Names:INEZA Barakah Hemeste
project:Smart irrigation system
Groupe:8
date:27/09/2025

In Smart Agriculture Irrigation System
Objective:
To automate irrigation in agricultural fields by using a soil moisture sensor (simulated with a potentiometer). When the soil is dry, the motor (water pump) turns ON to irrigate the soil. When the soil is moist, the motor turns OFF. The LCD displays the soil status.

Block Diagram

Description:

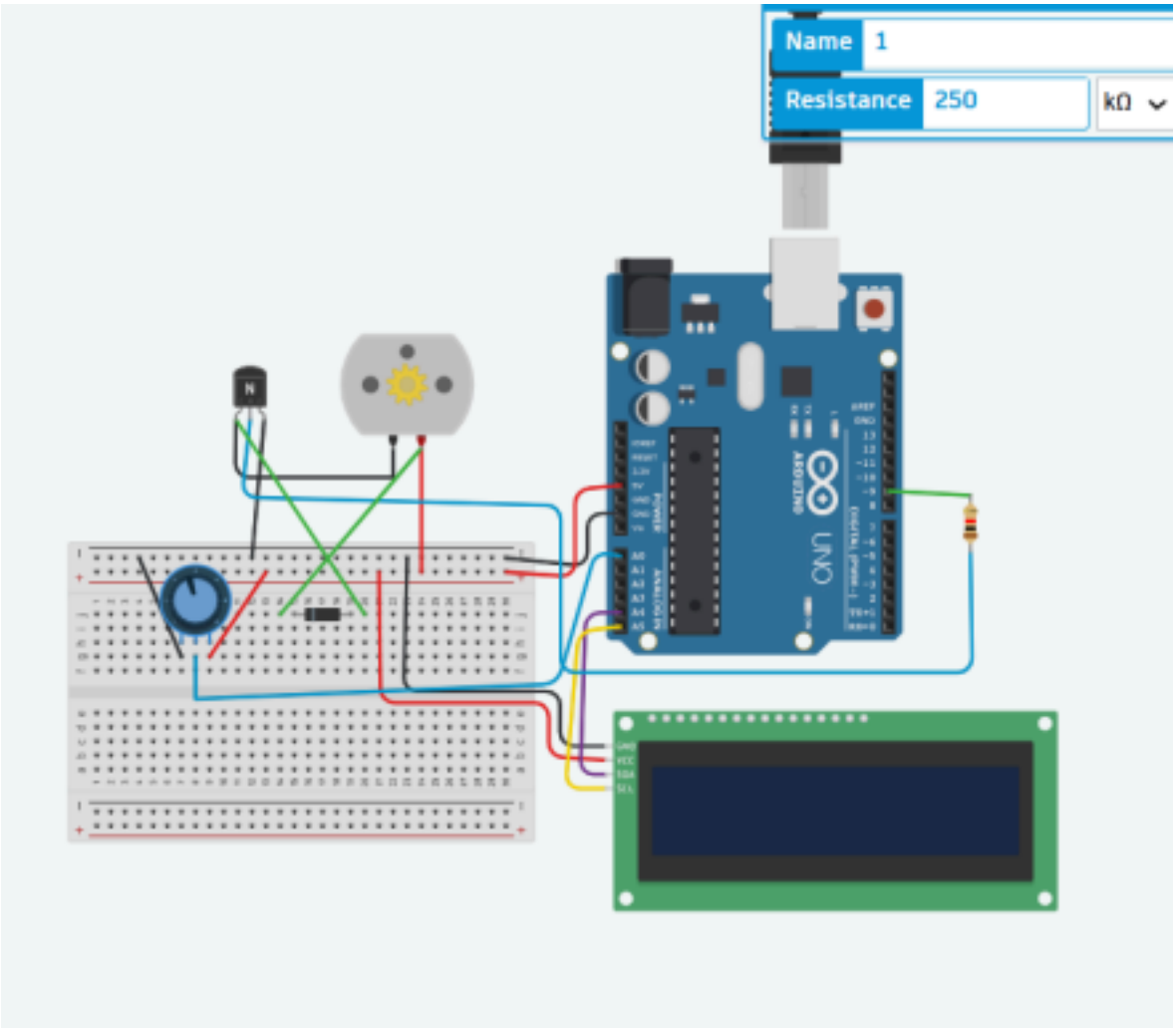
- Soil Moisture Sensor → Arduino → Decision (Dry or Wet) → DC Motor (Pump)
- LCD shows "Soil Dry → Pump ON" or "Soil Wet → Pump OFF"

Components Used

(In Tinkercad simulation)

- Arduino Uno
- Soil Moisture Sensor (simulated with Potentiometer)
- DC Motor (Pump) with NPN Transistor Driver + Diode
- 16x2 LCD Display (I2C)
- Breadboard + Jumper Wires
- Resistors

Circuit Diagram



Arduino code:

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

LiquidCrystal_I2C lcd(32, 16, 2); // I2C address may vary (0x27 or 0x3F)

int sensorPin = A0;
int motorPin = 9; // Motor driver control
int sensorValue = 0;
int threshold = 500; // Adjust threshold for dry vs moist

void setup() {
  pinMode(motorPin, OUTPUT);
  lcd.init();
  lcd.backlight();
  lcd.setCursor(0,1);
```

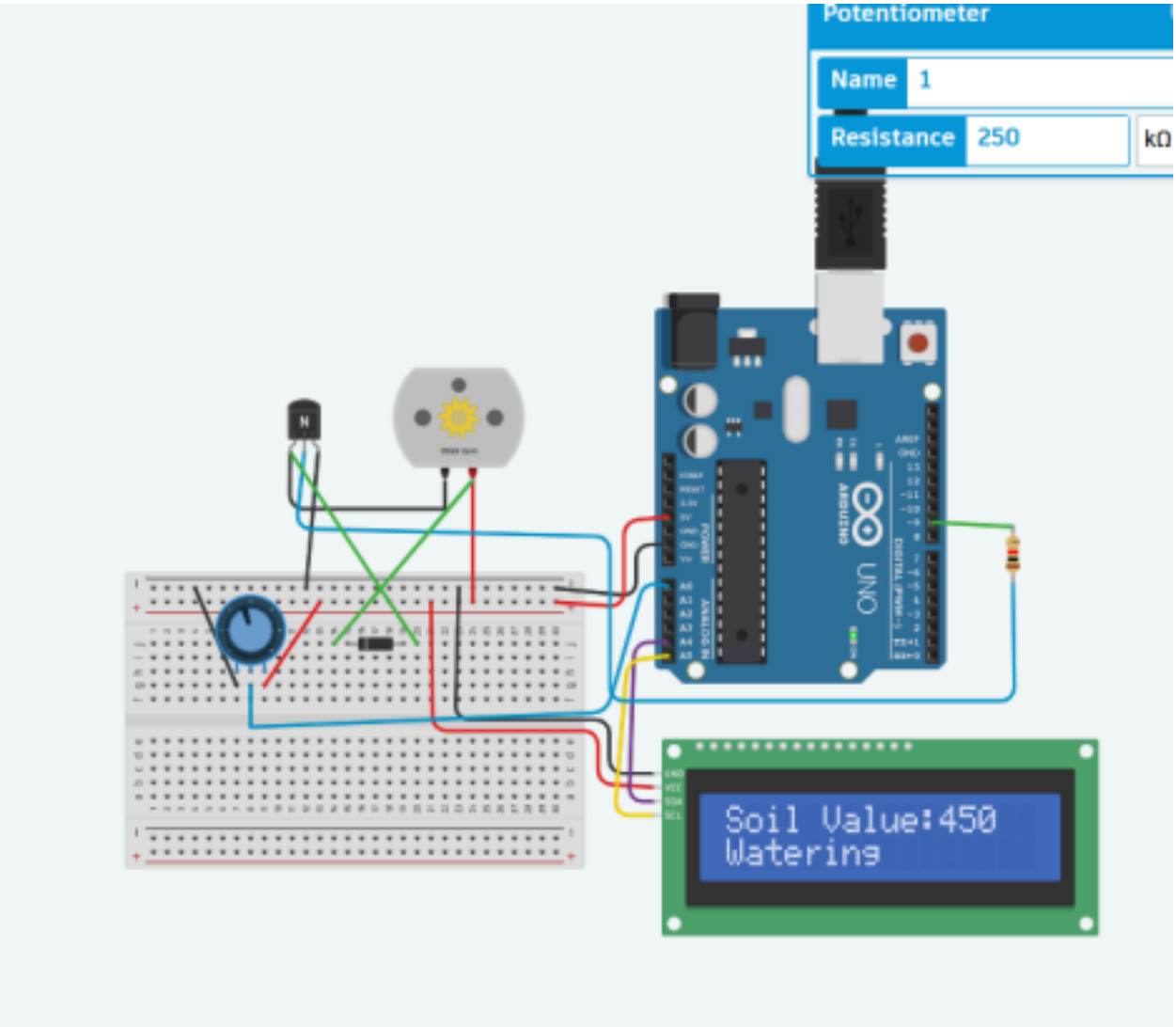
```
  lcd.print("Smart Irrigation");
  delay(2000);
  lcd.clear();
}

void loop() {
  sensorValue = analogRead(sensorPin);

  lcd.setCursor(0,0);
  lcd.print("Soil Value:");
  lcd.print(sensorValue);

  if(sensorValue < threshold) {
    digitalWrite(motorPin, HIGH); // Pump ON
    lcd.setCursor(0,1);
    lcd.print("Watering");
  } else {
    digitalWrite(motorPin, LOW); // Pump OFF
    lcd.setCursor(0,1);
    lcd.print(" Moist ");
  }

  delay(1000);
}
```

GitHub orrepository link
https://github.com/inezabarakah-ops/smart-irrigation-system

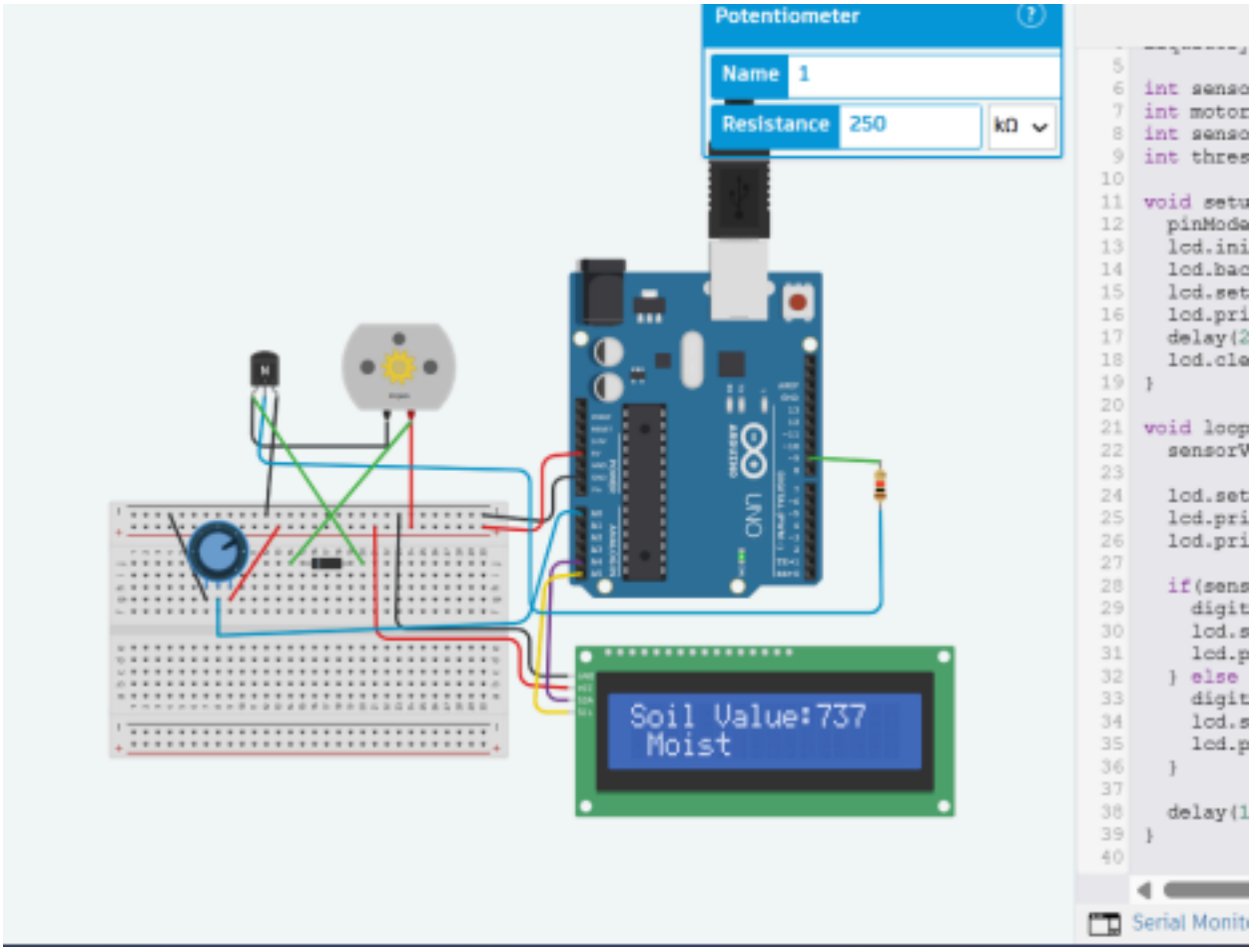
Workflow

1. Soil moisture sensor continuously reads soil condition (via potentiometer simulation).
2. Arduino compares the sensor value with a threshold.
    - If value < threshold → Soil is dry → Pump turns ON.
    - If value ≥ threshold → Soil is wet → Pump turns OFF.
3. LCD displays both the soil condition and pump status.

Simulation Results



This circuit shows if the moisture is under the threshold motor will turn on.



Also this circuit shows if the soil value >threshold the motor will turn OFF because it means that the soil has enough water.

Learning Outcomes

- Understand sensor-actuator logic.
- Apply automation in smart farming applications.
- Integrate soil moisture sensing with motor control and display feedback on LCD.

Evaluation

- Correct threshold values trigger the expected motor response.
- Motor turns **ON** when soil is dry and **OFF** when soil is wet.
- LCD correctly displays soil status and pump activity.

Reflection / Challenges Faced

- Adjusting the correct threshold for soil moisture readings.
- Properly wiring the transistor driver for the DC motor in Tinkercad.
- LCD wiring was tricky and required debugging to ensure correct pin mapping.
- Learned about sensor-actuator logic in real-world smart farming applications.This project helped me understand how sensors and actuators interact in real applications. I learned how soil moisture readings can be used to control a water pump automatically and how feedback is displayed on an LCD. One challenge was wiring the motor driver and ensuring the LCD worked correctly, but testing in Tinkercad helped solve these issues. Overall, the project showed how automation can support smart farming by saving water and improving efficiency.