
# CSE 461 Project Report

Spring 24

**Section: 06**
**Group: 04**

## Title

## Automated Irrigation System

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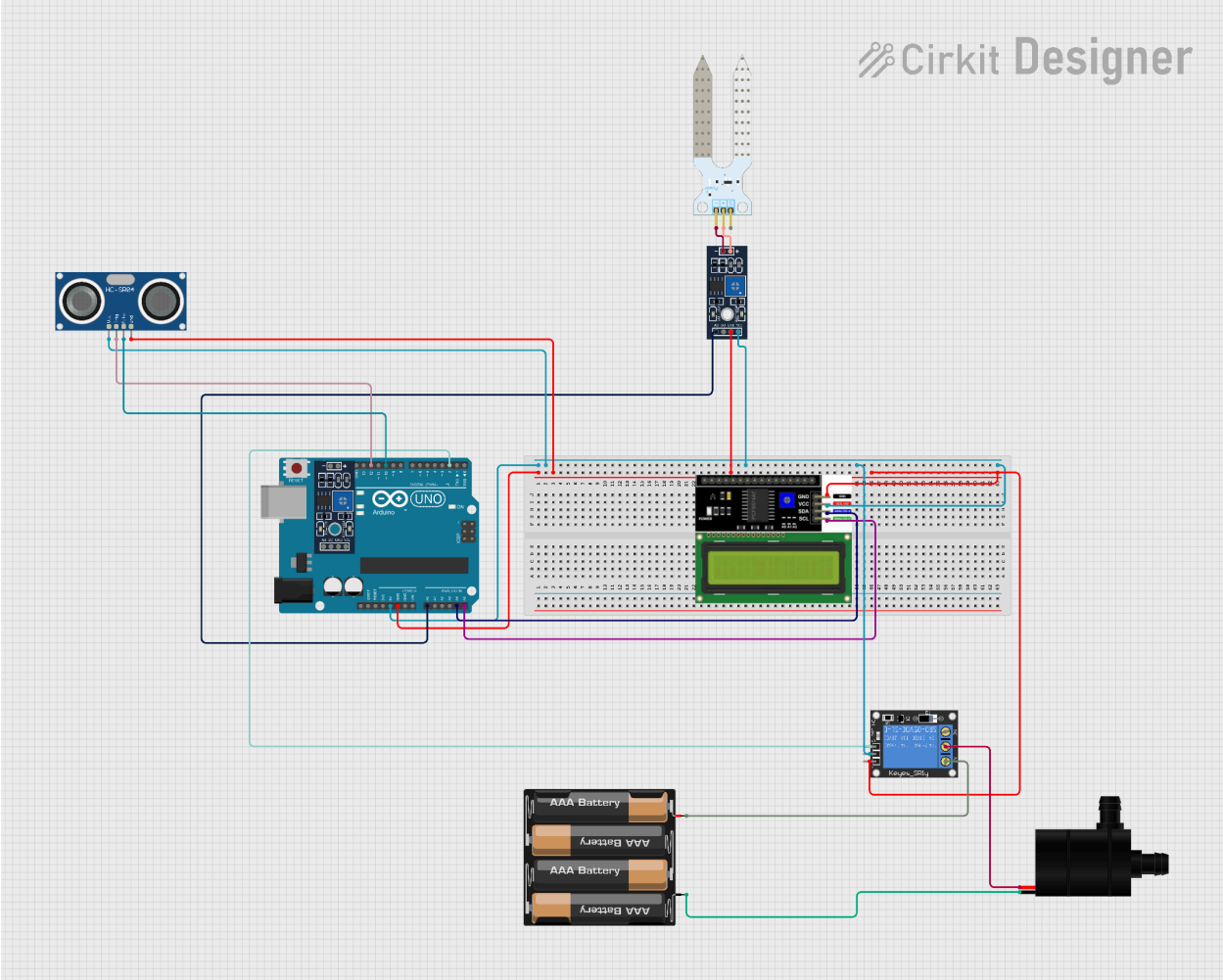
**Abstract:**

The "Automated Irrigation System" project aims to address the growing need for efficient and sustainable irrigation methods in agriculture. By integrating sensors, actuators, and microcontroller-based automation, the system automates the process of watering plants based on real-time soil moisture levels. This report presents the design, implementation, and evaluation of the automated irrigation system, highlighting its effectiveness in maintaining optimal soil moisture and promoting plant growth.

**Components:**

1. Arduino Uno R3
2. Ultrasonic Distance Sensor (HC-SR04)
3. 16*2 LCD display
4. I2C Display Module
5. 5v single channel relay module
6. 5v DC pump
7. YL-69 Soil Hygrometer Humidity Sensor
8. LM393 Comparator Module
9. 4x ‘AA’ Batteries
10. Breadboard
11. Jumper wires
12. PVC tubes

**Circuit Diagram:**




**Code:**

```
#include <LiquidCrystal_I2C.h>

const int trigPin = 12;
const int echoPin = 10;
long duration;
int distance;
LiquidCrystal_I2C lcd(0x3F, 16, 2);

void setup() {
```

```
 Serial.begin(9600);
 lcd.init();
 lcd.backlight();
 lcd.clear();
 pinMode(trigPin, OUTPUT);
 pinMode(echoPin, INPUT);
 pinMode(2, OUTPUT); // relay or pump pin set as output
 digitalWrite(2, HIGH);
 delay(1000);
 lcd.setCursor(0, 0);
 lcd.print("IRRIGATION");
 lcd.setCursor(0, 1);
 lcd.print("SYSTEM IS ON ");
 lcd.print("");
 delay(3000);
 lcd.clear();
}

void loop() {
 int value = analogRead(A0);
 Serial.println(value);

 // Pump Functions
 if (value > 950) {
  digitalWrite(2, HIGH); // Turn OFF the pump when moisture is high
  lcd.setCursor(0, 0);
  lcd.print("Pump ON ");
 } else {
  digitalWrite(2, LOW); // Turn ON the pump when moisture is low
  lcd.setCursor(0, 0);
  lcd.print("Pump OFF ");
```

```
 }

 // Print Functions
 if (value < 300) {
  lcd.setCursor(0, 1);
  lcd.print("Moisture : HIGH");
 } else if (value > 300 && value < 950) {
  lcd.setCursor(0, 1);
  lcd.print("Moisture : MID ");
 } else if (value > 950) {
  lcd.setCursor(0, 1);
  lcd.print("Moisture : LOW ");
 }

 // HCSR04
 digitalWrite(trigPin, LOW); // initialize with 0v
 delayMicroseconds(2); // wait 2 microseconds

 // Trigger Function
 digitalWrite(trigPin, HIGH); // set the trig to 5v
 delayMicroseconds(10); // wait 10 microseconds for 8 cycles burst
 digitalWrite(trigPin, LOW); // set trigpin to 0v

 // Echo Func
  duration = pulseIn(echoPin, HIGH); // reads the total pulse duration until the echoPin stays HIGH
                                     // stops reading when the echo pin goes LOW (automatically)
 distance = duration * 0.0343 / 2;  // duration multiplied by speed of sound (cm per microsec) / 2 == distance
```

```
// Calculate percentage
int percentage;
if (distance <= 5) {
  percentage = 100;
} else if (distance <= 7) {
  percentage = 75;
} else if (distance <= 10) {
  percentage = 50;
} else if (distance <= 13) {
  percentage = 25;
} else {
  percentage = 0;
}

// Print percentage
lcd.setCursor(10, 0);
lcd.print(percentage);
lcd.setCursor(13, 0);
lcd.print("%");
Serial.println(percentage);
}
```

**Conclusion:**

In conclusion, the "Automated Irrigation System" project successfully designed, implemented, and evaluated an efficient and cost-effective solution for automated plant irrigation. By leveraging sensor technology and microcontroller-based automation, the system offers a scalable and customizable approach to optimizing water management in agriculture. Future work may involve integrating additional sensors for monitoring environmental parameters and incorporating machine learning techniques for adaptive control.

**Operation:**

**Powering On the System:**

Ensure that the power supply is connected to the system.

Press the power button to turn on the system. The LCD display will light up, indicating that the system is ready for operation.

**Setting Irrigation Schedule:**

We can use the code panel to set the desired irrigation schedule. We can specify the watering frequency and duration based on your plant's needs.

**Monitoring Soil Moisture:**

The system continuously monitors soil moisture levels using the soil moisture sensor.

The LCD display will show real-time soil moisture readings.

**Automated Irrigation:**

Once the soil moisture drops below the set threshold, the system will automatically activate the water pump to irrigate the plants.

The LCD display will indicate when the irrigation process is in progress.

**Manual Override:**

In case of manual intervention, you can manually activate the water pump.

**Troubleshooting:**

**Pump Failure:**

If the water pump fails to activate or makes unusual noises, first check the power supply and connections.

Ensure that the pump is not clogged with debris or sediment.

If the issue persists, the pump may be faulty and require replacement. Contact customer support for assistance.

**Sensor Malfunction:**

If the soil moisture sensor readings seem inaccurate or erratic, check the sensor connections and wiring. Clean the sensor probe to remove any dirt or residue that may affect its performance.
If the problem persists, the sensor may be damaged and need replacement.

**LCD Display Error:**

If the LCD display shows error messages or stops functioning, check the power supply and connections. Reset the system by powering it off and on again.

**Conclusion:**

In conclusion, the "Automated Irrigation System" project successfully designed, implemented, and evaluated an efficient and cost-effective solution for automated irrigation. By leveraging sensor technology and microcontroller-based automation, the system offers a scalable and customizable approach to optimizing water management in agriculture. Future work may involve integrating additional sensors for monitoring environmental parameters and incorporating machine learning techniques for adaptive control.

**Video Link: Automated Irrigation System| CSE461| Sec 6| Group 4**