VISVESVARAYA TECHNOLOGICAL UNIVERSITY

BELAGAVI-590018 KARNATAKA

A

MINI PROJECT REPORT

ON

"SMART IRRIGATION SYSTEM USING IOT"

Submitted by:

BASAVARAJESHWARI	2LG22CS006
REKHA	2LG22CS030
SHRIDEVI	2LG22CS044
SHRIDEVI AJJODI	2LG23CS409

Under the Guidance of

Asst-Prof. Prof. TEJASHWINI HIREMATH(B.E)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

GOVERNMENT ENGINEERING COLLEGE

TALAKAL, KOPPAL-583238

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GOVERNMENT OF KARNATAKA

GOVERNMENT ENGINEERING COLLEGE TALAKAL,

KOPPAL – 583238

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the Project Work entitled **“SMART IRRIGATION SYSTEM USING IOT”** carried out by bonafied students of B.E 5th Semester have successfully completed the practical assessment for the partial fulfillment of the Bachelor Degree in E and Engineering as prescribed by the Visvesvaraya Technological University, Belagavi, during the year 2024-2025.The project report has been approved as it satisfies the academic requirements in respect of work prescribed for the Bachelor of Engineering Degree.

Name of the Student	**University Seat Number**
BASAVARAJESHWARI	2LG22CS006
REKHA	2LG22CS030
SHRIDEVI	2LG22CS044
SHRIDEVI AJJODI	2LG23CS409

…………………………   …………………………

Signature of Guide   Signature of HOD

Signature of Principal

Dr. Virupaxi Bagodi

Name of the Examiner   Sign and Date

1……………………………………….   ………………….

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BASAVARAJESHWARI 2LG22CS006
REKHA 2LG22CS030
SHRIDEVI 2LG22CS044
SHRIDEVI AJJODI 2LG22CS040

ABSTRACT

In India, agriculture assumes an essential part for advancement in nourishment generation. In our nation, agriculture is relies upon the rainstorm which isn't adequate wellspring of water. So the irrigation is utilized as a part of agriculture field. In Irrigation framework, contingent on the dirt sort, water is given to plant. Automated irrigation framework comprises of a criticism control framework that utilizes monitoring of ecological parameters and controlling irrigation. Natural parameters such soil dampness, temperature and moistness assume a critical part in general improvement of the product and great yield. Preservation of water and other asset can be accomplished by upgrading these parameters. The progressions in science and innovation have empowered the utilization of current innovation, similar to Wireless Sensor Network (WSN), in such framework with ease. WSN can be consolidated to disseminate the monitoring over whole harvest field. This paper surveys for different sensors accessible to screen above ecological parameters and concentrates on different procedures utilized as a part of for automated irrigation.

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CHAPTER 1

INTRODUCTION

Water scarcity and inefficient irrigation practices are significant challenges in agriculture and landscape management. A Smart Irrigation System using IoT (Internet of Things) offers an innovative solution to optimize water usage while enhancing crop yield and resource efficiency. This system leverages IoT technology to automate and intelligently manage irrigation processes. Sensors, such as soil moisture, temperature, humidity, and weather data sensors, are integrated into the system to gather real-time data from the environment. This data is transmitted to a cloud platform or a centralized control system via IoT-enabled devices. Using data analytics and pre-set parameters, the system decides the optimal amount of water required and triggers irrigation only when necessary. This reduces water wastage, minimizes manual intervention, and ensures the plants or crops receive the right amount of water at the right time. Agriculture is considered as the basis of life for us as it is the main source of food and other raw materials. It plays vital role in the growth of country's economy. Growth in agricultural is necessary for the economic development condition of a country.

1.1 Problem statement

- The motivation for this project came from the countries where economy is based on agriculture and the climatic conditions lead to lack of rains & scarcity of water. Our country mostly depends on agriculture.
- The farmers working in the farm lands are solely dependent on the rains and bore wells for irrigation of the land. Even if the farm land has a water-pump, manual intervention by farmers is required to turn the pump on/off whenever needed.

1.2 Objective

- The project aim is to detect the dryness in soil using sensors and provide water to the plants appropriately. This project helps to maintain the plants quite easily. In this project we are detecting soil moisture and need for Irrigation.
- The Aim of our project is to minimize this manual intervention by the farmer.

CHAPTER 2

LITERATURE SURVEY

Bobby Singla, Satish Mishra [2018]: published a paper on “A study on smart irrigation system using IoT” This system helps the farmer by working automatically and smartly. With placing sensor in the soil, water can be only provided to the required piece of land. This system requires less maintenance so it is easily affordable by all farmers. This system helps to reduce water consumption with using this system the crop production increases to a great extent.

Girish K.M, Jahnavi N [2023]: published a paper on “smart irrigation system using Arduino” 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. As water supplies become scarce and polluted, there is a need to irrigate more efficiently in order to minimize water use. However, research indicates that different sensors types perform under all conditions with no negative impact on crop yields with reductions in water use range as high as 70% compared to traditional practices.

S Nalini Durga, M Ramakrishna [2018]: published a paper on “smart Irrigation system based on soil moisture using Arduino” has been designed and tested successfully. It has been developed by integrated features of all the hardware components used. The system has been tested to function automatically. The moisture sensors measure the moisture level (water content) of the different plants.

Priyanka and Jain [2017]: Developed an “automatic irrigation system using an Arduino microcontroller and a moisture sensor”. The system was designed for small-scale irrigation and could be easily implemented by farmers to reduce labour costs and improve crop yields. The authors used a moisture sensor to detect the soil moisture levels and trigger the irrigation system when the levels fell below the desired threshold.

Karan Kansara [2015]: build an” automatic irrigation system on sensing soil moisture content” includes the soil moisture sensor is placed in the soil with crops, which checks the moisture level of the soil and send signals to Arduino. Arduino takes the decision of whether to switch-on or switch-off the water motor. Using such techniques the wastage of water in agriculture can be stopped.

CHAPTER 3

SYSTEM MODEL

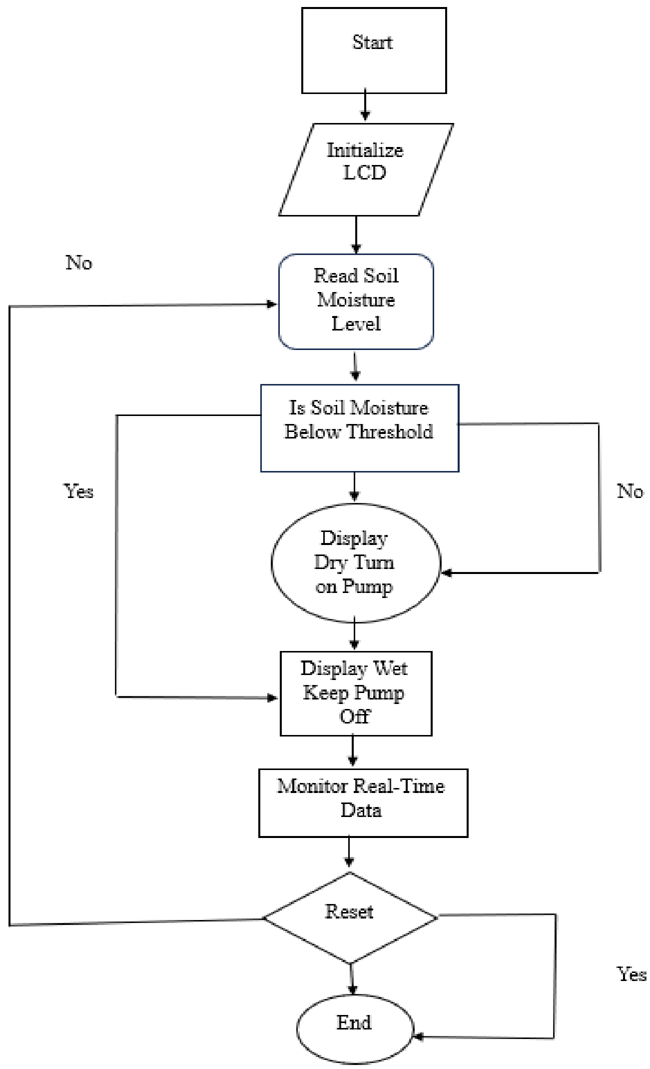

Fig 3.1 flowchart

The most creative and challenging face of the system development is System Design. It provides the understanding and procedural details necessary for the logical and physical stages of development. In designing a new system, the system analyst must have a clear understanding of the objectives, which the design is aiming to fulfill. The first step is to determine how the output is to be produced and in what format. Second, input data and master files have to be designed to meet the requirements of the proposed output. The operational phases are handled through program construction and testing.

CHAPTER 4

REQUIREMENT SPECIFICATION

4.1 Software Requirements

Software	:	Arduino Cloud
Programming language	:	Embedded Programming Language

4.1.1 Arduino cloud

Arduino Cloud is a versatile platform designed to simplify the process of creating and managing IoT (Internet of Things) projects. It enables users to connect, monitor, and control their Arduino devices from anywhere using a web-based dashboard or mobile app. With features like real-time data visualization, automated triggers, and seamless integration with other services such as Alexa, Arduino Cloud provides an intuitive environment for both beginners and advanced users. The platform supports various Arduino and third-party devices, and its code editor streamlines programming with pre-built libraries and templates.

4.1.2 Embedded programming language

An embedded programming language is a specialized type of programming language used to develop software for embedded systems. Embedded systems are computer systems integrated into hardware devices, designed to perform dedicated functions within a larger system. Languages like C and C++ are widely used for embedded programming due to their efficiency, low-level hardware access, and deterministic behavior. Other languages like Assembly are used for highly resource-constrained applications, while Python and Java are becoming more common in high-level embedded applications. Embedded programming often involves direct interaction with hardware components, such as microcontrollers and sensors, and requires knowledge of real-time operating systems, memory management, and low-level debugging. The goal is to create software that is compact, efficient, and reliable for specific hardware tasks.

4.2 Hardware Requirements

Arduino is most popular microcontroller board and it easy to use programmable board for creating own projects. Arduino has a simple hardware platform and a free source code editor. Plug-in expansion boards add extra functionality like sensors, actuators, sound input and output and visual display to projects. The hardware components consisting of Arduino UNO, Soil Moisture Sensor, Relay module, 9V Battery, Water pump, LCD display, Bread Board, Jumper Wires.

4.2.1 Arduino UNO

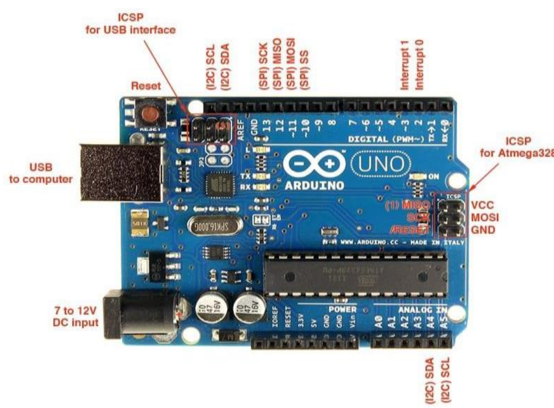

Fig 4.2.1 Arduino UNO

The above fig 4.2.1 is a Arduino UNO. It is a micro controller based on the AT mega 328. It has 14 digital input and output pins (of which 6 can provide PWM output), 6 analog inputs, USB connector, a power jack reset bottom. The operating voltage is 5 volts. Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. This board can be interfaced with other Arduino boards, Arduino shields, and can control relays, LCD, and motors as an output**.**

4.2.2 SOIL MOISTURE SENSOR

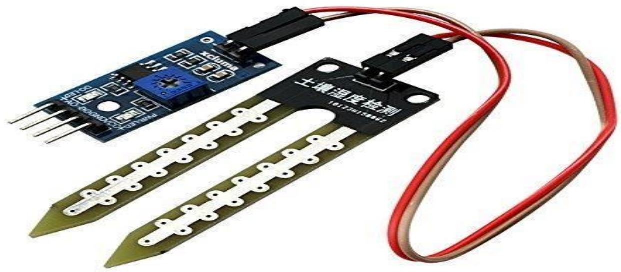

Fig 4.2.2 Soil Moisture Sensor

The above fig 4.2.2 is a Soil Moisture sensor. The soil moisture sensor (SMS) is a sensor connected to an irrigation system controller that measures soil moisture content in the active root zone before each scheduled irrigation event and bypasses the cycle if soil moisture is above a user- defined set point. The Soil Moisture Sensor uses capacitance to measure dielectric permittivity of the sur-rounding medium in soil, dielectric permittivity is a function of the water content. The sensor averages the water content over the entire length of the sensor

4.2.3 Relay Module

Fig 4.2.3 Relay Module

The above figure 4.2.4 is a Relay Module. It is an electronic component that allows microcontroller or other low-power device to control high-power devices such as motors, lights, and appliances. The relay module consists of a relay switch and a control circuit. When the control circuit receives a signal from the microcontroller, it activates the relay switch, which in turn closes or opens a circuit to control the connected device. Electromechanical relays to physically open and close the switch contacts. They are reliable and can handle high current loads, but can be slower than other types of relays

4.2.4 LCD Display

Fig 4.2.4 LCD

The above figure 4.2.5 is a LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels. To display images, LCD (liquid-crystal display) projectors typically send light from a metal-halide lamp through a prism or series of dichroic filters that separates light to three polysilicon panels – one each for the red, green and blue components of the video signal.

4.2.5 water pump

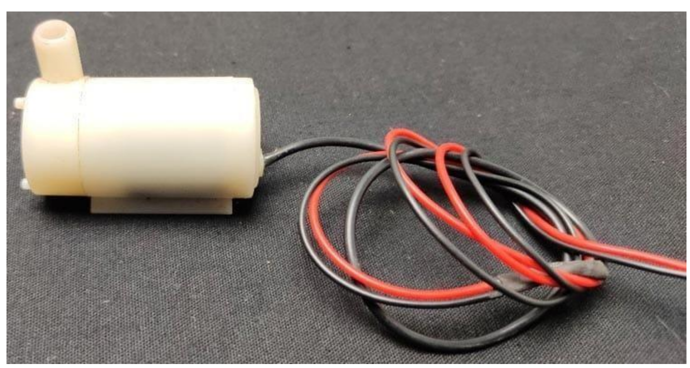

Fig4.2.5 Water Pump

A water pump is a critical component of a smart irrigation system using Arduino, as it facilitates efficient and automated water delivery to plants. The pump is responsible for drawing water from the source and distributing it to the irrigation system. Its operation is controlled by the Arduino microcontroller, which uses real-time data from sensors, such as soil moisture sensors, to determine when irrigation is needed. By automating this process, the pump eliminates the need for manual intervention, ensuring water is provided only when required.

4.2.6 Battery

Fig 4.2.6 Battery

The battery is an essential component of a smart irrigation system using Arduino, as it provides a reliable power source for the system's components. This includes the Arduino microcontroller, sensors, relays, and the water pump. The battery ensures uninterrupted operation, even in locations with inconsistent electricity supply or during power outages. Such reliability is crucial for maintaining the automation of the irrigation process, as delays in watering could negatively affect plant health and growth.

CHAPTER 5

SYSTEM DESIGN

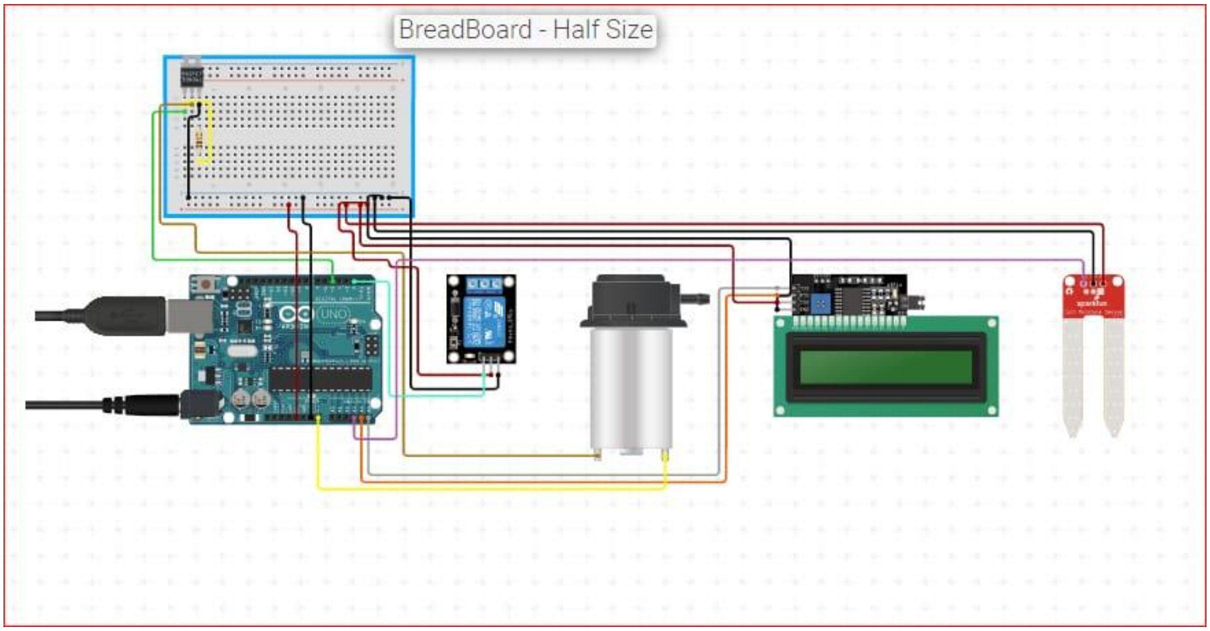

Fig 5.1.1 Schematic Diagram

In the smart irrigation system, the soil moisture sensor is connected to the Arduino Uno. The sensor's VCC pin is linked to the 5V pin on the Arduino, and the GND pin connects to the Arduino GND. The sensor's analog output (AO) is connected to the A0 pin on the Arduino to provide moisture data.

The relay module controls the water pump. The VCC and GND pins of the relay are connected to the 5V and GND pins of the Arduino, respectively. The IN pin of the relay is linked to a digital pin (e.g., pin 8) on the Arduino to send control signals. The COM pin of the relay connects to the positive terminal of the water pump, and the NO pin connects to the positive terminal of the 9V battery. The pump's ground connects to the negative terminal of the battery. The LCD display is powered through the 5V and GND pins of the Arduino. The SDA and SCL pins on the LCD connect to the A4 and A5 pins on the Arduino for communication. The 9V battery powers both the Arduino and the relay. The positive terminal of the battery connects to the relay and the water pump, while the negative terminal connects to the GND of the Arduino and the pump. This setup allows the Arduino to read the soil moisture, activate the water pump via the relay when needed, and display the system's status on the LCD.

CHAPTER 6

SYSTEM IMPLEMENTATION

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#include <SoftwareSerial.h>

// Define pin numbers
const int motor = 8;
const int soilMoisturePin = A1;
const int relayPin = 8;
const int threshold = 850;

// Create LCD and GSM objects
LiquidCrystal_I2C lcd (0x27, 16, 2); // Set the LCD address to 0x27 for 16 chars and 2 line display

// Variable to store soil moisture value
int soilMoistureValue = 0;

void setup() {
  // Initialize serial communication
  Serial.begin(9600);
  delay(1000);

  // Initialize the LCD
  lcd.init();
  lcd.backlight();
  lcd.setCursor(0, 0);
  lcd.print("Smart Irrigation System");
  delay(1500);
```

```
 // Initialize pins
  pinMode
(soilMoisturePin, INPUT);
  pinMode(relayPin, OUTPUT);
  digitalWrite(relayPin, LOW);}
    void loop() {
  // Read the soil moisture value
  soilMoistureValue = analogRead(soilMoisturePin);
  Serial.print("Soil Moisture: ");
  Serial.println(soilMoistureValue);

 // Display the soil moisture value on the LCD
  lcd.setCursor(0, 0);
  lcd.print("Soil Moisture: ");
  lcd.setCursor(0, 1);
  lcd.print(soilMoistureValue);
  lcd.print("      "); // Clear remaining characters

// Control the relay based on the soil moisture value

if (soilMoistureValue > threshold) {

 if (digitalRead(relayPin) == LOW) {

  digitalWrite(relayPin, HIGH);

  lcd.setCursor(12, 1);

  lcd.print("HIGH ");
```

```
    }
  } else {
    if (digitalRead(relayPin) == HIGH) {
      digitalWrite(relayPin, LOW);
      lcd.setCursor(12, 1);
      lcd.print("LOW");
      Serial.println("Motor off");

    }
  }

  delay(1000);
}
```

CHAPTER 7

RESULTS

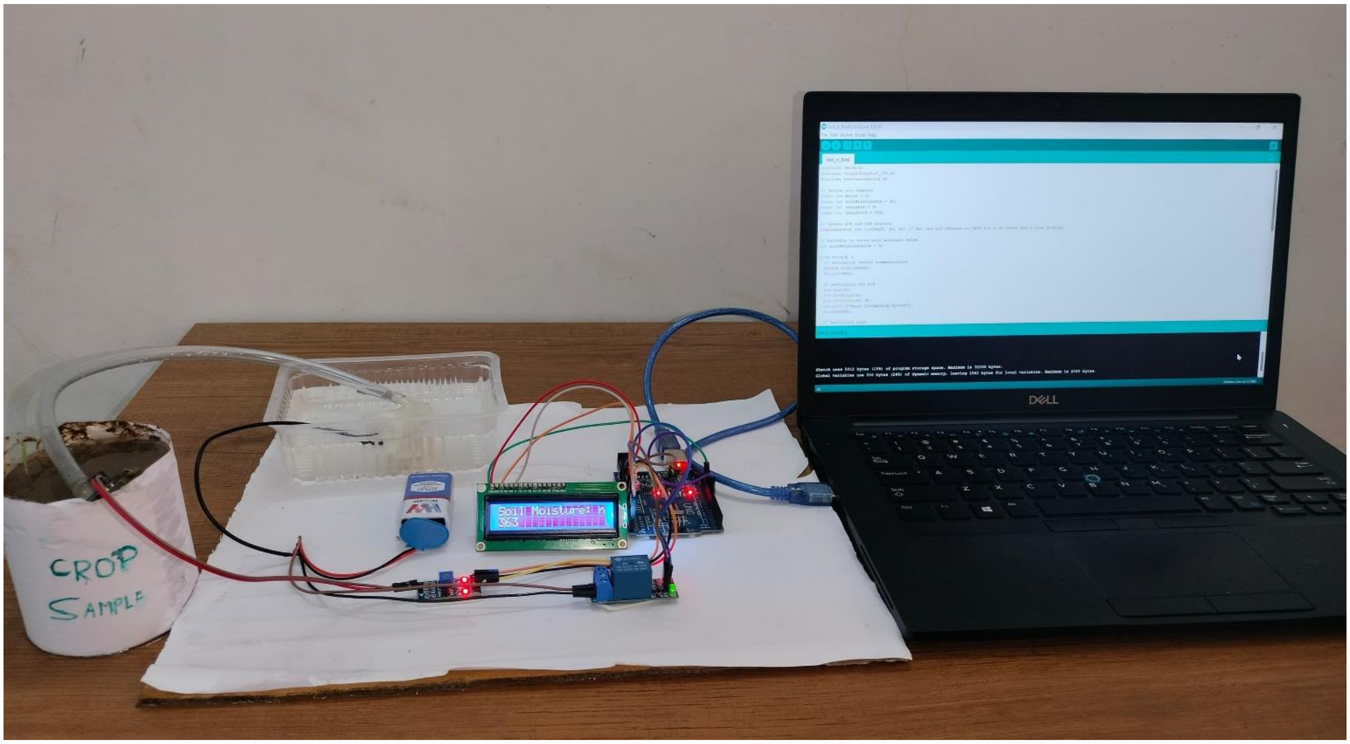

Fig 7.1 Result of the smart irrigation system

This image outlines the components and system setup for a Smart Irrigation System using an Arduino microcontroller, LCD, relay module, Soil moisture sensor, battery. The Sensor Module measures soil moisture and sends data to the Microcontroller (Arduino). The microcontroller processes this data and decides whether to turn the water pump on or off. If the soil moisture value exceeds the threshold (indicating dryness), the relay is turned ON (HIGH) to start the motor. The LCD shows "ON". If the soil moisture value is below the threshold (indicating sufficient moisture), the relay is turned OFF (LOW) to stop the motor. The LCD shows "OFF".