Smart Soil Moisture Lamp

Prototyping Interactive Interfaces SDEG-600

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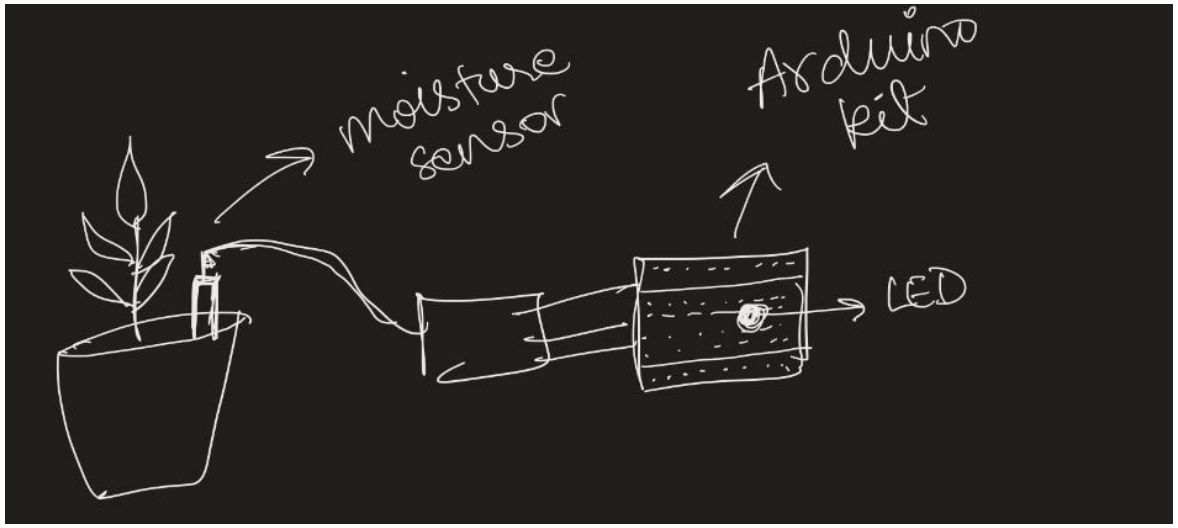
Description

This project uses a soil-moisture sensor connected to an Arduino to monitor the hydration level of a plant and translate it into a live, expressive visual display using p5.js. The goal is to create a simple, intuitive system where the plant's "mood" is shown through a series of illustrated states, making the data feel more human, emotional, and easy to understand.

The soil moisture sensor continuously reads the water content in the soil and sends this value to a p5.js sketch through a WebSerial connection. The p5 interface updates in real time, switching between four different plant illustrations that represent the plant's health state. These states include: a **happy plant** when the soil is well hydrated, **one leaf falling** as moisture begins to drop, a **warning icon plant** when the soil becomes too dry, and **both leaves falling** when the plant is at its driest and needs immediate attention.

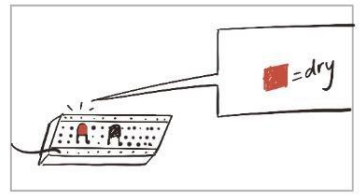
By combining Arduino sensing, p5.js visualization, and custom illustrations drawn in Procreate, the system becomes a playful, educational display that helps users understand their plant's needs at a glance.

Storyboard

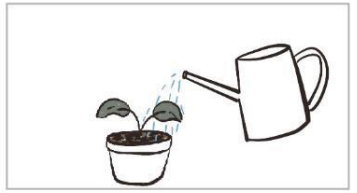


Soil is dry.

Inserting the sensor to check moisture level.



Red LED turns on.
Red = Dry



watering the plant as it needs moisture

Inserting the sensor to check moisture level now.

Green LED turns on => Happy plant.

How it works?

1) The Arduino briefly powers the sensor, takes a reading from pin A0, and turns the sensor off to save energy.
2) The moisture value is compared with a threshold (thresh).
3) Depending on the reading, the code lights up either the red or green LED.
4) The Serial Monitor prints live data

Components

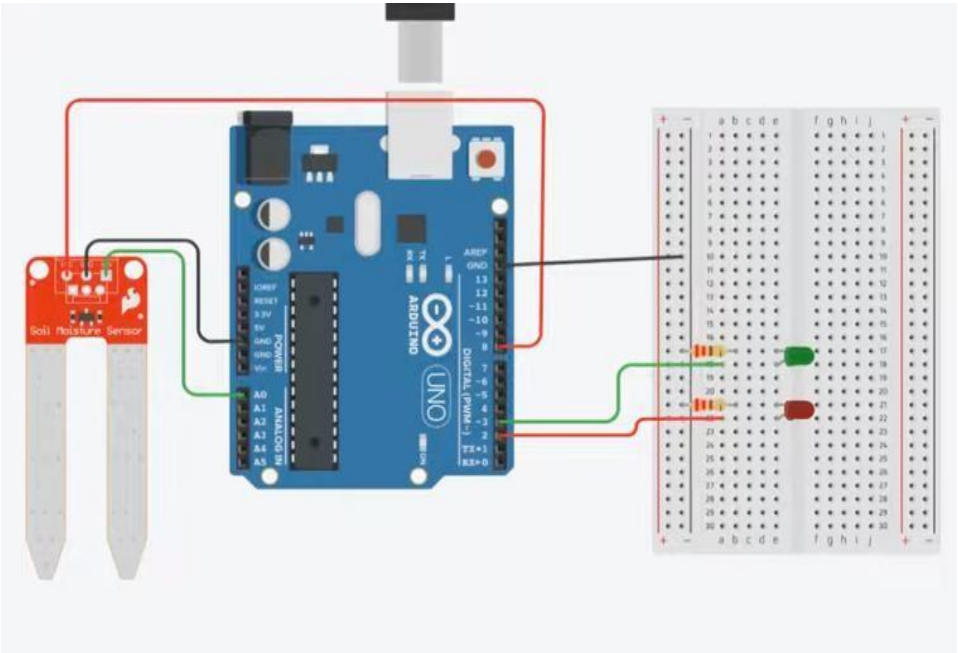
Arduino Uno
Soil Moisture Sensor (Analog output)
2 LEDs (Red and Green)
2 Resistors (220 Ω or 1 kΩ)
Jumper wires
Breadboard
USB cable

Connections

Moisture Sensor VCC → Pin 8, GND → GND, AO → A0

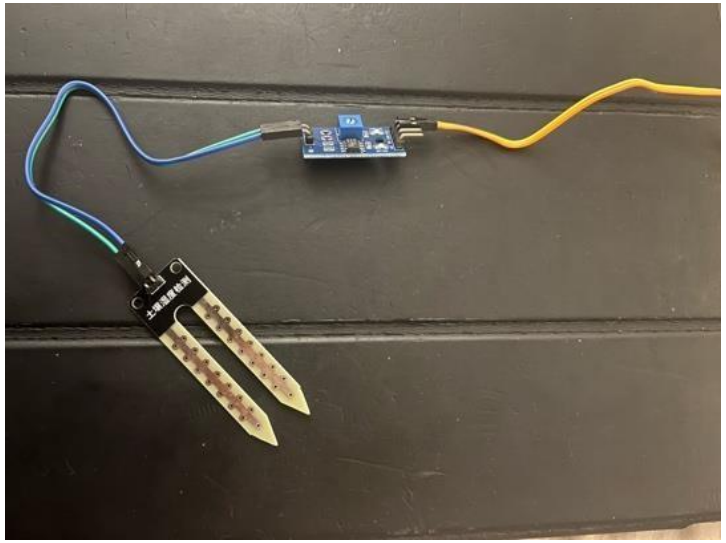
Red LED → Pin 2 (with resistor to GND)

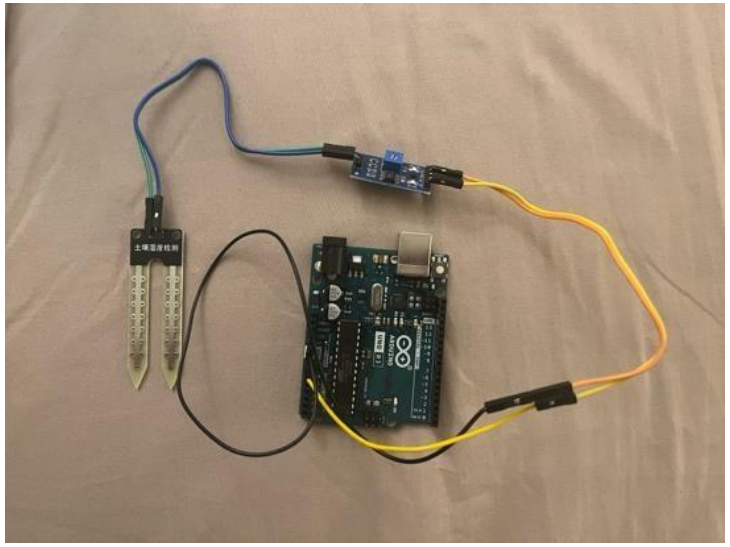
Green LED → Pin 3 (with resistor to GND)



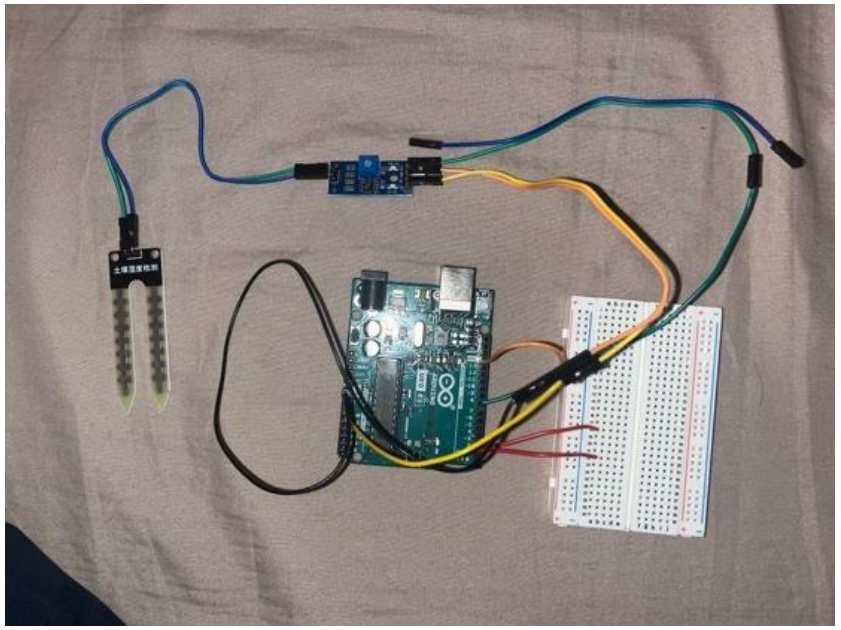
Steps

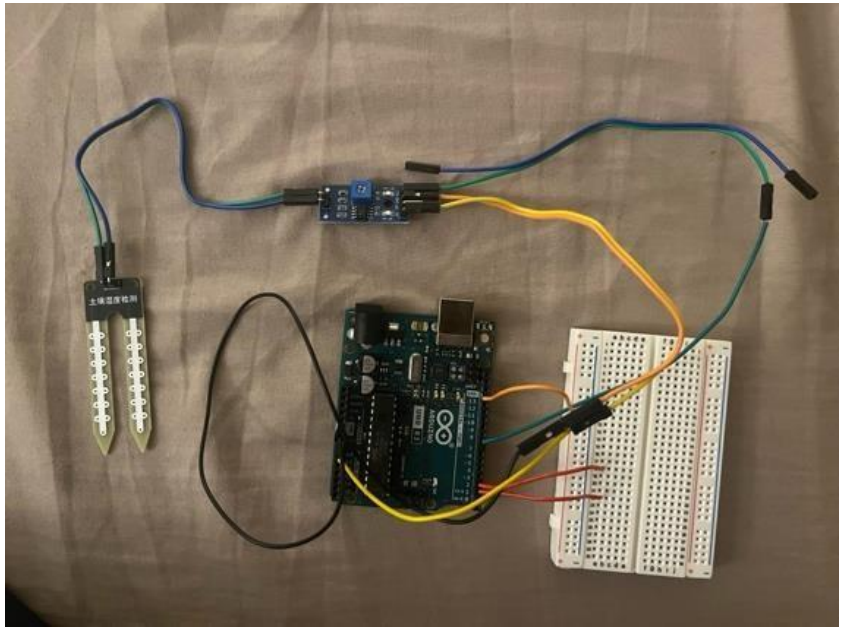
Connect the positive and negative ends of the sensor and the moisture resistance device. Next, connect the moisture sensor to the Arduino kit. Moisture Sensor VCC → Pin 8, GND → GND, AO → A0



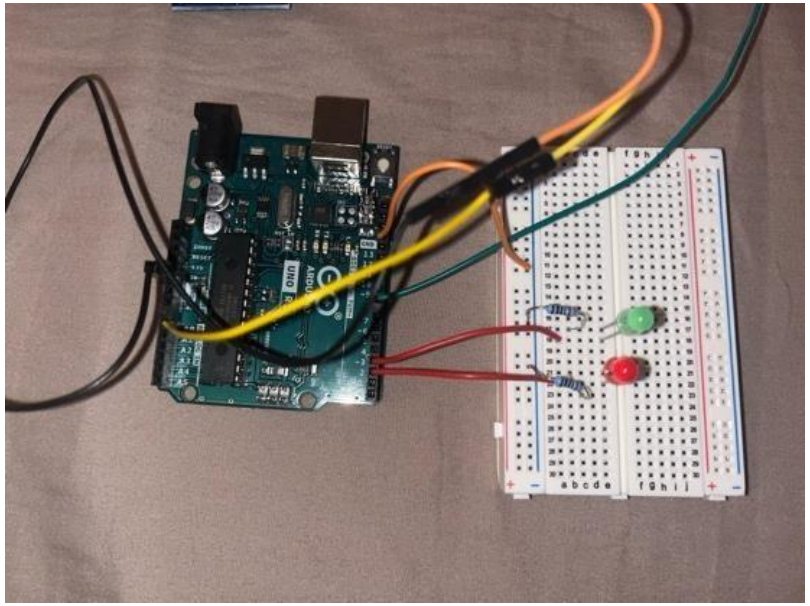


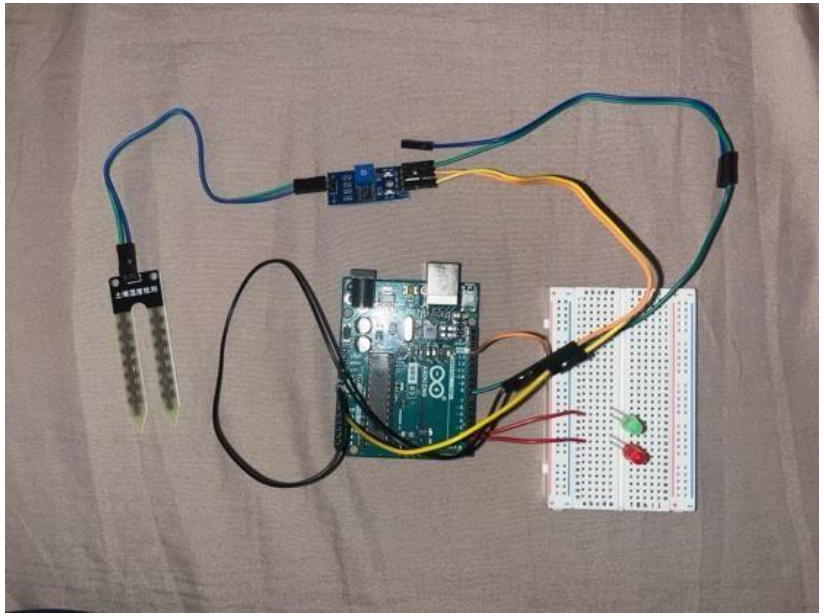
Connect one jumper wire from digital pin 2 (for the red LED) and another from digital pin 3 (for the green LED) to two separate rows on the breadboard. These will carry the signals that control the LEDs. Connect 5V from the Arduino to the positive rail and GND to the negative rail on the breadboard to complete the circuit.





Place the LEDs on the breadboard, inserting the red LED with its long leg (anode) in the same row as the wire from pin 2, and the green LED with its long leg aligned with the wire from pin 3. Keep both short legs (cathodes) in separate rows toward the GND side, then connect a 220Ω resistor from each cathode to the GND rail to limit current and protect the LEDs from burning out.





Threshold readings

Measured the readings by inserting the sensor in the soil and reading values from the serial monitor:

High values (~900–1003) → dry or not inserted in soil

Low values (~320–500) → wet soil

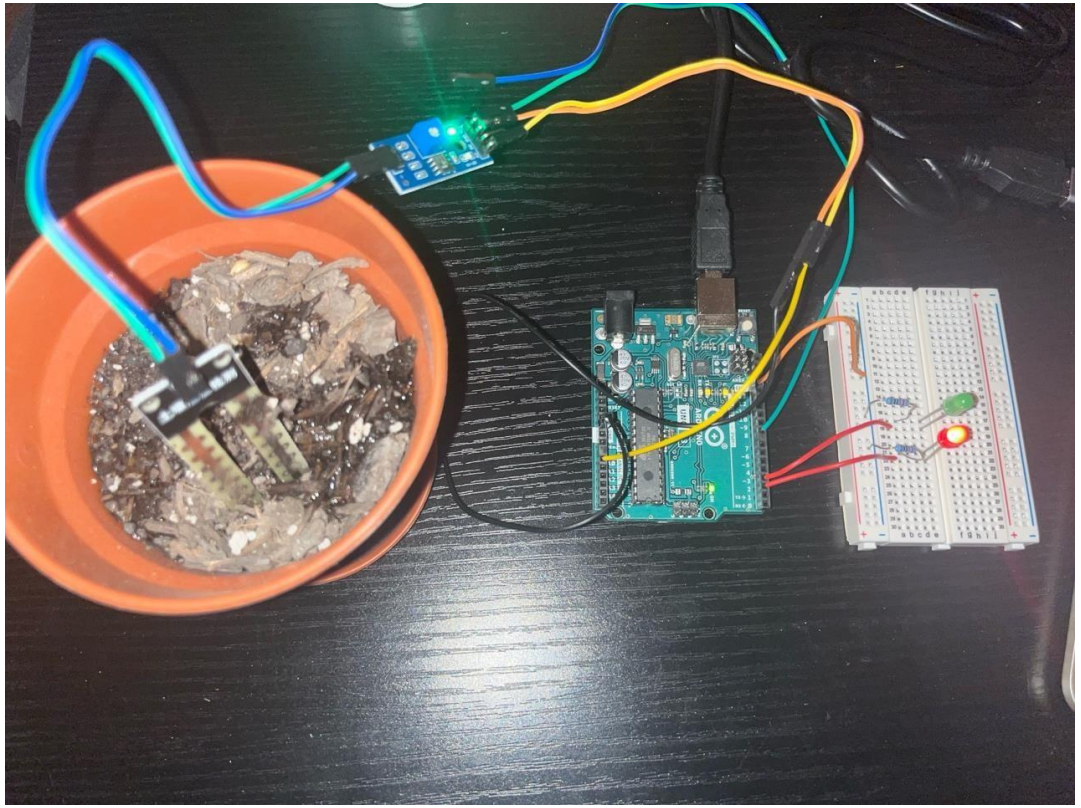
Threshold value = (dryValue + wetValue) / 2 i.e: 1003+320/2=661

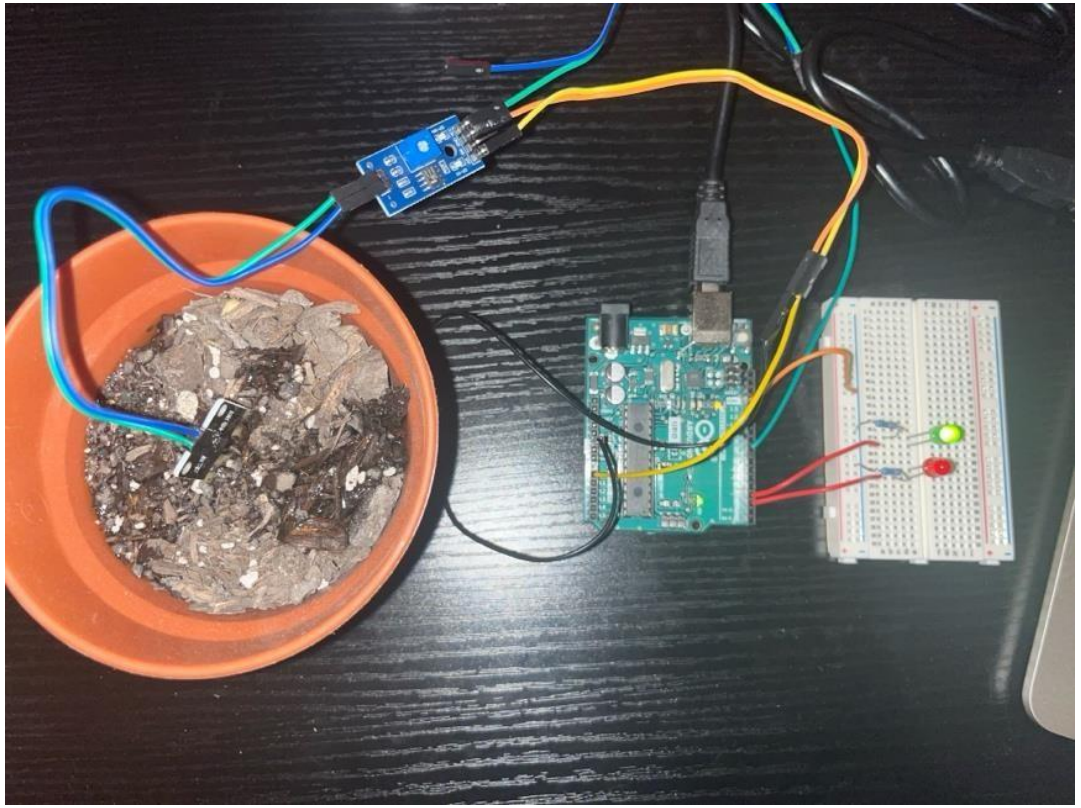
Code

```
// Soil Moisture Sensor

int sensor;

const int powerpin = 8; const int delayTime =1000; const int redLED = 2;

const int greenLED = 3; const int thresh = 661;

void setup() {

Serial. begin (9600);    pinMode (powerpin, OUTPUT) ;    pinMode (redLED, OUTPUT) ;    pinMode

(greenLED, OUTPUT) ;
}
void loop()
{
  digitalWrite (powerpin, HIGH); // turn sensor on    delay (10); // short delay

sensor = analogRead (A0) ; // read sensor   digitalWrite (powerpin, LOW); // turn sensor off    Serial. println

(sensor); // print reading   if (sensor<thresh)
  {
 // soil is wet

 //turn green LED on, red LED off    digitalWrite (redLED, LOW) ;    digitalWrite (greenLED, HIGH) ;
  }
  else // soil is dry
  {

  digitalWrite (redLED, HIGH) ;    digitalWrite (greenLED, LOW);

  } // end else delay (delayTime);
} //end
```

Upload the soil moisture program to the Arduino Uno. Insert the sensor in soil - when the soil is **dry**, the **red LED** should turn ON. As I kept adding water, the readings started decreasing indicating that the plant is getting enough moisture.

Once it crossed the threshold value, the green LED turned on. Indicating that it’s sufficiently watered.





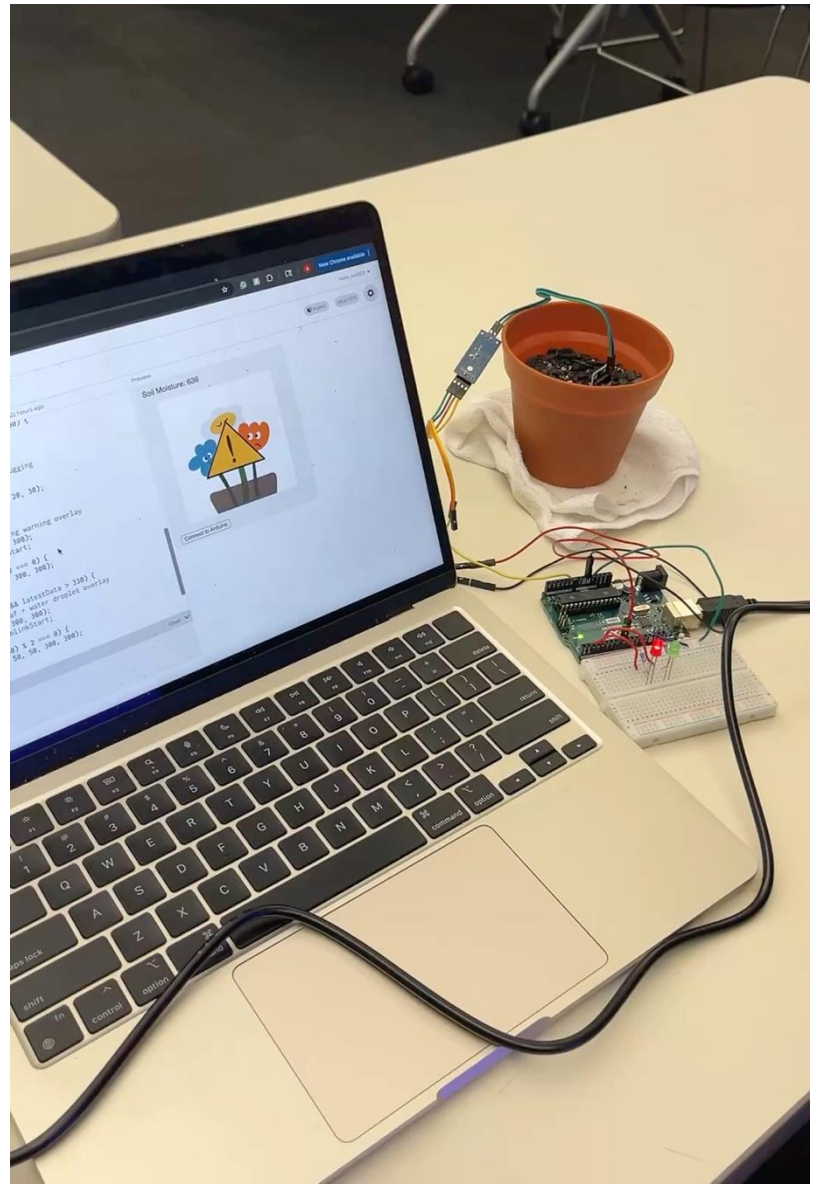
Integrating with P5JS

```
let port;
let connectBtn;
let latestData = "no data";
// Plant images
let sadPlantImg;
let oneLeafImg;
let happyPlantImg;
let warningImg;     // warning overlay when plant needs water
let waterPlusImg;   // water added overlay
// Blink variables
let blinkStart = 0;
function preload() {
  sadPlantImg = loadImage("nowater.PNG");     // dry/wilted plant
  oneLeafImg = loadImage("1leaf.PNG");       // one leaf grows
  happyPlantImg = loadImage("delight.PNG");     // fully happy plant
  warningImg = loadImage("warning.PNG");     // indicates water needed
  waterPlusImg = loadImage("water.PNG"); // shows water being added
}
```

```
function setup() {
  createCanvas(400, 400);
  // Create Serial object
  port = createSerial();
  // Create connect button
  connectBtn = createButton("Connect to Arduino");
  connectBtn.position(20, 370);
  connectBtn.mousePressed(connectPort);
}
function connectPort()
{
  console.log("Button clicked");
  port.open("Arduino", 9600); // change "Arduino" if needed for your port
}
function draw() {
  background(240);
  // Read sensor data from Arduino
  let data = port.readUntil("\n");
  if (data) {
    latestData = int(data.trim());
```

```
  // Trigger blink when plant needs water (dry)
  if (latestData > 499) {
    blinkStart = millis();
  }
  // Trigger blink when water is being added (mid-level)
  if (latestData <= 499 && latestData > 330) {
    blinkStart = millis();
  }
}
// Display soil moisture value for debugging
fill(0);
textSize(18);
text("Soil Moisture: " + latestData, 20, 30);
// Decide which image to show
if (latestData > 499) {
  // Dry soil → sad plant + blinking warning overlay
  image(sadPlantImg, 50, 50, 300, 300);
  let elapsed = millis() - blinkStart;
```

```
 if (elapsed < 5000) {
     if (floor(elapsed / 500) % 2 === 0) {
       image(warningImg, 50, 50, 300, 300);
     }
   }
 } else if (latestData <= 499 && latestData > 330) {
   // Mid-level soil → one leaf + water droplet overlay
   image(oneLeafImg, 50, 50, 300, 300);
   let elapsed = millis() - blinkStart;
   if (elapsed < 5000) {
     if (floor(elapsed / 500) % 2 === 0) {
       image(waterPlusImg, 50, 50, 300, 300);
     }
   }
 } else {
   // Soil sufficiently wet → happy plant
   image(happyPlantImg, 50, 50, 300, 300);
 }
}
```



Video

Thank you!!

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