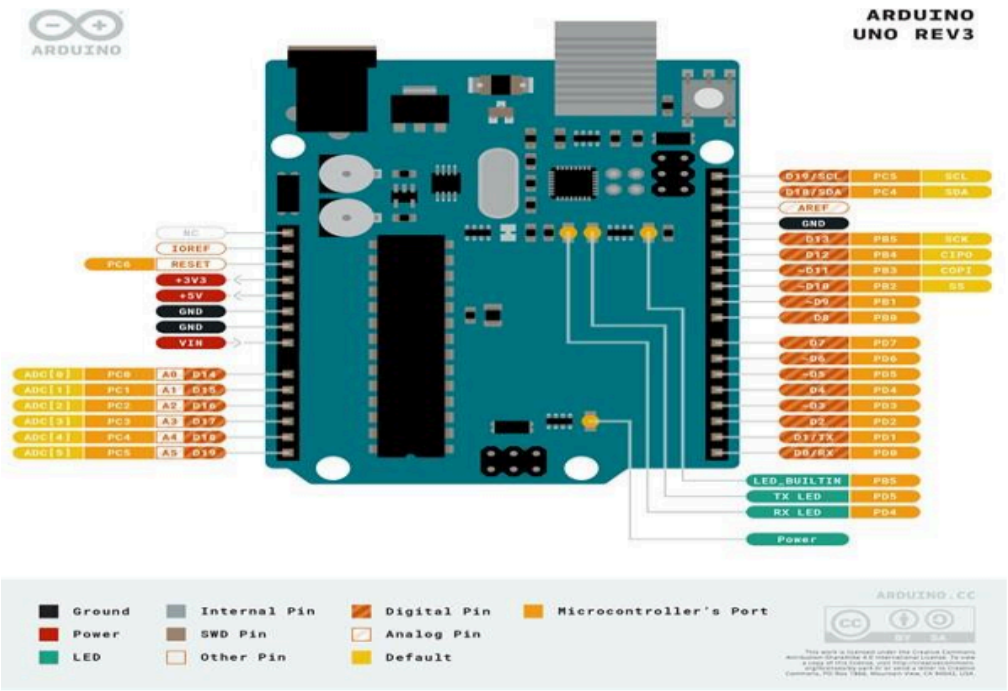
An Arduino may be a microcontroller based kit which may be used either directly by purchasing from a vendor or are often made reception using specific components required for the build of Arduino and owing to its open source hardware features. it's basically utilized in communication and controlling. It performs operations supporting desired input and provides or performs operations at the output end.. Arduino was found by Massimo Banzi and David Cuartielles in 2005

Arduino architecture

Arduino is mainly using the Harvard style of architecture with a separate memory of the programme code and programme data. It contains two programmes and data storage. It is saved to the flash memory storage and the information is saved to the data memory storage. The Atmega328 takes 32 kb of flash storage unit for bootloaders with a code of 0.5KB and a clock-speed of 16MHz, with 2kb of sram and 1kb of eeprom. The main benefit of Arduino is that the programmes can be overloaded straight into the devices without having to burn the programme from any hardware programming. The bootloader's 0.5KB enables this to be done by burning the programme in the circuit. We have to copy and write code to the Arduino software.



Arduino pin diagram:



Arduino Uno comprises 14 digital i/o pins, 6 of it can be useful as PWM output and 6 analogue i/p's, a 16MHz crystal oscillator with a USB connections, an ICSP with power jack and as a reset
button.

Digital inputs:

With a current of 40mA, it has 14 digital input and output pins. Some have more advanced functionality, such as receiver and transmitter pins 0 and 1, serial pins 2 and 3, external pins 3,5,6,9, and 11, PWM output, and pin 13 connected to an LED. Analog inputs and outputs: There are six analogue input and output pins, each with a resolution of ten bits. AREF serves as the analogue input's reference. When the voltage is low, it will reset the microcontroller.

Humidity and temperature Sensor (DHT11)

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). It's fairly simple to use, but requires careful timing to grab data.

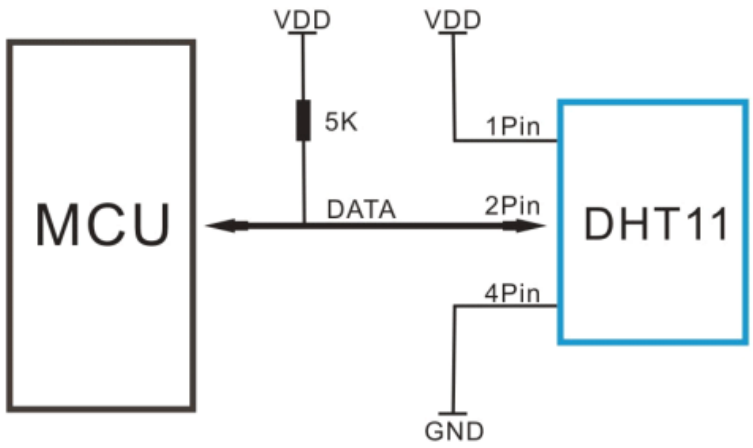
DHT11 module is a Temperature and humidity sensing module, which uses Digital Signal Acquisition, which converts the Temperature and Humidity to a digital Reading, which can be easily read by a Microcontroller. Operating range of DHT11 is 0 to 50 degree Celsius which is quite sufficient for Home or Hobby purposes.

DHT11 Specifications

- Operating Voltage: 3.5V to 5.5V
- Operating current: 0.3mA (measuring) 60uA (standby)
- Output: Serial data
- Temperature Range: 0°C to 50°C
- Humidity Range: 20% to 90%
- Resolution: Temperature and Humidity both are 16-bit
- Accuracy: ±1°C and ±1%

HUMIDITY OUTPUT:

0.9V → low humidity output voltage and range 30%RH.
3.4V → high humidity output voltage and range 90%RH



Soil moisture sensor

The moisture content in soil can be gauged via electrical resistance, which changes as water levels vary. The resultant electrical conductivity shift enables a soil moisture sensor to detect moisture content. This data can then be transmitted to an agricultural monitoring system, automating irrigation or helping to enhance crop yields.

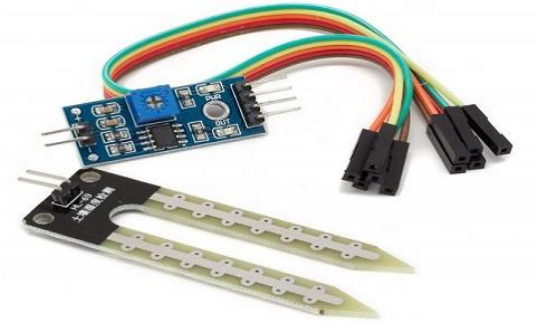
This sensor mainly utilizes capacitance to gauge the water content of the soil (dielectric permittivity). The working of this sensor can be done by inserting this sensor into the earth and the status of the water content in the soil can be reported in the form of a percent.This sensor makes it perfect to execute experiments within science courses like environmental science, agricultural science, biology, soil science, botany, and horticulture.

The water content in soil is unrushed by Soil Moisture Devices. A moisture sensor contains numerous sensors of soil moisture. You can use this Soil wetness to sense the soil wetness or to detect water around the device so that the plant life in your plot can help you. Put this component into the ground and then set up the involved potentio meter for compassion adjustment. When moisture is above/below the threshold set by the potentiometer, the sensor will dispense HIGH/LOW logic.

Specifications

The specification of this sensor includes the following.

- The required voltage for working is 5V
- The required current for working is <20mA
- Type of interface is analog
- The required working temperature of this sensor is 10°C~30°C



Water Pump

A water pump is a tiny or micro AC or DC water pump usually used to pressurize, circulate, or pump water for different uses. The DC type can have a rating of 3V, 5V, 6V, 12V, or 24V, and you can power it using a battery or solar.

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 thereof.

The relay permits a small amount of electrical current to control high current loads. When voltage is supplied to the coil, small current passes through the coil, resulting in a larger amount of current passing through the contacts to control the electrical load.

The 1 Channel 5V Relay Module provides a single relay that can be controlled by any 5V digital output from your microcontroller. The relay is accessible using screw terminals and can handle up to 2A of current. A handy LED indicates the status of the relay.

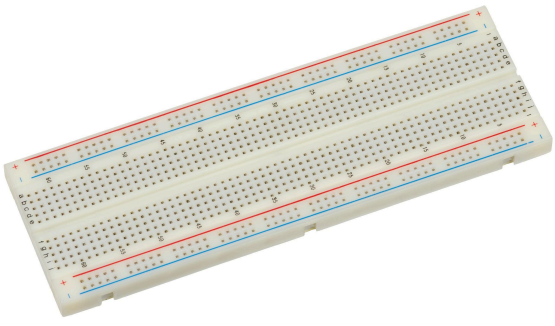
Solar Pannel

This is a high-performance, lightweight, portable monocrystalline silicon solar panel in a PET package, with an integrated voltage regulator output of 5V, with working indicators, USB type-A mother-port output, plug-and-play.

Breadboard

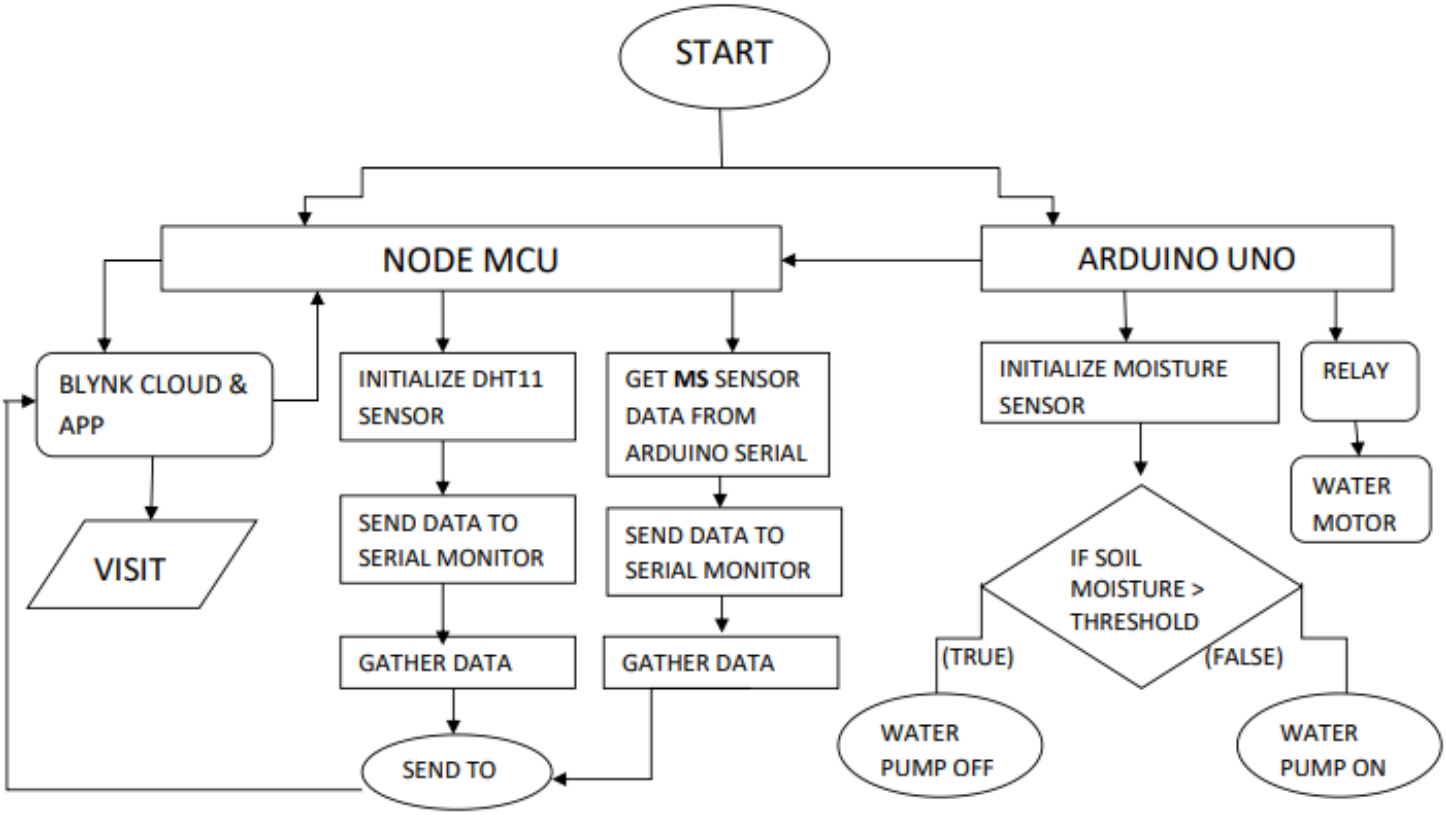
A breadboard, solderless breadboard, or protoboard is a construction base used to build semi-permanent prototypes of electronic circuits. Unlike a perfboard or stripboard, breadboards do not require soldering or destruction of tracks and are hence reusable.

A breadboard (sometimes called a plugblock) is used for building temporary circuits. It is useful to designers because it allows components to be removed and replaced easily. It is useful to the person who wants to build a circuit to demonstrate its action, then to reuse the components in another circuit.

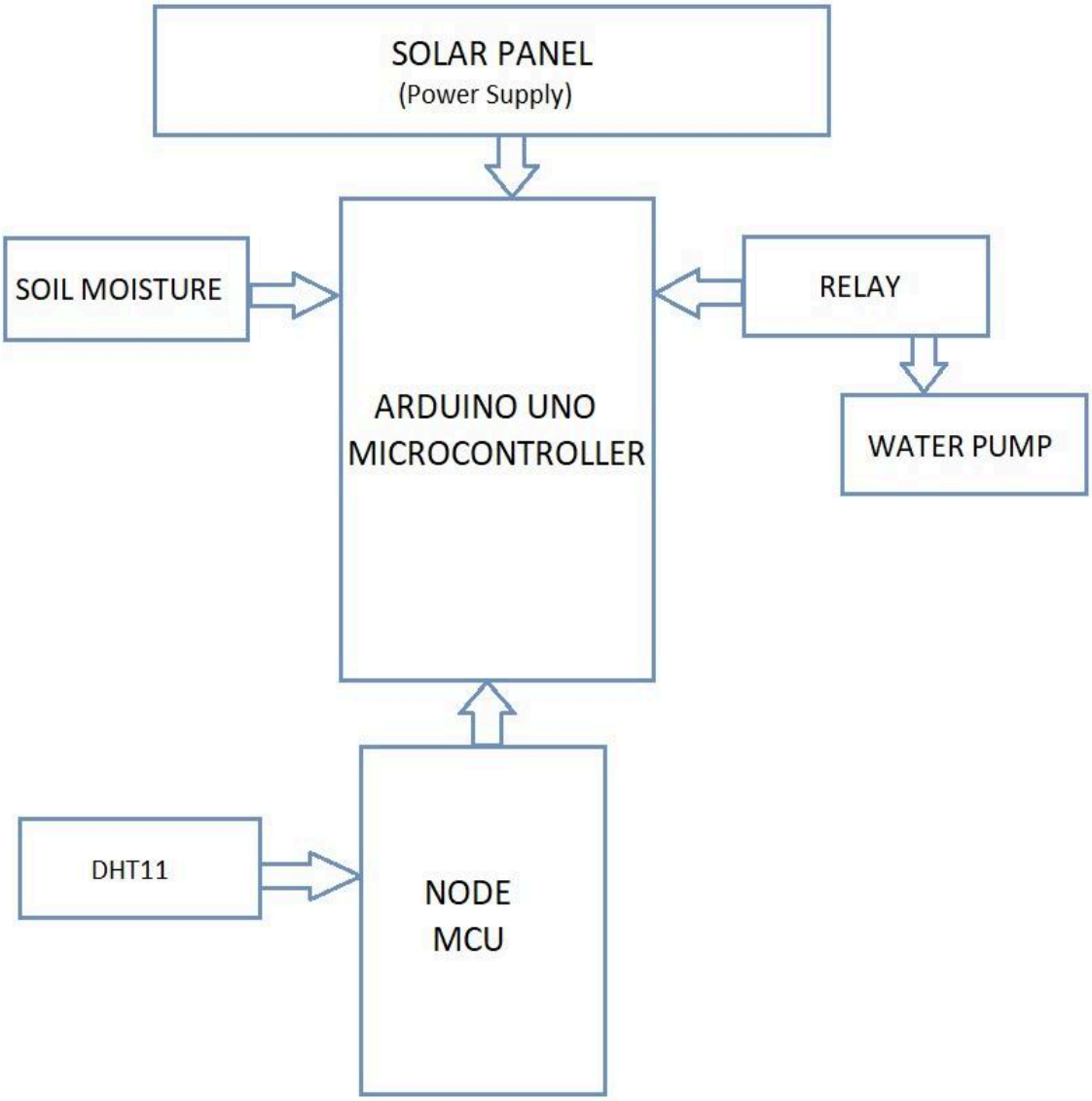


CHAPTER -4
System Design

4.1 FLOW CHART



4.2 BLOCK DIAGRAM



CHAPTER -5
IMPLEMENTATION

5.1 Methodology

- To monitor the state of the environment, we used four sensors in the suggested system: temperature, humidity, soil moisture, and water level sensor.
- A temperature sensor is a device that detects the ambient temperature.
- A humidity sensor detects the amount of moisture in the air.
- A water level sensor is used to determine the level of water on agricultural land. When the water level falls below a certain level, the water motor turns on automatically.
- The moisture content of the soil is detected using a soil moisture sensor. When the value exceeds the threshold, an alert message will be sent to the node MCU.
- Moisture in the Soil Sensor data is communicated to the server, which then takes the appropriate action, such as using a water motor to moisten the soil if the moisture level is below what is required.
- Humidity Sensor detects moisture in the air

5.2 IOT Implementation Setup

Using real-time data or sensor data, an IOT-based smart agriculture system is utilized to make irrigation system decisions. The farmer initially signs into the system with his own credentials, rather than using a username and password through an Android or iOS app. Three phases are involved in the implementation of the system.

- Sensing
- Processing
- Dissemination of data

Sensing phase

Temperature, wetness, humidity, and motion are among the physical factors that are sensed during the sensing phase. The Arduino Uno microcontroller board is connected to these sensors. The Arduino Uno microcontroller is used in an Internet of Things (IoT) application, in which the board serves as an IoT gateway in the built system. It has the ability to send information or data to the cloud. The information is transferred utilizing the ESP 8266 module, also known as the Node MCU

Processing phase

The cloud at this phase consists of a web server and a database where the sensed data is stored, as well as a decision logic that makes decisions depending on the data. The result of the decision logic will be transferred to the android app and subsequently to the IOT gateway in this step of information distribution. The following is the algorithm for a smart agriculture system:

- Begin

* Continuous sensor data acquisition on the Arduino Uno microcontroller. *

Analog to digital conversion of sensor data on the Arduino Uno microcontroller.

* Use an IOT gateway to send data to the cloud.*

If the data exceeds the threshold, + the application receives a notification; + if the user selects turn on.

Sends a control signal to the server (cloud), which is subsequently forwarded to the IOT gateway .

The water motor is turned on when the IOT gateway triggers the relay; otherwise, if the user selects off, it is turned off.

Sends a control signal to the cloud server. # After that, a control signal is transmitted to the IoT gateway.

The relay is triggered by the IoT gateway, and the water pump is shut off.

+Endif \s* Else

+ Keep an eye out for the threshold condition.

*Endif \s-End

Information distribution

The Android Blynk app was used to create the smart agricultural app. The following are the features offered by the application.

1. Choosing whether or not to turn on/off the water pump
2. Irrigation profile selection, i.e. when the farmer wants to start irrigation and when he wants to stop irrigation.
3. Advice to the farmer on which pesticides to use for their particular crop.

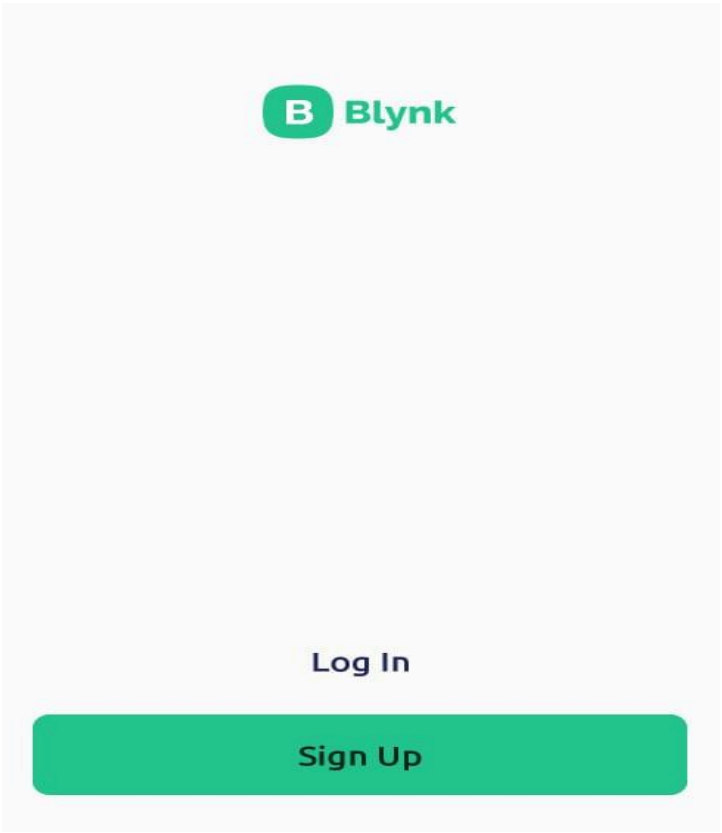
5.3 Cloud setup

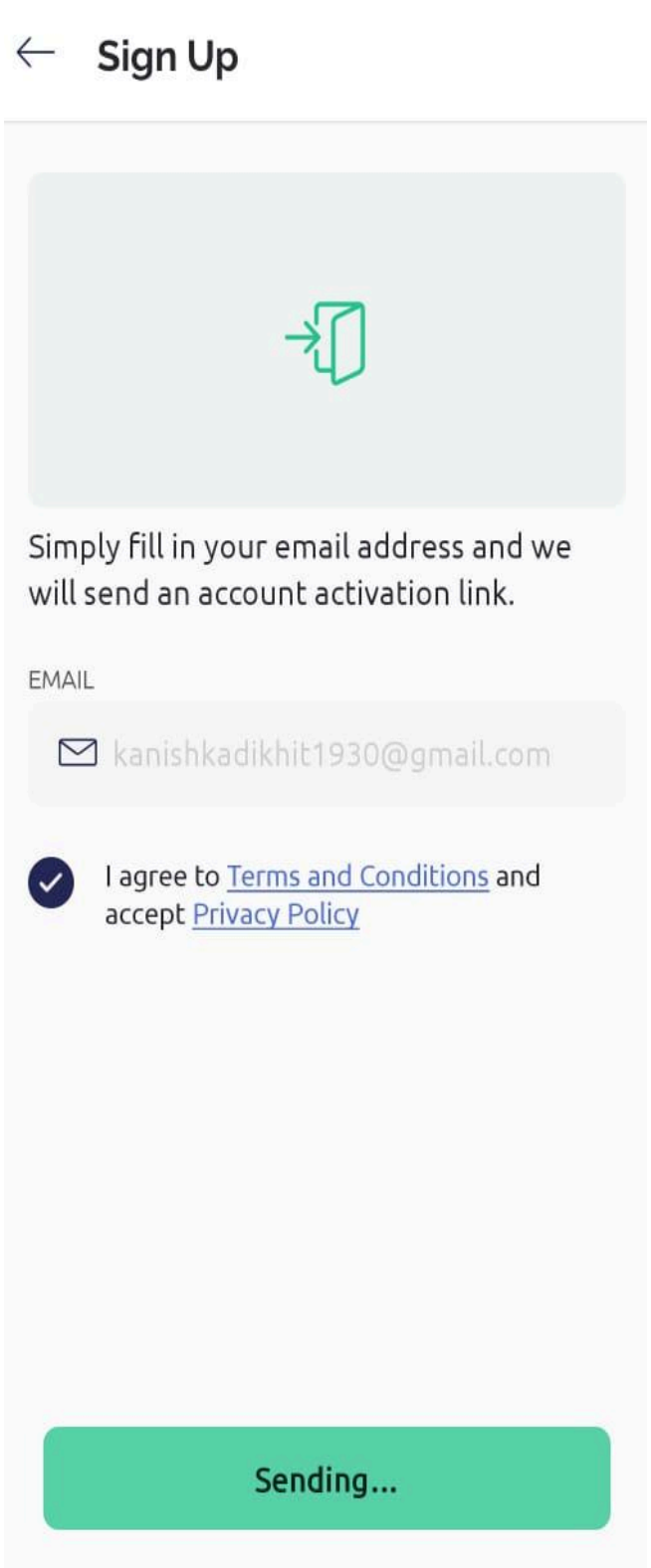
Blynk was created with the internet of things in mind. It has the ability to manage hardware remotely, show sensor data, save data, visualize it, and perform a variety of other tasks.

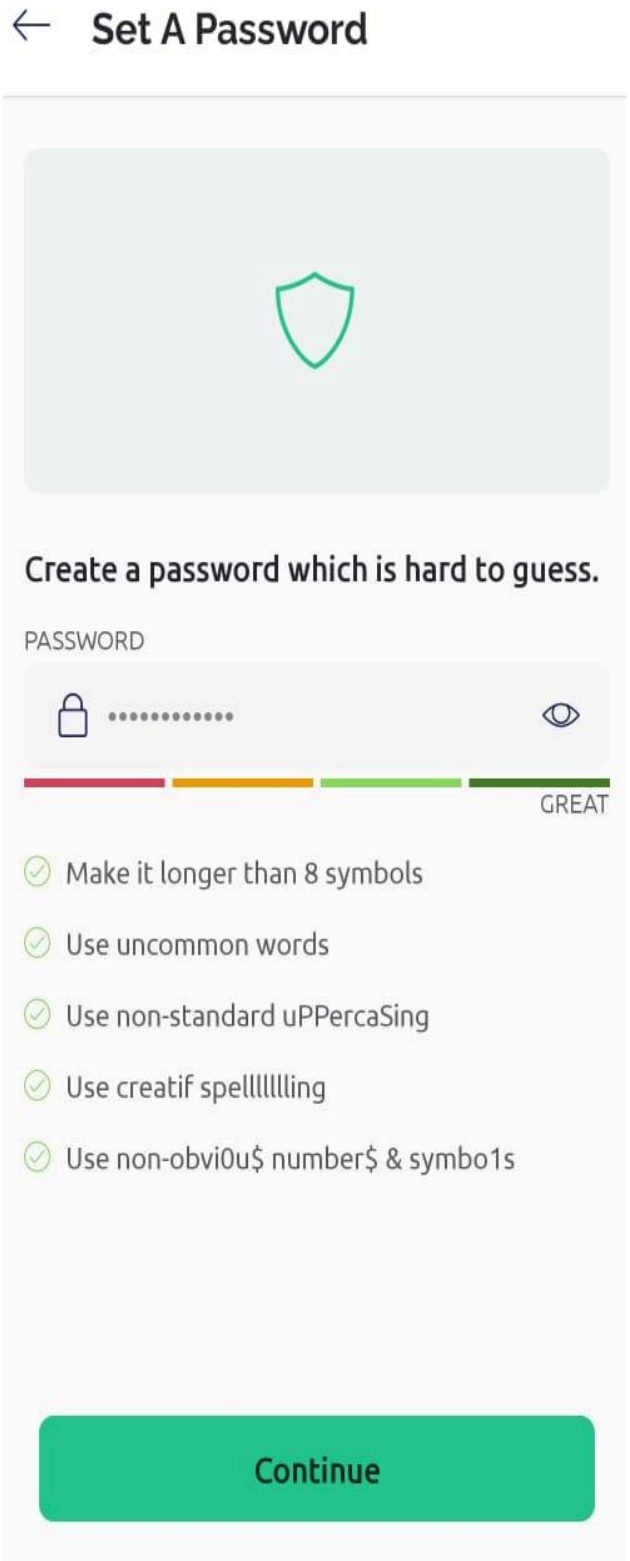
Setting up Blynk :

- Sign up a Blynk account

- Select the sign up option on the screen.

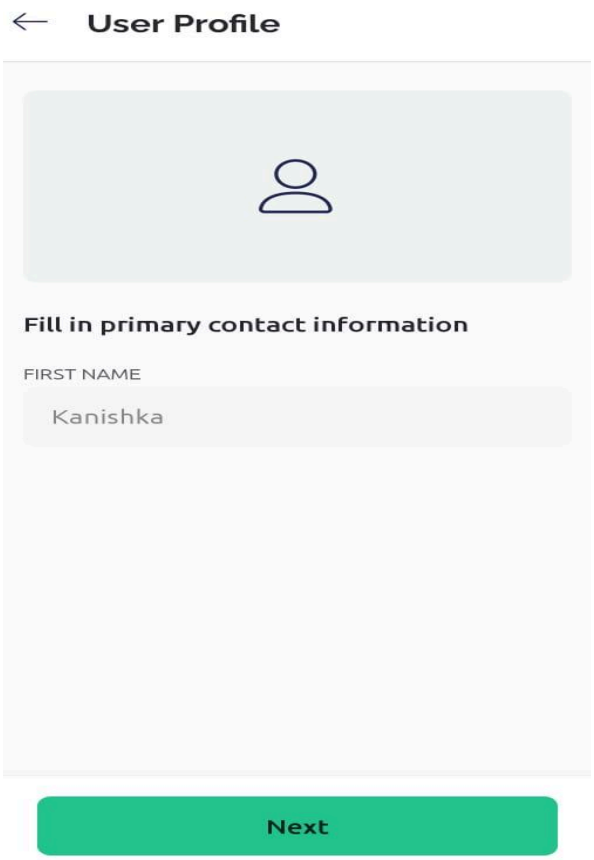



Sign Up
Simply fill in your email address and we will send an account activation link.
EMAIL
kanishkadikhit1930@gmail.com
I agree to Terms and Conditions and accept Privacy Policy
Sending...

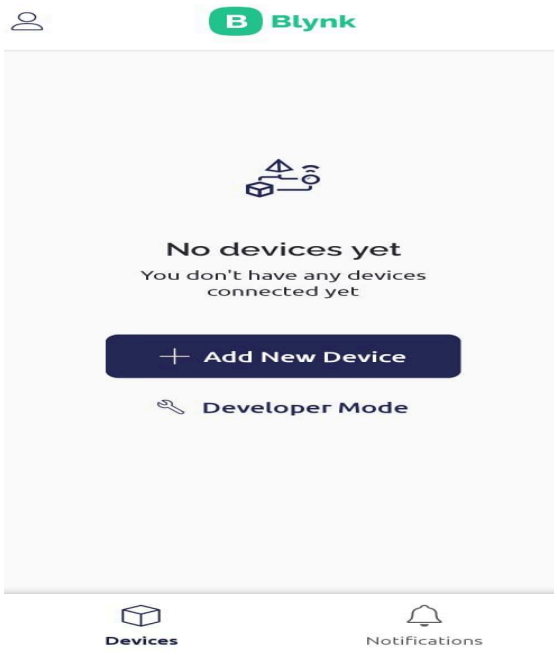

Set A Password
Create a password which is hard to guess.
PASSWORD
GREAT
Make it longer than 8 symbols
Use uncommon words
Use non-standard uPPercaSing
Use creatif spellllllling
Use non-obvi0u$ number$ & symbo1s
Continue

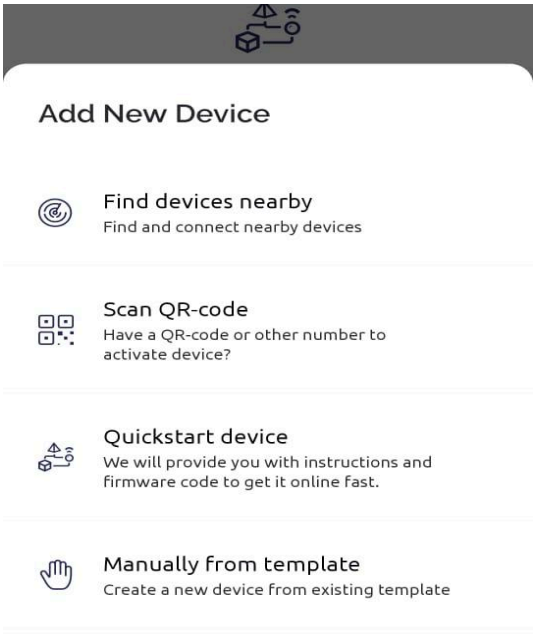
Add email address to set account Set a strong password.

- Set user profile.



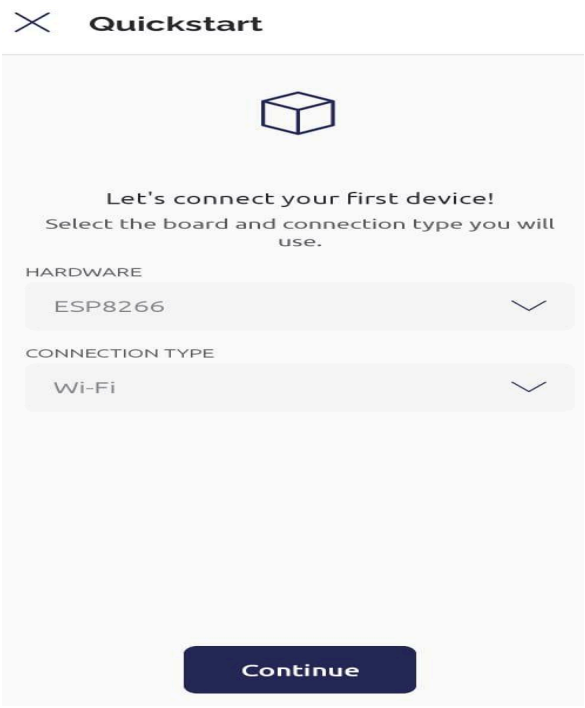
- Generate a new task

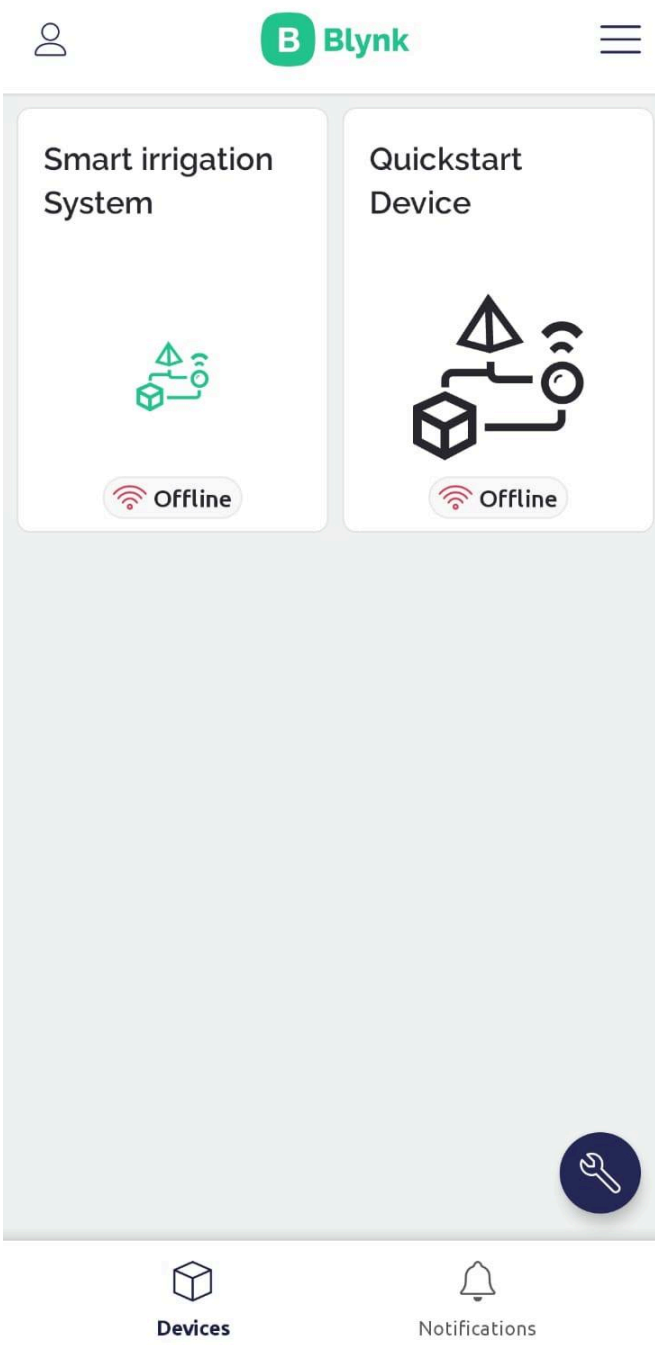


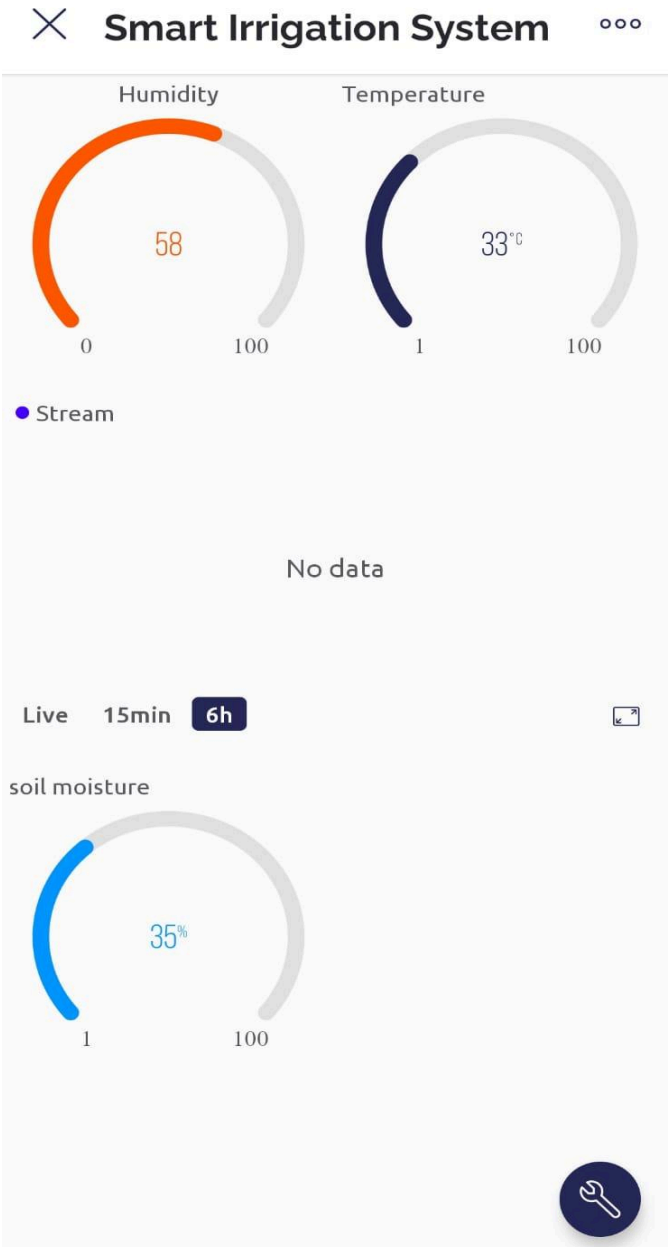


-Choosing Hardware

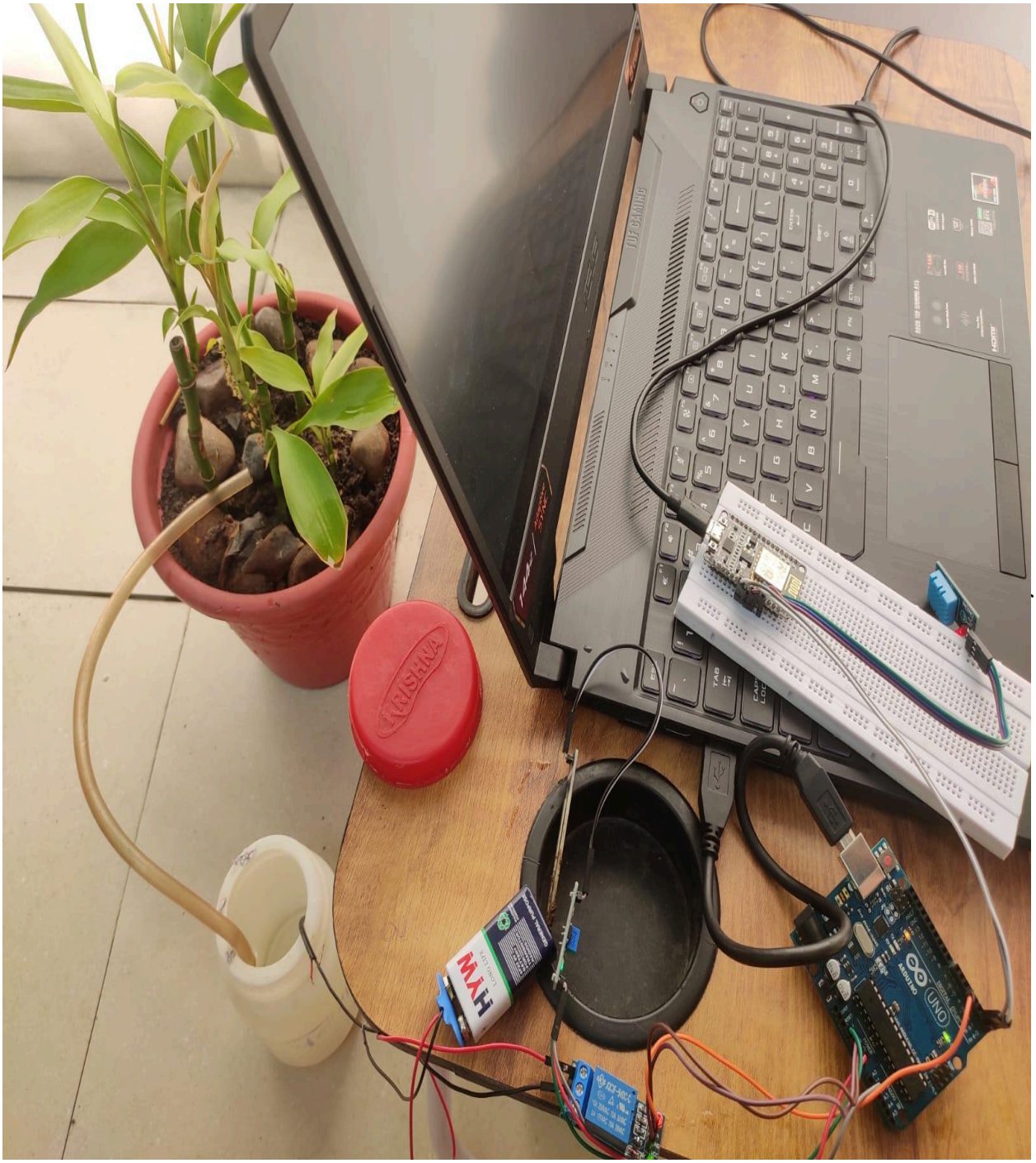
Selecting the hardware model (esp8266)




Blynk
Smart irrigation System
Quickstart Device
Offline
Offline
Devices
Notifications


Smart Irrigation System
Humidity
Temperature
58
0
100
33°C
1
100
Stream
No data
Live
15min
6h
soil moisture
35%
1
100

5.4 PROJECT IMAGE



CHAPTER -7

7.1 Future scope

In the current project we have implemented a project that can protect and maintain the crop. In this project the farmer monitors and controls the field remotely. In future we can add or update a few more things to this project.

- We can create a few more models of the same project ,so that the farmer can have information about the entire project.
- We can update this project by using solar power mechanisms. So that the power supply from electric poles can be replaced with solar panels. It reduces the power line cost. It will be a one time investment. We can add solar fencing technology to this project
- We can use GSM technology for this project so that the farmers can get the information directly to his home through SMS. This helps the farmer to get information if there are internet issues .
- We can add a camera feature so that the farmer can monitor his field in real time. This helps in avoiding thefts

7.2 LIMITATIONS

One huge disadvantage of smart farming is that it requires an unlimited or continuous internet connection to be successful. This means that in rural communities, especially in the developing countries where we have mass crop production, it is completely impossible to operate this farming method. In places where internet connections are frustratingly slow, smart farming will be impossible. Smart farming makes use of high techs that require technical skill and precision to make it a success. It requires an understanding of robotics and ICT.

However, many farmers do not have these skills. Even finding someone with this technical ability is difficult or even expensive to come by, at most. Advantages and Disadvantages of Smart Farming can be a discouraging factor hindering a lot of promising farmers from adopting it

Chapter - 08
APPENDEX

moistureardu.ino

```
int relayPin = 4;
const int sensor_pin = A1;//moisture sensor
void  setup(){
  Serial.begin(9600);
  pinMode(relayPin, OUTPUT);
  pinMode(sensor_pin, INPUT);
  Serial.println ("Reading From the Sensor ...");
  delay(2000);
}

void loop(){
  //Moisture Sensor
  int moisture_percentage;
  int sensor_analog;
  sensor_analog = analogRead(sensor_pin);
  moisture_percentage = ( 100 - ( (sensor_analog/1023.00) * 100 ) );
  Serial.print("Moisture Percentage = ");
  Serial.print(moisture_percentage);
  Serial.print("%\n\n");

  if (moisture_percentage < 40)
  {
    digitalWrite (relayPin, LOW);
    Serial.println("Pump turned on");
  }
  else
  {
    digitalWrite (relayPin, HIGH);
    Serial.println("Pump turned off");
  }
  delay(3000);
 }
```

ESPBLYNK.ino

```
#include <SoftwareSerial.h>
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include <DHT.h>

SoftwareSerial arduinoSerial(D5, D6);

#define DHTPIN D3
#define DHTTYPE DHT11
DHT dht(DHTPIN, DHTTYPE);


char auth[] = "z2y3ie0njGal-FmjXprBz2VoTy-9xaK0";
char ssid[] = "BSNL-FIBER";
char pass[] ="7312970994";

void setup()
{
 Serial.begin(9600);
 arduinoSerial.begin(9600);
 WiFi.begin(ssid, pass);

 while (WiFi.status() != WL_CONNECTED) {
  delay(1000);
  Serial.println("Connecting to WiFi...");
 }
 dht.begin();
 Blynk.begin(auth, ssid, pass);
}

void loop()
{
 float h = dht.readHumidity();
 float t = dht.readTemperature();
 if (isnan(h) || isnan(t)) {
  Serial.println("Failed to read from DHT sensor!");
```

```
    return;
  }

  Blynk.virtualWrite(V0, t);
  Blynk.virtualWrite(V1, h);

  if (arduinoSerial.available())
  {
    int moisture_percentage = arduinoSerial.parseInt();
    //Serial.println("moisture:", moisture_percentage);
    Blynk.virtualWrite(V3, moisture_percentage);
    Blynk.virtualWrite(V5, moisture_percentage);
  }
  delay(2000);
  Blynk.run();
}
```

Chapter - 09
CONCLUSION

Farmers can benefit greatly from an IoT-based smart agriculture system. As a result of the lack of irrigation, agriculture suffers. Climate factors such as humidity, temperature, and moisture can be adjusted depending on the local environmental variables. This technology also detects animal invasions, which are a major cause of crop loss. This technology aids in the scheduling of irrigation based on present data from the field and records from a climate source. It helps in deciding the farmer whether to do irrigation or not to do.Continuous internet connectivity is required for continuous monitoring of data from sensors.This also can be overcomed by using GSM unit as an alternative of mobile app. By GSM, SMScan be sent to farmers' phones .