

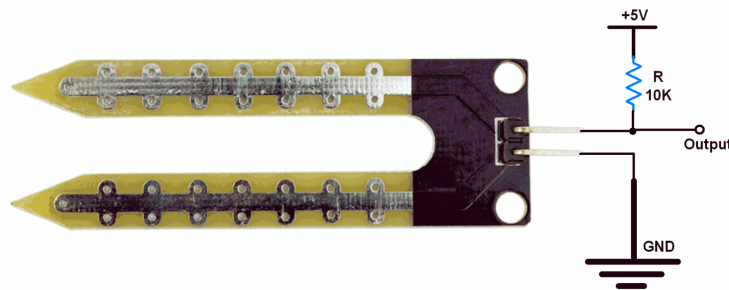
Program 10

Aim: To interface soil moisture sensor with Arduino.

Apparatus required: Arduino Uno, HC-SR04 Ultrasonic sensor, Connecting wires, Arduino IDE.

Theory:

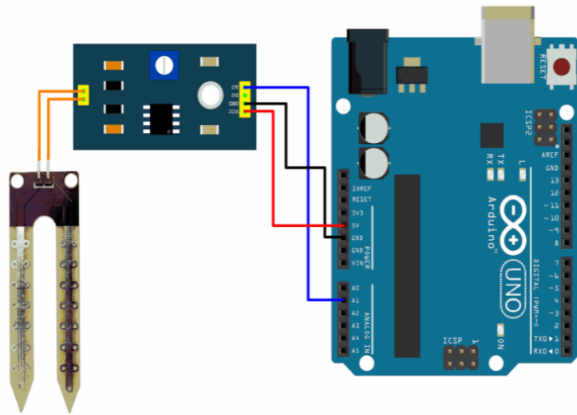
Soil moisture refers to the content of water present in the soil. This can be measured using a soil moisture sensor which consists of two conducting probes that act as a probe. It can measure the moisture content in the soil based on the change in resistance between the two conducting plates. The resistance between the two conducting plates varies in an inverse manner with the amount of moisture present in the soil. Soil moisture sensor consists of two conducting plates which function as a probe and act as a variable resistor together. When the sensor is inserted into the water, the resistance will decrease and get better conductivity between plates.



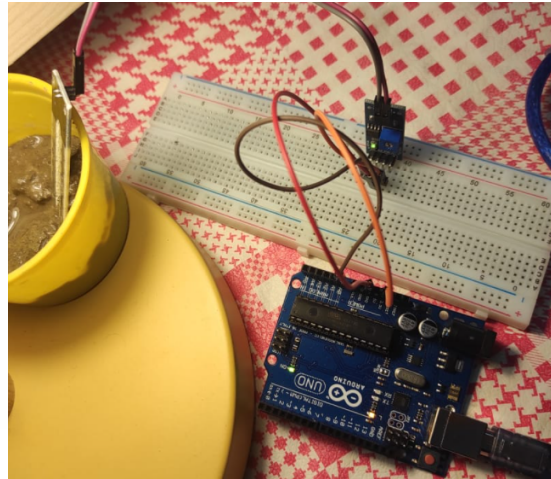
Working principle of soil moisture sensor:

- The above figure shows the working principle of the soil moisture sensor.
- Soil moisture sensor has two conducting plates. First plate is connected to the +5V supply through series resistance of 10K ohm and the second plate is connected directly to the ground.
- It simply acts as a voltage divider bias network, and output is taken directly from the first terminal of the sensor pin, which is shown in figure above.
- The output will change in the range of 0 – 5 Volt, in proportion with change in content of water in the soil.
- Ideally, when there is zero moisture in soil, the sensor acts as open circuit i.e. infinite resistance. For this condition, we get 5V at the output.

Connection diagram:



Interfacing Soil Moisture Sensor With Arduino UNO



Sketch:

```
void setup() {
  // initialize serial communication at 9600 bits per second:
  Serial.begin(9600);
}

// the loop routine runs over and over again forever:
void loop() {
  // read the input on analog pin 0:
  int sensorValue = analogRead(A0);
  // print out the value you read:
  Serial.println(sensorValue);
  delay(1);    // delay in between reads for stability
}
```

Results:

Measuring soil moisture in terms of percentage.

Here, the analog output of the soil moisture sensor is processed using ADC. The moisture content in terms of percentage is displayed on the serial monitor. The output of the soil moisture sensor changes in the range of ADC value from 0 to 1023. This can be represented as moisture value in terms of percentage using the formula given below.

$$\text{AnalogOutput} = \frac{\text{ADCValue}}{1023}$$

Moisture in percentage = $100 - (\text{Analog output} * 100)$

For zero moisture, we get a maximum value of 10-bit ADC, i.e. 1023. This, in turn, gives 0% moisture.

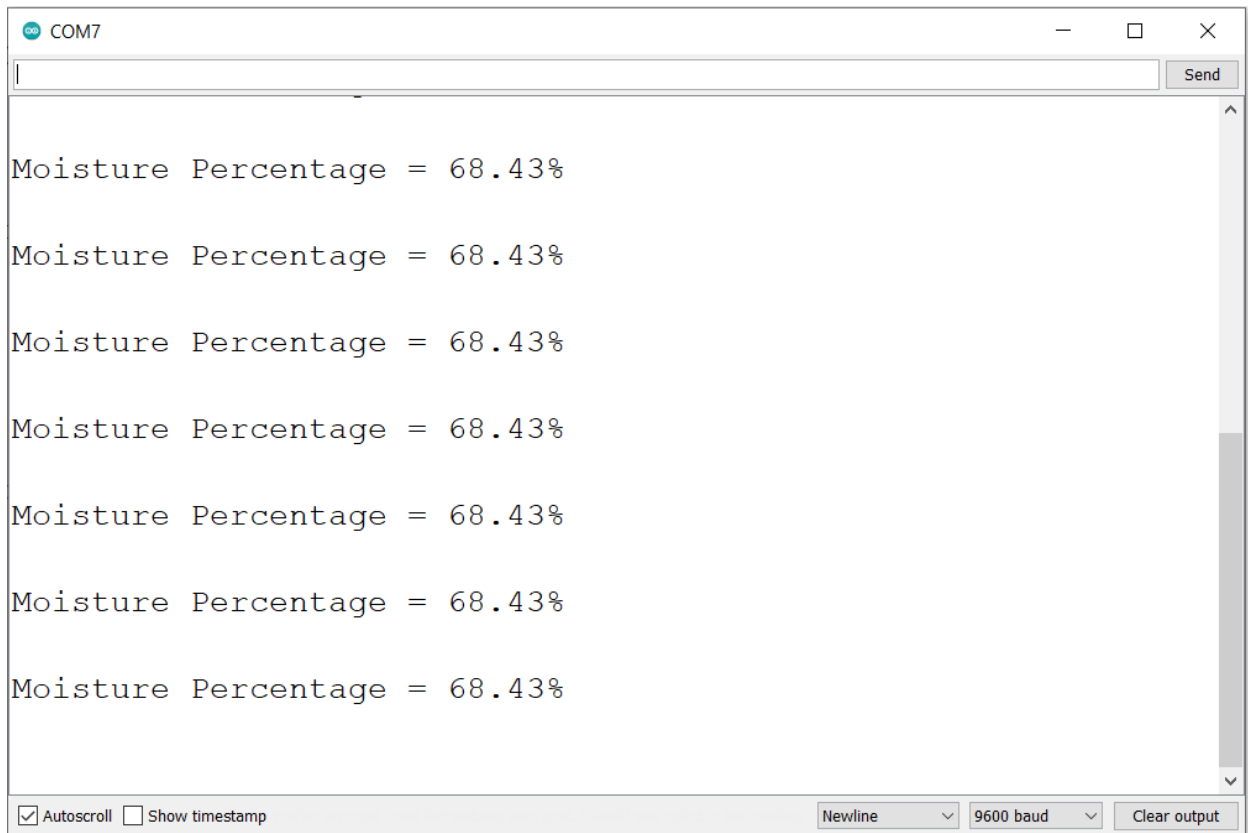


Fig.: Output on serial monitor.