Group 13

Soil Moisture Sensor

IE 407 - Internet of Things Lab Task

Group 13
Members

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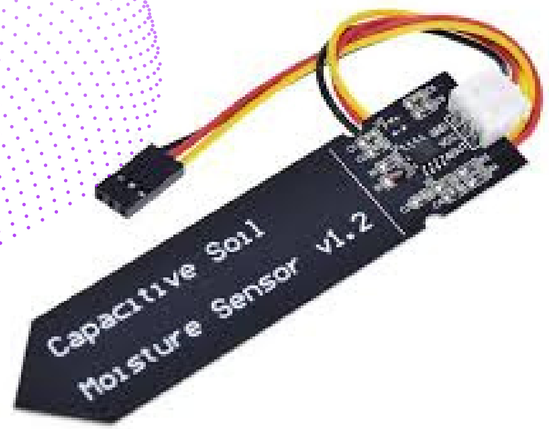
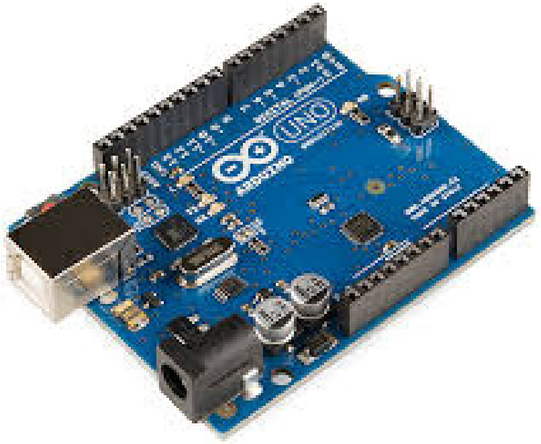
Components



Capacitive Soil Moisture Sensor



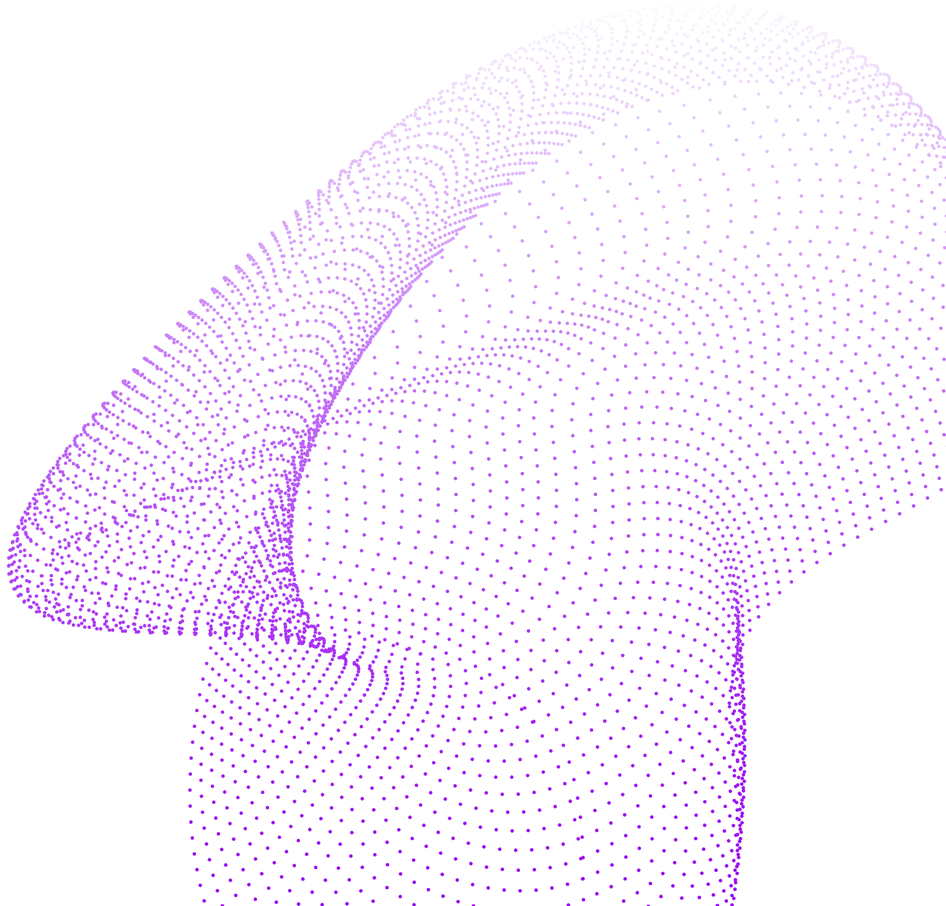
Arduino UNO

Code

```
void setup() {
 Serial.begin(9600);

}

void loop() {
  float val;
  float voltout;
  val = analogRead(0);
  voltout = 5*(val - 416)/468;
  Serial.println(voltout);
  delay(10);
}
```



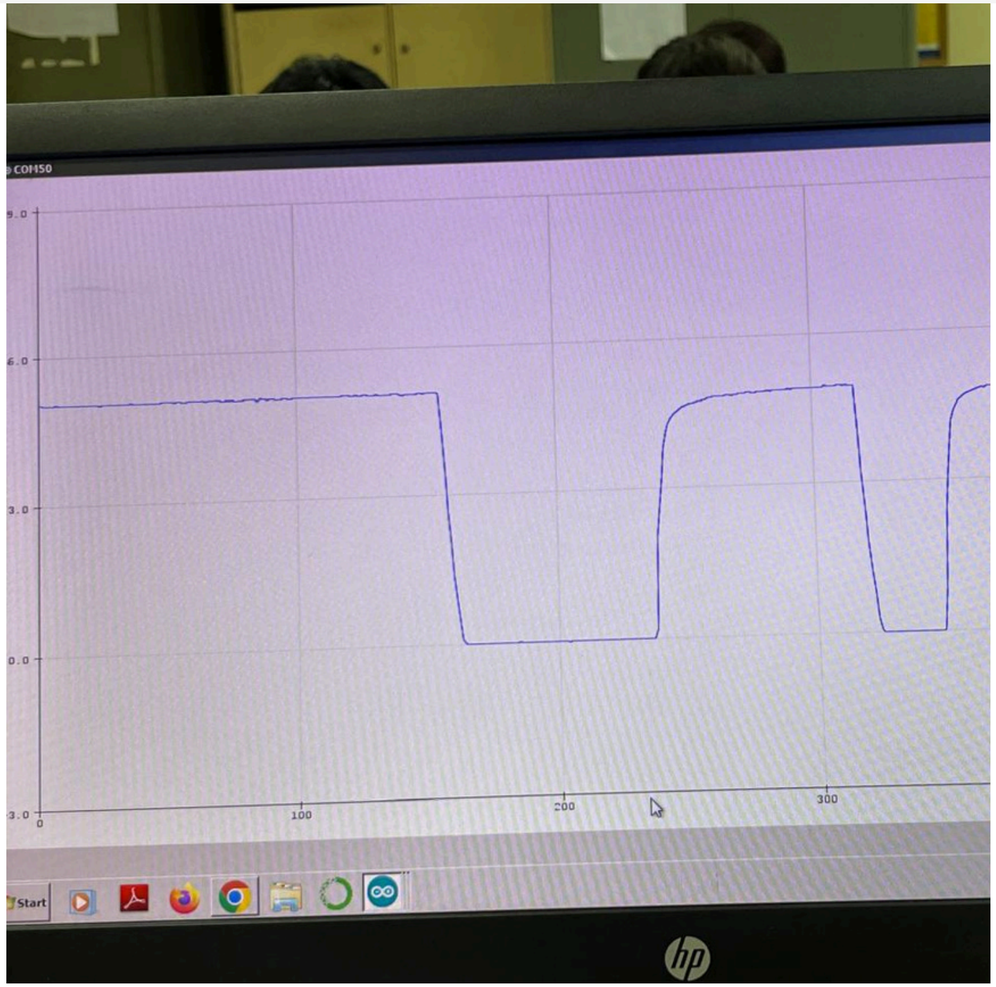
Range of Soil Moisture Sensor

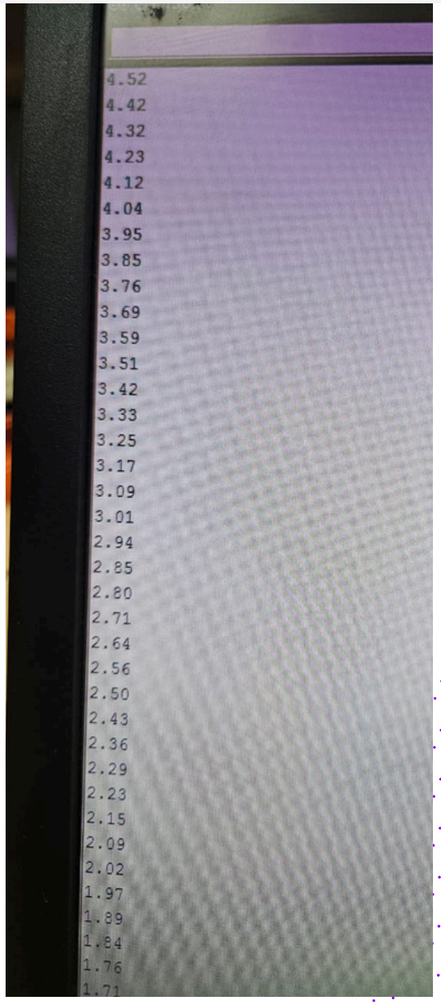
- Dry Value (Value in Air) = 884
- Wet Value (Value in Water) = 416
- We take 884 as 5V, and 416 as 0V reading.
- Making a linear equation from the values:
  - 468y = 5x - 2080
- where, x is the reading of the soil moisture sensor and y is the output in volts.

Response Time

- To calculate the response time of the sensor, we took delay as 10ms, and calculated the number of values which it took to reach from maximum value to the minimum value.
- We found it took 90 readings to reach the minimum value from the maximum value.
- So to calculate the response time we do
  - (delay)*(no. of data points) = 10ms*90 = 0.9 seconds
- **The Response Time is approximately 0.9 seconds**

Response Time Results





Sensitivity

- To calculate the sensitivity of the sensor, we take readings at every centimeter of the sensor, till the recommended depth (7cm).
- We then used those data points and plotted the graph.
- The sensitivity is calculated by getting piece wise slope of graph.

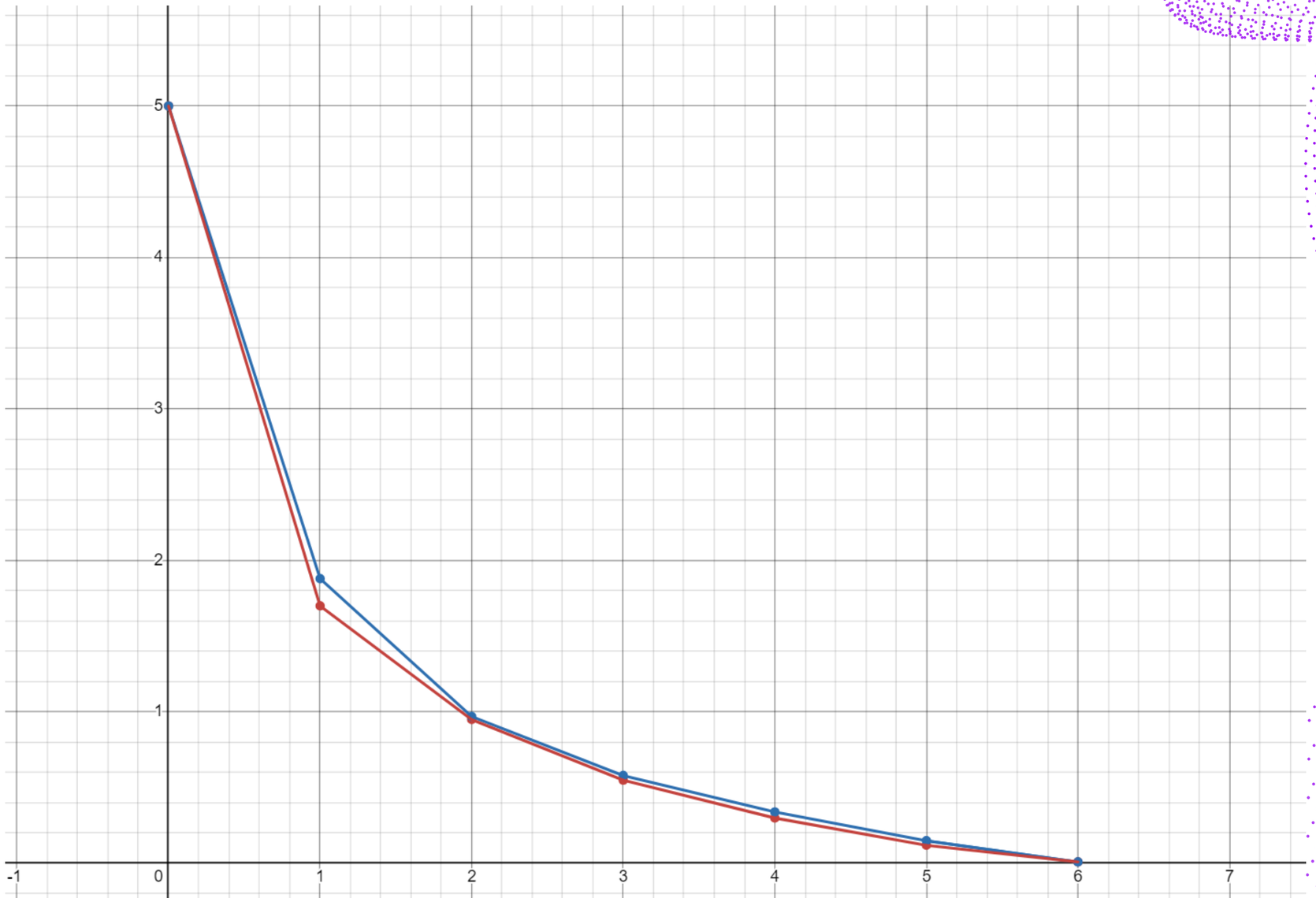
X	Y	Slope/ Sensitivity
0	5	-
1	1.7	-3.3
2	0.95	-0.75
3	0.55	-0.4
4	0.30	-0.25
5	0.12	-0.18
6	0.01	-0.11

Hysteresis

- We calculate hysteresis in the following way:
- **Method 1**
  - Get the middle value of the range of X axis = 6/2 = 3 level
  - Take the value of ascent and descent in the 3rd level we get:
    - y_1 = 0.55V
    - y_2 = 0.58V
    - y_max = 5V
    - y_min = 0V
  - Then we apply the formula (y_2-y_1)/(y_max - y_min)* 100%
  - =(0.58 - 0.55)/(5 - 0) * 100 = (0.03/5) * 100 = **0.6%**
- **Therefore, the hysteresis is 0.6%**

- **Method 2**
  - Get the maximum difference of voltage from graph at each measured level, in our case the maximum difference occurs at level 1
  - Take the value of ascent and descent in the 1st level we get:
    - y_1 = 1.7 V
    - y_2 = 1.87 V
    - y_max = 5 V
    - y_min = 0 V
  - Then we apply the formula (y_2-y_1)/(y_max - y_min)* 100%
  - =(1.87 - 1.7)/(5 - 0) * 100 = (0.17/5) * 100 = **3.4%**
- **Therefore, the hysteresis is 3.4%**

Hysteresis Plot



THANK YOU