CMR ENGINEERING COLLEGE

UGC AUTONOMOUS

Department of Artifitial intelligence and machine learning

REAL TIME PROJECT

Automatic Irrigation System and Plant watering system

Batch No:B4

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CONTENTS

Aim create an automatic irrigation system using an Arduino Uno

- The aim of the Automatic irrigation and plant watering system project is to design an efficient and automated watering solution for plants. The project utilizes an Arduino microcontroller, soil moisture sensors, and a water pump to monitor soil moisture and control irrigation. Key objectives include:
- **Automated Watering**: Water plants automatically based on soil moisture levels.
- **Water Conservation**: Optimize water usage by only watering when necessary.
- **Plant Health**: Maintain plant health with consistent, proper watering.
- **Remote Monitoring**: Offer real-time monitoring and control through an interface.
- **Alert Notifications**: Send alerts for low water levels or system issues.
- **Scalable Design**: Adapt the system for different garden sizes and needs.
- The project aims to provide a practical solution for efficient plant irrigation, promoting healthy growth and sustainable water use.

Motivation

- Everyone of us likes a little greenary in our houses, don’t we?plants require really low maintenance and can be left for days without supervision but our long trips extending over a week or 2 can be detrimental for the health of the plants due to the lack of moisture in the soil. In such situations , the plant may die due to the absence of proper watering. In order to solve this problem, in this project, we are making an Automatic Irrigation System with an Arduino Uno which will irrigate your plants automatically and keep them healthy even when you are out of the town for weeks or months.

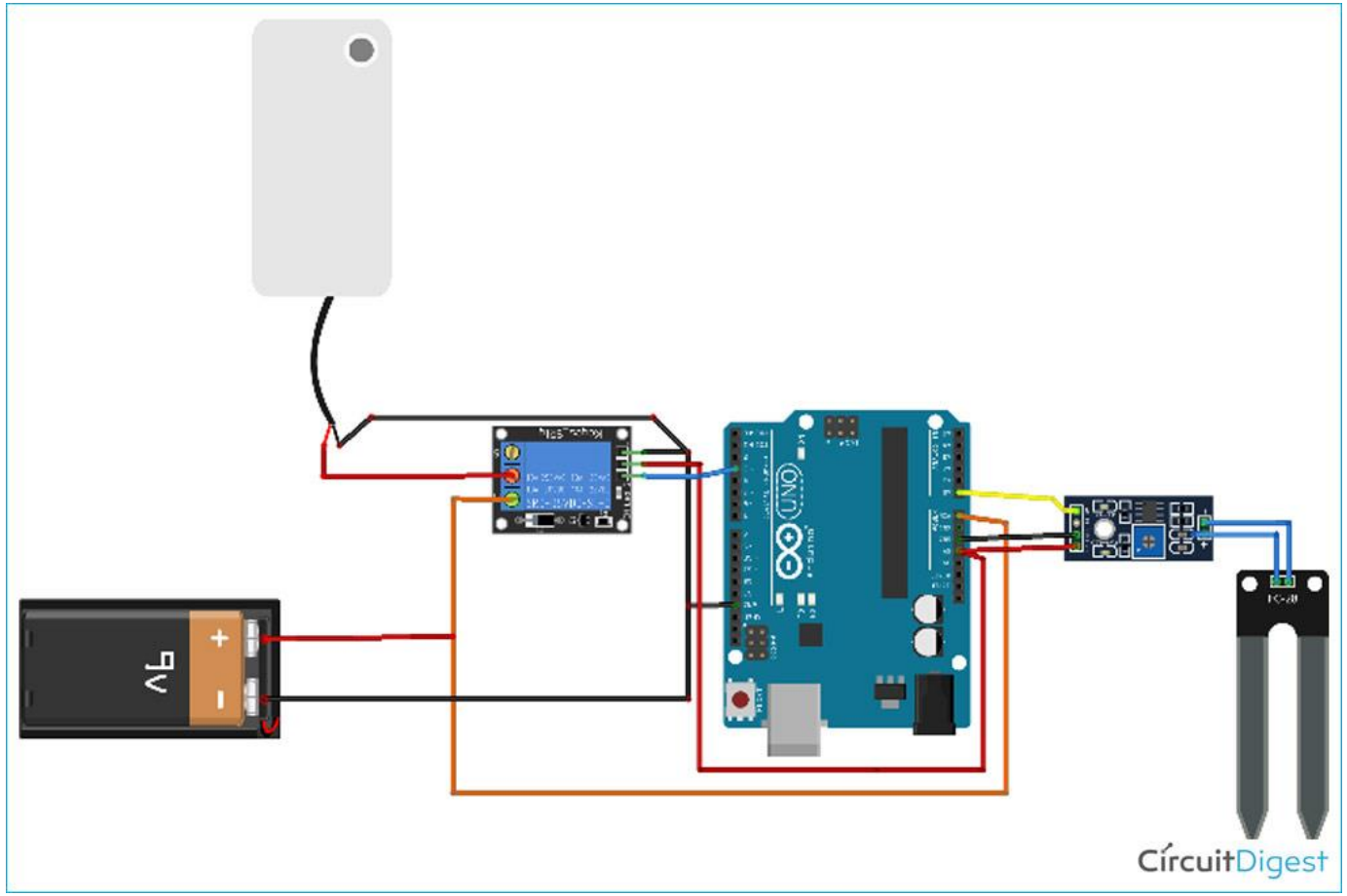
Abstract

- The Arduino-based plant irrigation system project focuses on developing an efficient and automated approach to watering plants. By utilizing an Arduino microcontroller, soil moisture sensors, and a water pump, the system monitors soil moisture levels and waters plants as needed. This smart irrigation system conserves water by only activating the pump when the soil is dry, preventing over-watering and promoting healthy plant growth. Additionally, the system can provide real-time monitoring and control through a user-friendly interface, along with alert notifications for low water levels or potential system issues. The scalable design allows for application across various garden sizes and agricultural plots. Overall, this project aims to create a sustainable and practical solution .

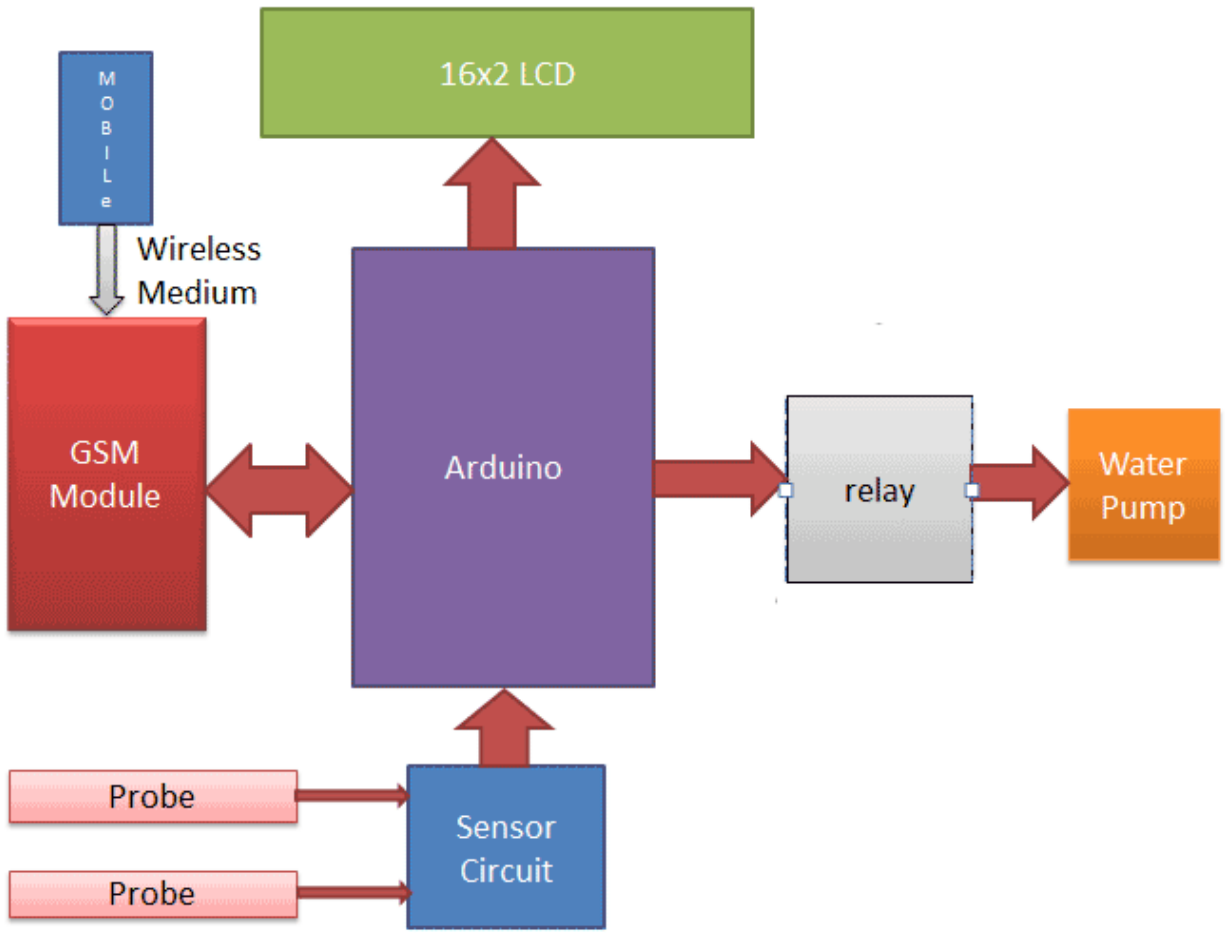
Components required

- Arduino uno
- Moisture sensor
- 5v relay module
- 6v mini water pump with small pipe
- Connecting wires
- 5v battery

Circuit diagram



Schematic diagram

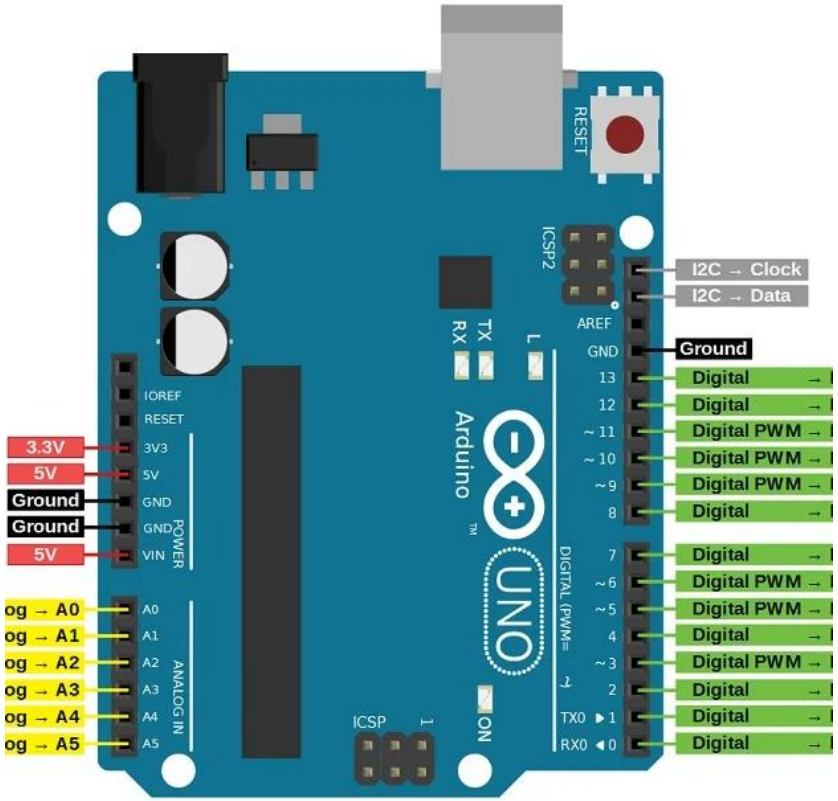


Working principle

- The automatic irrigation system using Arduino Uno operates by leveraging a soil moisture sensor, a 5V relay module, a 6V mini water pump, and other components to ensure efficient watering of plants. The soil moisture sensor is placed in the soil, where it measures the moisture level and sends data back to the Arduino Uno.
- The Arduino Uno uses the data from the sensor to determine whether the soil moisture is below a predefined threshold. If the moisture level is low, the Arduino triggers the 5V relay module, which acts as a switch to control the flow of power from the 5V battery to the 6V mini water pump.
- When the relay module is activated, the water pump starts pumping water through the small pipe to irrigate the plants. This process continues until the desired soil moisture level is reached. The system constantly monitors the soil moisture, ensuring plants receive water only when needed.
- The entire process is fully automated, allowing for efficient and consistent watering while conserving water and promoting healthy plant growth. By automating the irrigation system, the project aims to simplify plant care and support sustainable gardening practices.

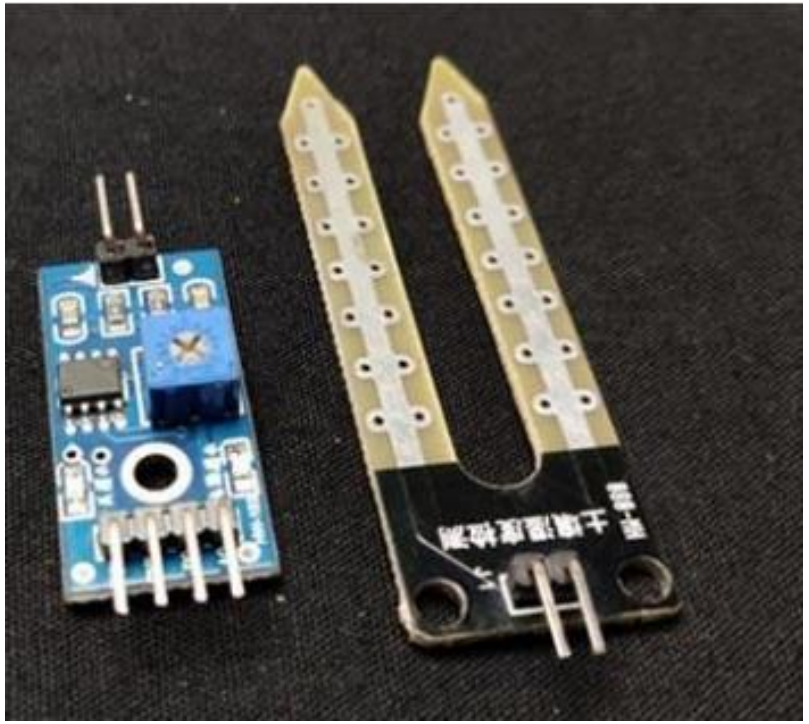
Arduino

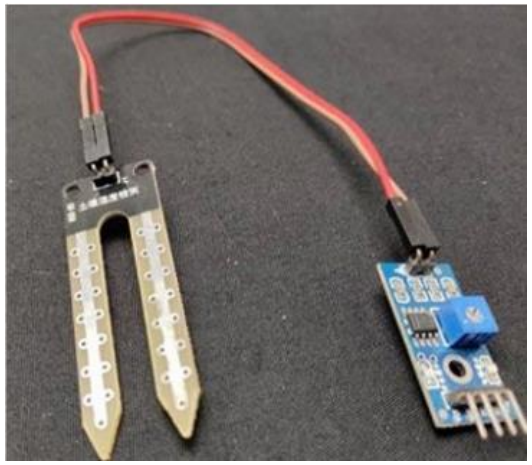
- In the automatic irrigation system, the Arduino Uno plays a central role in controlling the entire process.
- It reads data from the soil moisture sensor to assess the moisture level in the soil. Overall, the Arduino manages the system's automation, ensuring plants receive the right amount of water at the right time.
- Based on the sensor data, the Arduino decides whether irrigation is needed and compares the moisture level to a predefined threshold.
- If the soil is too dry, the Arduino activates the relay module, which in turn powers the water pump to irrigate the plants.
- Overall, the Arduino manages the system's automation, ensuring plants receive the right amount of water at the right time.



MOISTURE SENSOR

- In the automatic irrigation system, the moisture sensor is responsible for measuring the moisture level in the soil.
- It provides real-time data to the Arduino Uno, indicating whether the soil is too dry or has sufficient moisture.
- The sensor's readings allow the system to determine if irrigation is needed.
- By monitoring soil moisture, the sensor helps ensure that plants receive water only when necessary.
- This efficient use of water promotes healthy plant growth and conserves resources.



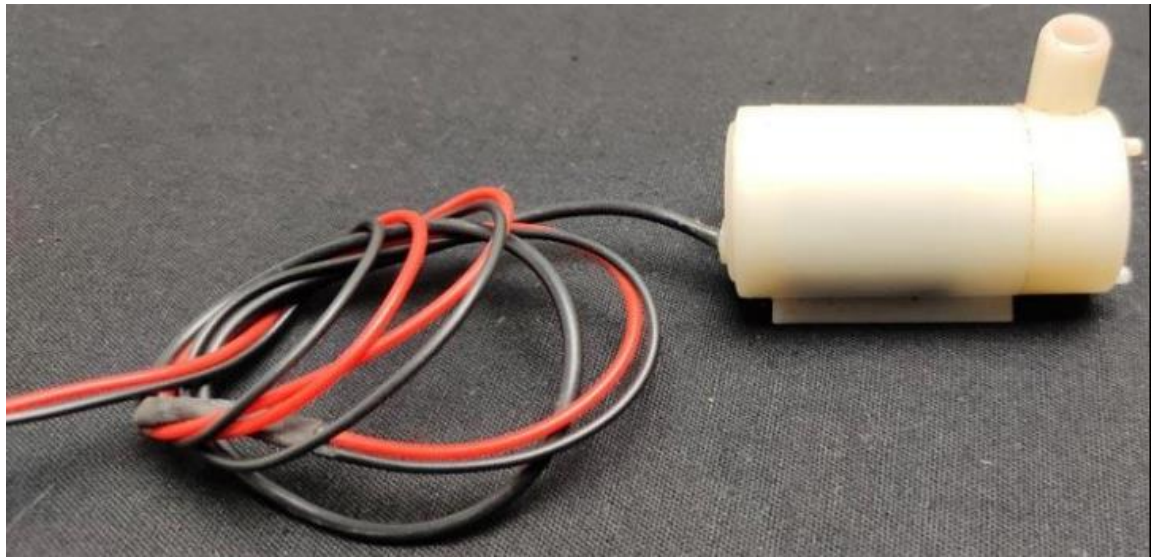


5V RELAY MODULE

- In the automatic irrigation system, the 5V relay module functions as a control switch for the water pump.
- The module receives signals from the Arduino Uno based on soil moisture levels.
- When the Arduino determines that irrigation is needed, it sends a signal to the relay module.
- The relay then closes the circuit, allowing the 6V mini water pump to receive power from the 5V battery.
- This activation of the pump enables the irrigation of plants.
- The relay module plays a crucial role in managing the power supply to the pump, facilitating efficient and automated watering

6V MINI WATER PUMP WITH SMALL PIPE

- In the automatic irrigation system, the 6V mini water pump with a pipe is the component responsible for delivering water to the plants. When the 5V relay module activates the pump based on signals from the Arduino Uno, the pump begins operating. It draws water from a water source and pushes it through the connected small pipe.
- The pipe is positioned near the plants, allowing the pump to precisely deliver water where it is needed. The pump continues to operate until the soil moisture reaches an adequate level, as determined by the sensor readings. This component is key to ensuring that plants receive the right amount of water efficiently and without manual intervention.



5V BATTERY AND CONNECTING WIRES

- In the automatic irrigation system, the 5V battery and connecting wires work together to power and enable communication among the various components. The 5V battery serves as the main power source, supplying the necessary voltage to the Arduino Uno, which controls the entire system. The battery also powers the 5V relay module, which switches the 6V mini water pump on and off as needed.
- Connecting wires provide the pathways for distributing the battery's power to all components, ensuring that each part of the system functions correctly. Wires transmit control signals from the Arduino to the relay, enabling the relay to activate the pump when soil moisture levels are low. Additionally, wires carry data from the soil moisture sensor to the Arduino for analysis.
- Properly arranged and secured connecting wires are crucial for stable connections and efficient operation of the system. Monitoring the battery's charge level is important for ensuring continuous and uninterrupted operation of the automatic irrigation system. Together, the 5V battery and connecting wires play a vital role in the smooth functioning of the irrigation process.

Source code

```
// Define pins
const int moistureSensorPin = A0; // Soil moisture sensor connected to analog pin A0
const int relayPin = 7; // Relay module connected to digital pin 7


// Set a threshold for soil moisture level
// Adjust this value according to the moisture level you want to maintain
const int moistureThreshold = 300; // Example threshold, may need adjustments
```

```
void setup() {
  // Initialize serial communication for debugging
  Serial.begin(9600);

  // Set relay pin as output
  pinMode(relayPin, OUTPUT);

  // Initially turn off the pump (relay off)
  digitalWrite(relayPin, LOW);
}
```

```
void loop() {
  // Read the soil moisture level from the sensor
  int moistureLevel = analogRead(moistureSensorPin);

  // Print the moisture level for debugging
  Serial.print("Moisture Level: ");
  Serial.println(moistureLevel);

  // Check if moisture level is below the threshold
  if (moistureLevel < moistureThreshold) {
    // If the soil is too dry, activate the relay to turn on the water pump
    digitalWrite(relayPin, HIGH);
    Serial.println("Watering plants...");
  }
```

```
else {
        // If the soil is moist enough, deactivate the relay to turn off the water pump
        digitalWrite(relayPin, LOW);
        Serial.println("Soil is moist enough.");
    }

    // Add a delay between readings (e.g., 5 minutes)
    delay(300000); // Delay in milliseconds (300000 ms = 5 minutes)
}
```

References

1) RESEARCH GATE
2) IEEEXPLORE
3) ELECTRONICSFORU