

Planet Watering System

CCSW-432 : Internet of Things (C8)

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Introduction:

A soil moisture sensor is a crucial instrument used in agriculture, environmental monitoring, and research to measure the moisture content in the soil. The amount of water present in the soil is a critical factor influencing plant growth, irrigation management, and overall soil health. Soil moisture sensors provide real-time or periodic data, allowing farmers, researchers, and land managers to make informed decisions about water usage, optimize irrigation strategies, and enhance crop productivity.

Definition and usage:

A soil moisture sensor is an electronic device designed to measure the volumetric water content in soil. It quantifies the amount of water present in the soil by assessing the dielectric constant, electrical conductivity, or impedance of the soil, all of which are influenced by the water content. These sensors are typically embedded in the soil at various depths to capture a comprehensive view of moisture distribution within the root zone.

Soil moisture sensor usage:

Efficiency: Precise watering based on real-time data, reducing water wastage

Improved Plant Health: Optimal moisture levels, promote healthy growth and prevent plant diseases

Convenience: Remotely monitor and control the system via smartphone or computer

Problem & solution:

One of the most common problems that should be paid attention to while taking care of the plants is: the irrigation scheduling. Overwatering occurs when you water your plants too early or for a long period of time, which can cause crop damage and wasting water & money. On the other hand, underwatering happens when you notice that the soil became too dry for too long causing wilting of leaves which can affect the agricultural trade.

We can solve this problem by using a soil moisture sensor. This sensor is usually used to detect moisture in the soil, so it's ideal for scheduling an automatic irrigation system or for monitoring the moisture of the soil in which you have planted your plants. Which is an efficient way of using technology in improving farming by helping farmers save money and water considering that they can decide "when and how long" they need to water the plants to avoid overwatering and underwatering.

Code , hardware, installation:

1- Code:

```
#define SoilSensorPin 4

#define RelayPin 7

int SoilMoistureValue = 0;

byte degree[8] =
{
0b00011,
0b00011,
0b00000,
0b00000,
0b00000,
0b00000,
0b00000,
0b00000
};

int val1 = 0; // Value for storing SOIL level

void setup() {

    Serial.begin(9600);

    pinMode(SoilSensorPin, INPUT);
    pinMode(RelayPin, OUTPUT);

    // put your setup code here, to run once:

}

void loop() {
    Serial.print("Soil Moisture sensor=");
```

```
Serial.println(digitalRead(SoilSensorPin));
```

```
SoilMoistureValue = digitalRead(SoilSensorPin)
```

```
if(SoilMoistureValue >= HIGH ){
```

```
    Serial.println("Soil Water: LOW");
```

```
    digitalWrite(RelayPin, LOW);
```

```
    delay(500);
```

```
}
```

```
if(SoilMoistureValue <= LOW){
```

```
    Serial.println("Soil Water: high");
```

```
    digitalWrite(RelayPin, HIGH);
```

```
}
```

```
    delay(1000);
```

```
}
```

```
// put your main code here, to run repeatedly:
```

2- Hardware:

- 1-Arduino UNO
- 2- 5V relay module,
- 3-water pump
- 4-tube
- 5- soil moisture sensor
- 6-water reservoir
- 7-breadboard,

3- Installation:

Breadboard

To install a watering plant system using an Arduino UNO, a 5V relay module, a water pump, a tube, a soil moisture sensor, a water reservoir, and a breadboard, you'll need to follow several steps. Here's a general outline to do it:

1-Gather the necessary components: Arduino UNO, 5V relay module, water pump, tube, soil moisture sensor, water reservoir, jumper wires, breadboard, power supply, and any additional hardware or tools.

2-Connect the Arduino UNO to the breadboard: Insert the Arduino UNO into the breadboard, ensuring that the pins are properly aligned.

3-Connect the power supply: Connect the power supply's positive terminal to the Arduino's 5V pin and the negative terminal to the Arduino's GND pin. This will power the Arduino UNO.

4-Connect the relay module: Connect the relay module to the Arduino UNO using jumper wires. The module should have several pins, including VCC, GND, IN1, and JD-VCC. Connect VCC and GND to the 5V and GND pins on the Arduino, respectively. Connect the IN1 pin to any digital pin on the Arduino, such as pin 2.

5-Connect the water pump: Connect the water pump to the relay module. Connect the pump's positive wire to the relay module's "NO" (normally open) pin and the pump's negative wire to the relay module's GND pin.

6-Connect the soil moisture sensor: Connect the soil moisture sensor to the Arduino. The sensor typically has three pins: VCC, GND, and A0 (analog output). Connect VCC to the 5V pin on the Arduino, GND to the GND pin, and A0 to any analog pin on the Arduino, such as A1.

7-Set up the code: Write or download the Arduino code to control the watering system. The code should include instructions to read the soil moisture sensor's analog output, activate the relay module to turn on the water pump if the moisture level is below a certain threshold, and control the timing and duration of watering cycles.

8-Upload the code: Connect the Arduino UNO to your computer using a USB cable and upload the code using the Arduino IDE or another compatible programming software.

9-Assemble the system: Place the water pump in the water reservoir and connect the tube to the pump's outlet. Position the tube near your plants, ensuring that water can reach the roots.

10-Test the system: Power up the Arduino and verify that the system functions as expected. The Arduino should read the moisture level from the sensor and activate the water pump through the relay module if necessary.

