TEAM: BIJLI WAALE

CCIOT: SMART AGRICULTURE

Smart irrigation and management using IOT

BIJLI WAALE

CONTRIBUTION

Sannidhya Gupta	Hardware design layout + code (Water dispensing logic) + piping
Krishna Singh	Hardware Implementation + wiring + help with code
Vinkesh Bansal	Code (All parts with sensor data) + ThingSpeak integration with system
Rhuthik P.	Soldering and assembling of sensor box + research about requirements

WHY SMART AGRICULTURE?

Smart irrigation using Internet of Things (IoT) technology offers several advantages over traditional irrigation methods:

- Reduced Water consumption
- Improved plant health
- Data tracking & analysis
- Cost savings
- Convenient management
- Weather adaptability

WORKING PRINCIPLE

DATA COLLECTION

Data is collected from DHT22 and capcitive soil moisture sensor and sent to the microcontroller as collected data.

ANALYSIS

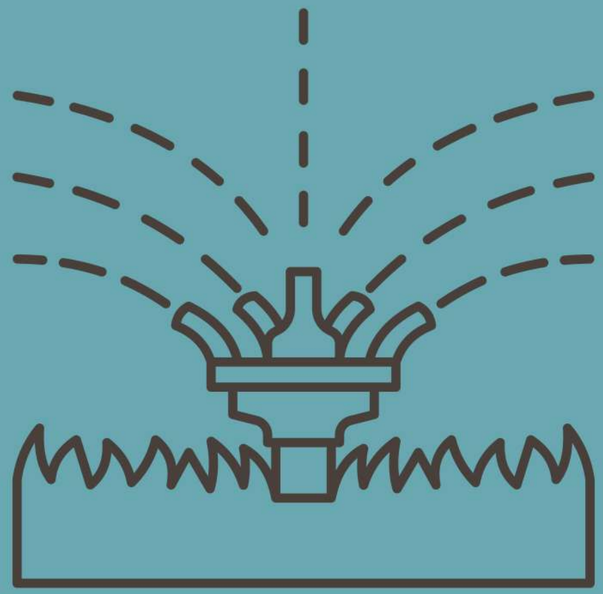
The data is then analysed and optimal time and condition for irrigation is calculated.

IRRIGATION

On reaching the condition of irrigation, a fixed amount of water is dispensed through the feeder pipe which irrigates the plants.

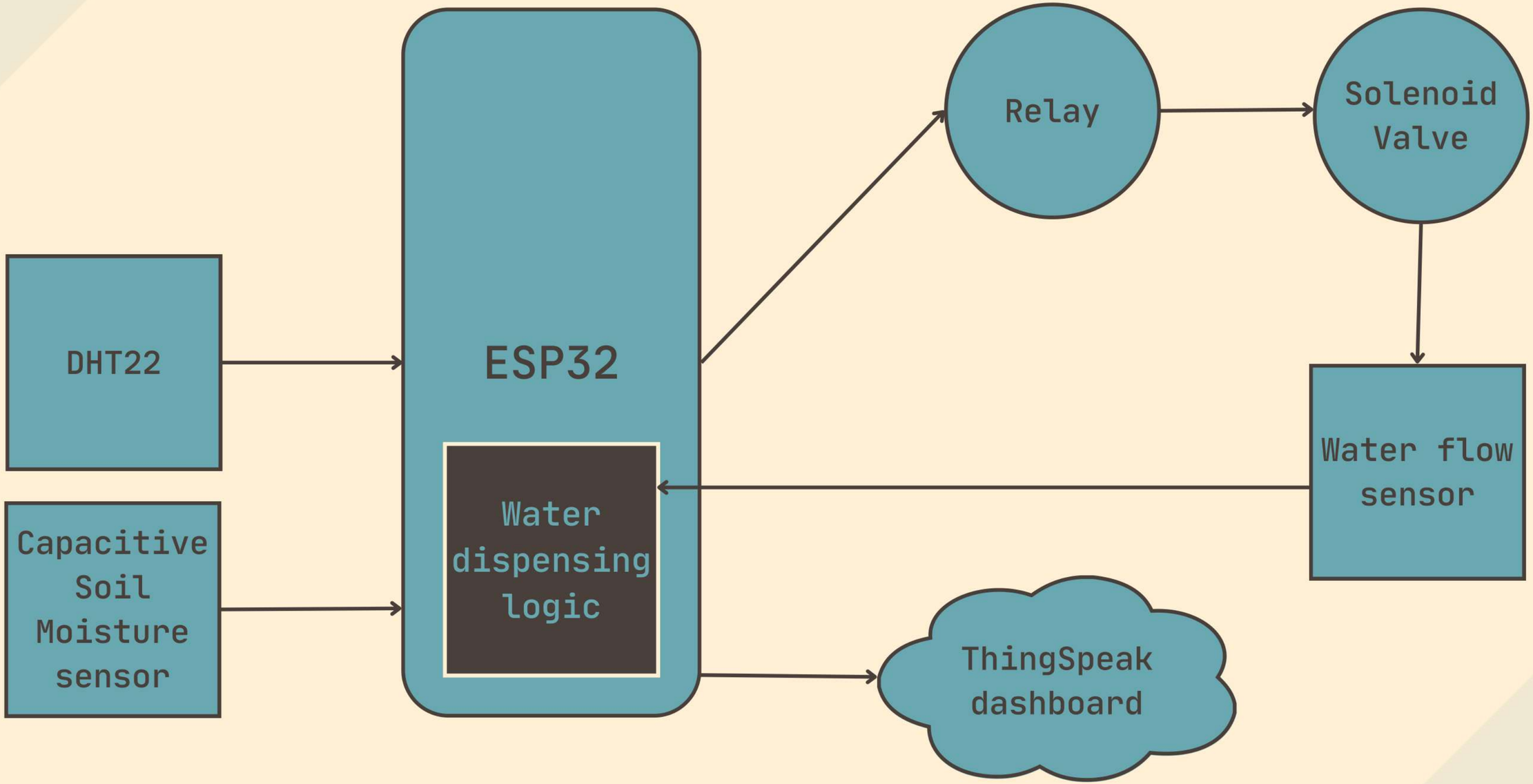
DATA DISPLAY AND TRACKING

The collected data from sensor and irrigation time is collected and displayed on ThingSpeak dashboard

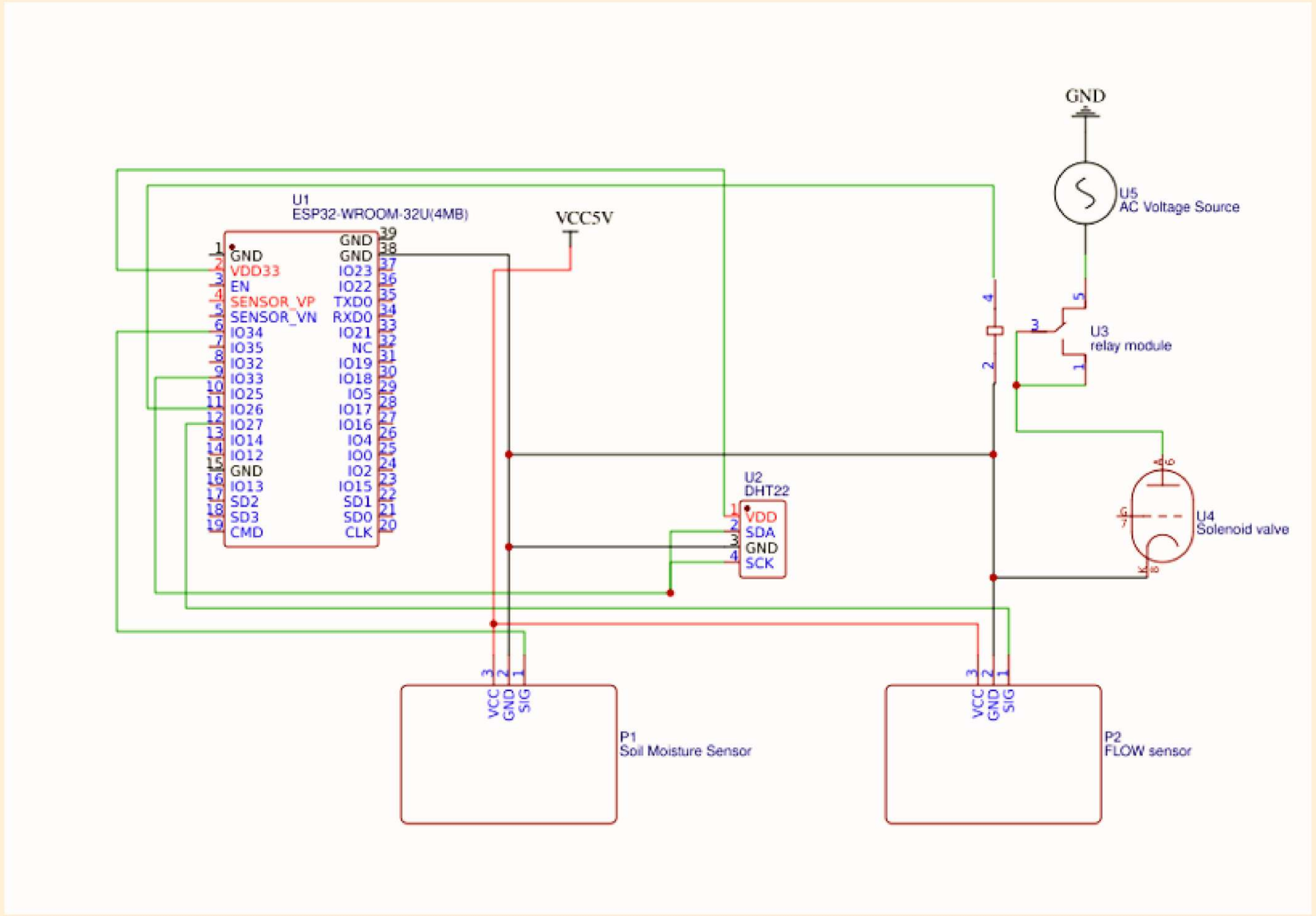


Water reaches the plants by using drip irrigation lines from main feeder pipeline

BLOCK DIAGRAM OF THE DESIGN



CIRCUIT DIAGRAM



COMPONENTS USED:

Following are the electronic components used:

DHT22

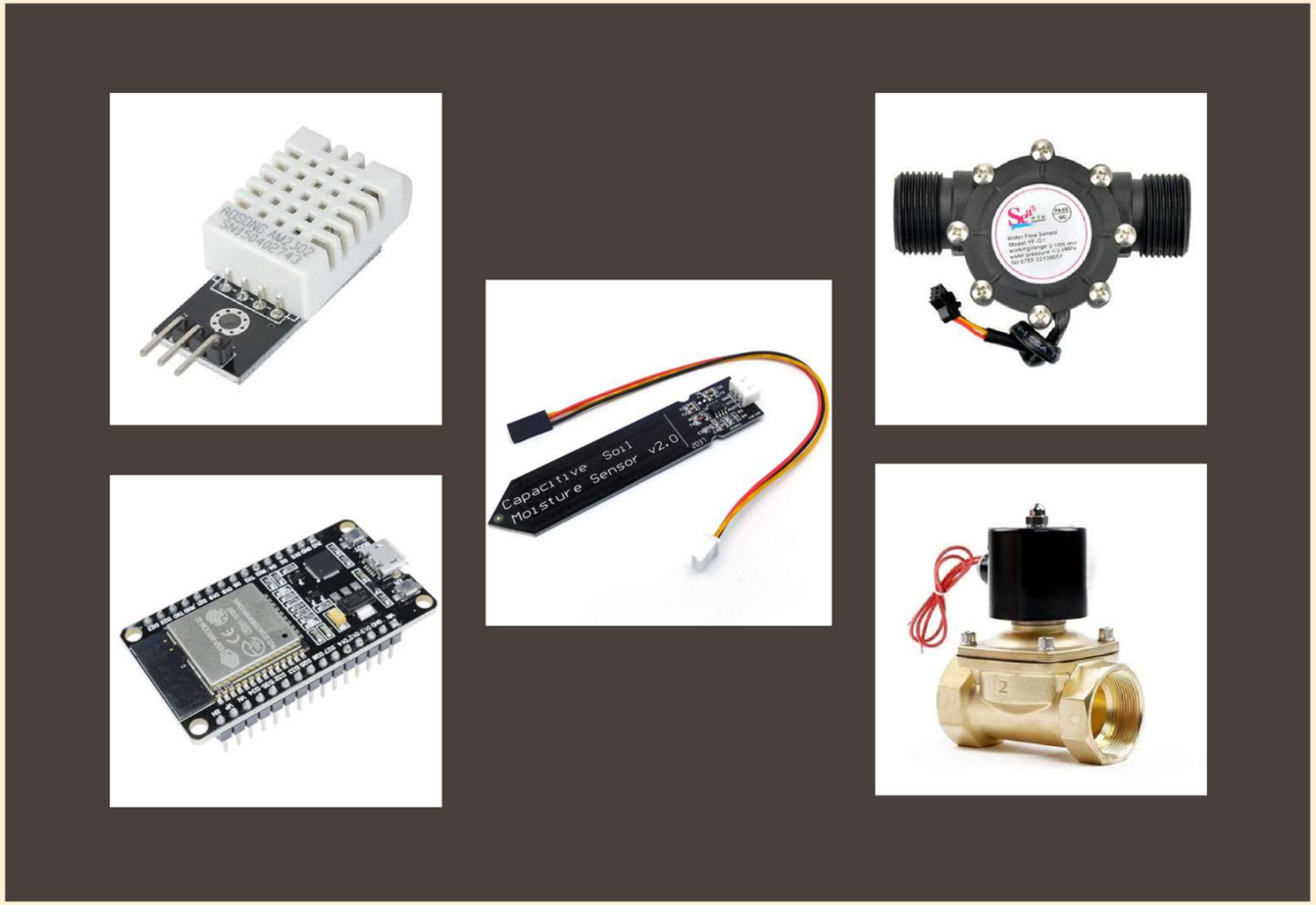
CAPACITIVE SOIL MOISTURE SENSOR

FLOW SENSOR

ESP32

SOLENOID VALVE

AND PLUMBING EQUIPMENT



WHY THESE COMPONENTS?

DHT22
Cheap, easy to use, covers desired temperature range

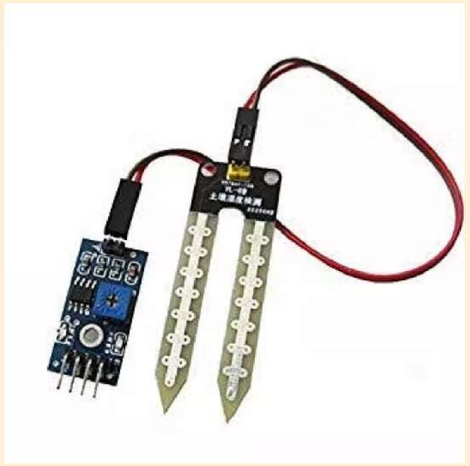
ESP32
Very powerful and compact microcontroller with WiFi support

220V AC Solenoid Valve
This valve handles 1MPa of pressure, and water pipes experience 0.6-0.7MPa

Capacitive Soil Moisture Sensor
Better than resistive moisture sensor in terms of longetivity & reliability

WHY CAPACITIVE SOIL MOISTURE SENSOR ?

Resistive



- The resistive sensor has two probes which allow the current to pass through the soil and then it gets the resistance value to measure the moisture value.
- The major issue is the corrosion of the sensor probes because it is in contact with the soil and there is a DC current flowing which causes electrolysis of the sensors.

Capacitive

- Capacitive measuring not only avoids corrosion of the probe but also gives a better reading of the moisture content of the soil.
- It measures the ions that are dissolved in the moisture i.e. Adding fertiliser for instance will decrease the resistance of the soil, even though no water is added.

CALIBRATION OF MOISTURE SENSOR

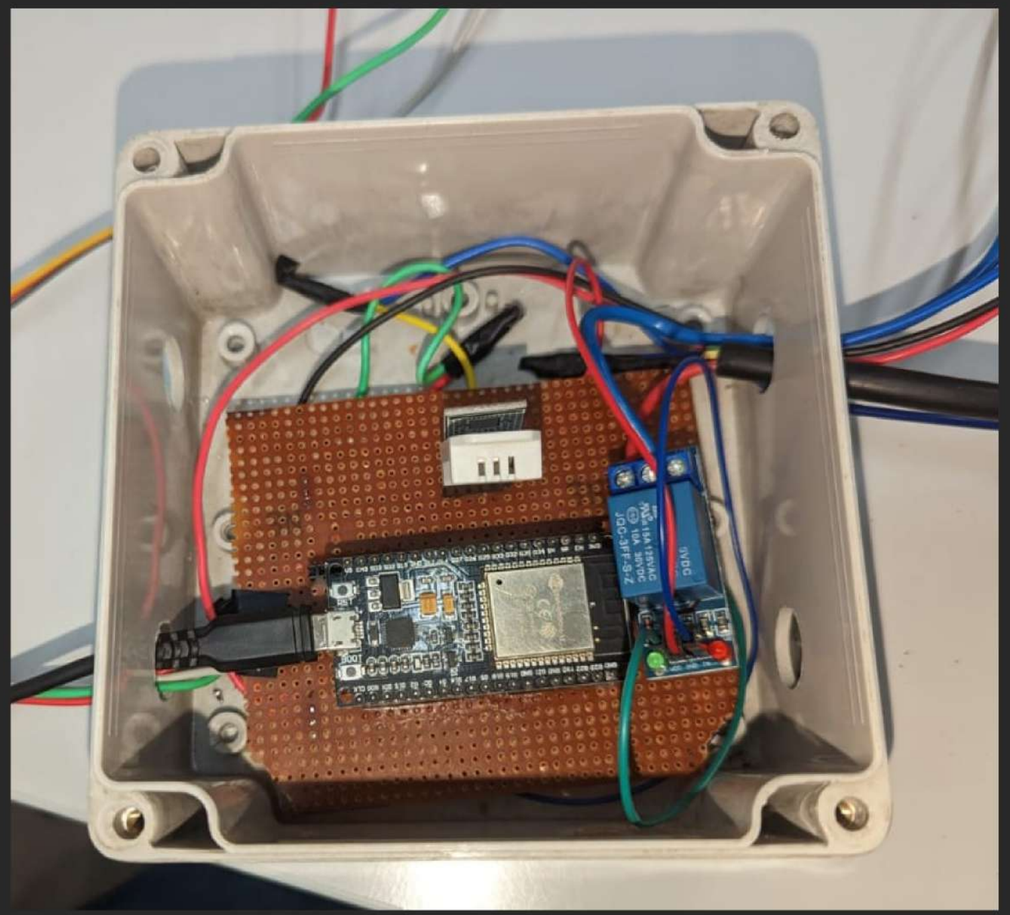
The soil moisture content should be maintained in the range of 40% to 70% of the soil's maximum water holding capacity (WHC). Sensor values corresponding to dry and swampy soil were mapped to 5% and 95%, respectively.

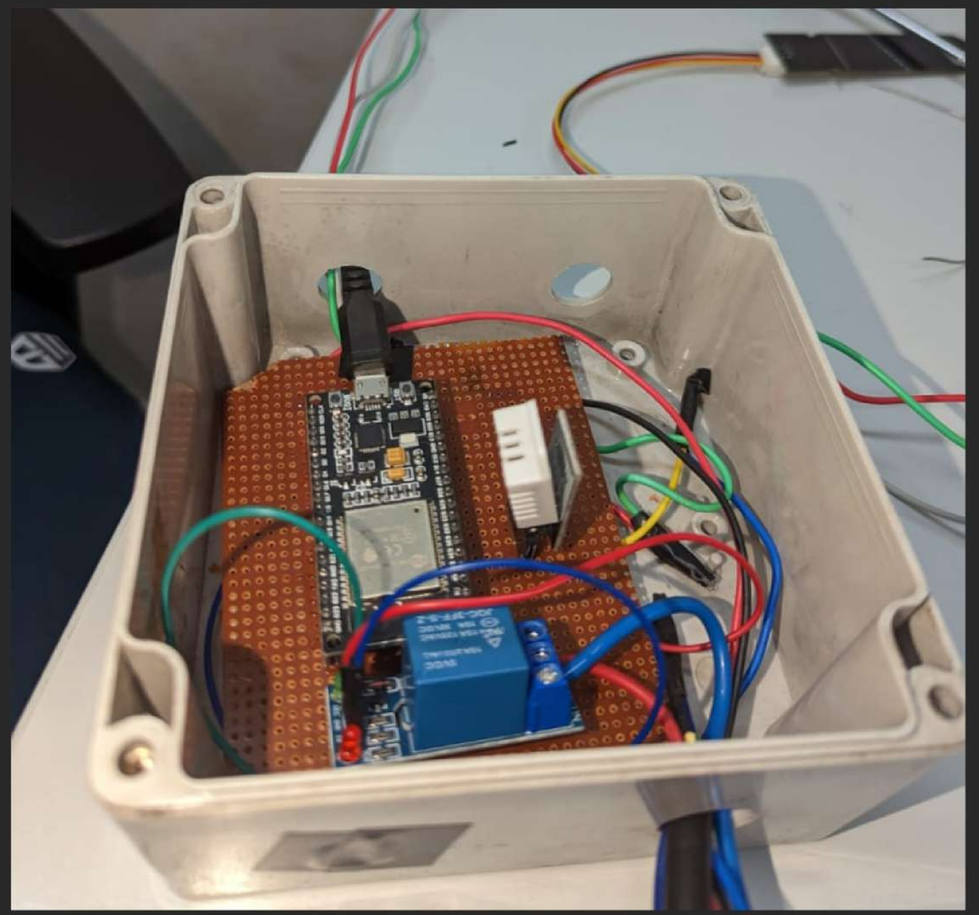
DEPLOYMENT SITE

We have deployed our system on a patch of Ashoka trees outside Kohli Research Block, IIITH

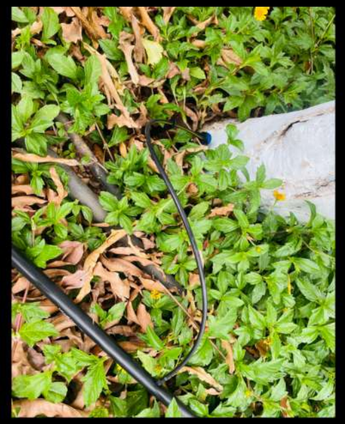
Before deployment

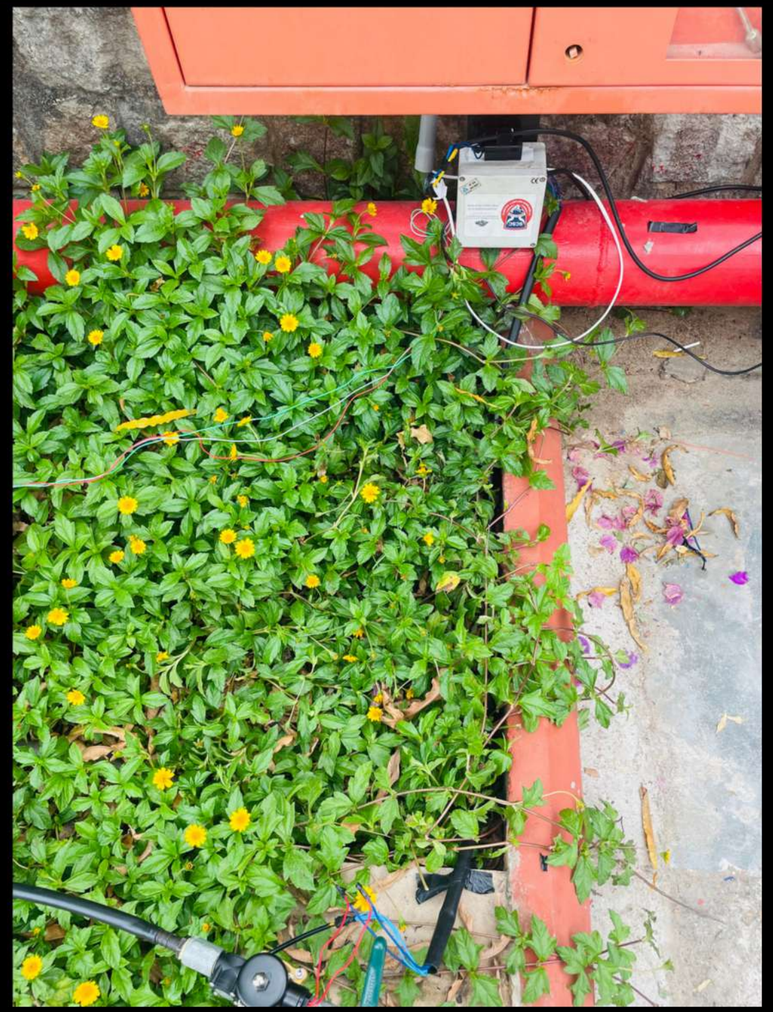
SENSOR BOX





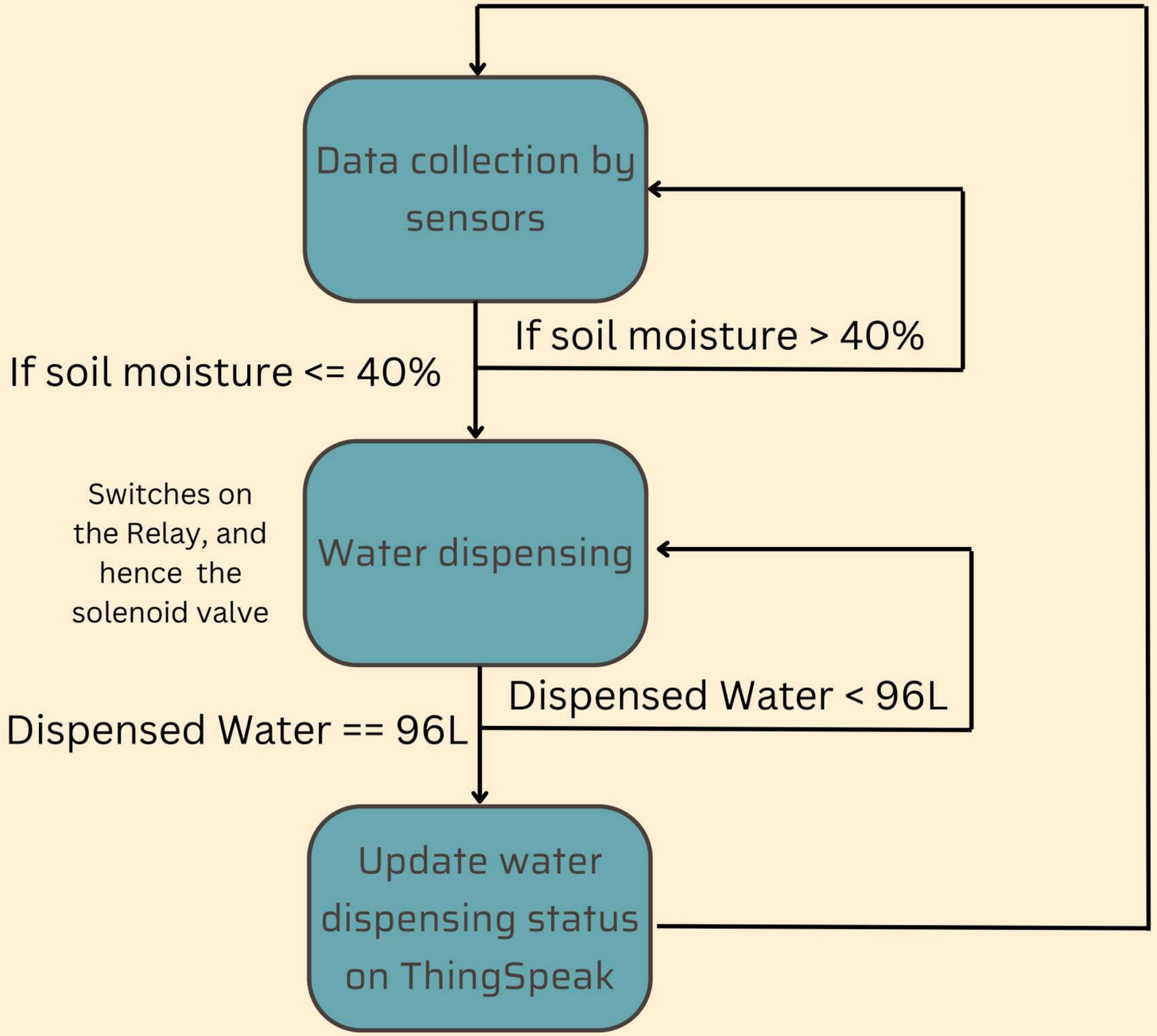
DEPLOYMENT





FUNCTIONING OF CODE

```
83  void loop() {
84
85    int value = analogRead(mois_PIN);  // read the analog value from flow_PIN
86    int ll = 750; // lower limit
87    int ul = 2800; // upper limit
88    int range = ul - ll;
89    value = value - ll;
90    float final = ((float)value / range) * 100;
91    final = 100 - final;
92
93    if (GivingWater == 0) {
94      temp = dht.readTemperature();  // Gets the values of the temperature
95      humid = dht.readHumidity();
96      Serial.print("Moisture value: ");
97      Serial.println(final);
98      ThingSpeak.setField(6, final);
99      Serial.print("temp value: ");
100     Serial.println(temp);
101     ThingSpeak.setField(1, temp);
102     Serial.print("humidity value: ");
103     Serial.println(humid);
104     ThingSpeak.setField(2, humid);
105     httpCode = ThingSpeak.writeFields(myChannelNumber, myWriteAPIKey);
106     if (httpCode != 200) {
107       Serial.println("Problem writing to channel. HTTP error code " + Strir
```



THINGSPEAK DASHBOARD

DATA FIELDS DISPLAYED:

- TEMPERATURE
- HUMIDITY
- SOIL MOISTURE
- WATER DISPENSING STATUS

VIDEO OF WORKING #1

IRRIGATION SYSTEM

A SMALL DEMONSTRATION OF THE SYSTEM WORKING PROCESS. THE WATER REACHES THE TREE THROUGH THE DRIP PIPE RIGHT AT ITS BASE.

VIDEO OF WORKING #2

Future Plans

- UPDATE THE CODE FOR CASES LIKE NO WATER SUPPLY OR PIPE BLOCKAGE.
- DATA ANALYSIS TO DETERMINE OPTIMAL WATER QUANTITY.
- INSTALL MORE SENSORS SUCH AS LIGHT INTENSITY, FERTILIZER SENSOR ETC.
- PROPER MAINTENANCE ENSURING OUR DEPLOYMENT SUSTAINS.

THANK YOU