Automatic Soil Irrigation System

1. Introduction: The Automatic Soil Irrigation System is an innovative solution designed to efficiently water plants based on their soil moisture levels. The system utilizes sensors to detect soil moisture content and triggers the irrigation process when necessary, optimizing water usage and promoting plant health. This report outlines the components used, the system's functionality, circuit diagram, programming code, installation procedure, applications, and future potential.

2. Components Used:

- Soil Moisture Sensor
- Arduino UNO
- Relay Module
- Water Pump
- Power Supply
- Connecting Wires and Breadboard

1. Soil Moisture Sensor: The soil moisture sensor is a crucial component that measures the moisture content present in the soil. It typically comprises two electrodes that are inserted into the soil. These electrodes measure the resistance between them, which changes based on the soil's moisture level. When soil moisture decreases, the resistance between the electrodes increases, and vice versa. This signal is then sent to the Arduino for processing.

2. Arduino UNO: The Arduino UNO acts as the brain of the system. It receives input from the soil moisture sensor and processes this data using its input pins. Based on the received moisture level data, the Arduino triggers the irrigation process by controlling the relay module connected to it. It's programmed to interpret the sensor data and execute commands accordingly.

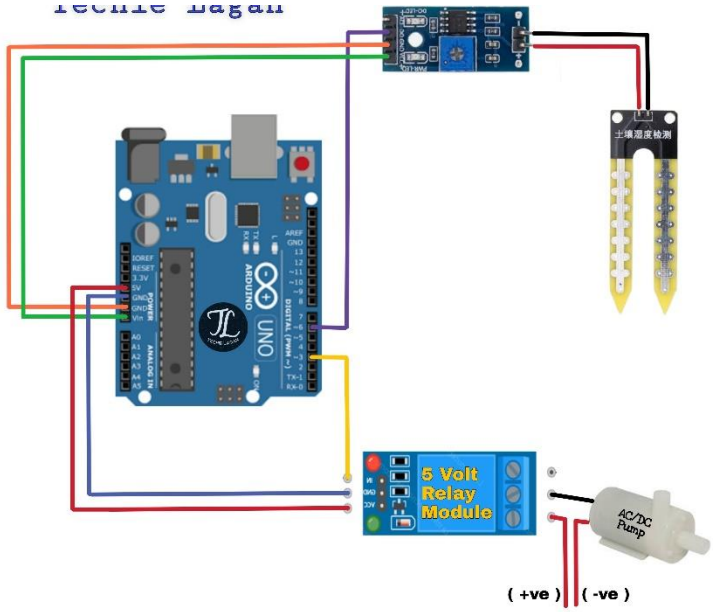
3. Relay Module: The relay module is used to control high-power devices like water pumps or solenoid valves through the Arduino. It acts as a switch that can handle the high current/voltage required by the water dispensing mechanism. When the Arduino sends a signal, the relay module closes or opens the circuit, allowing or cutting off the power supply to the water pump/solenoid valve.

4. Water Pump: These components are responsible for dispensing water to the plants. The water pump, if used, draws water from a reservoir and delivers it to the plants through tubing.

5. Power Supply: The power supply provides the necessary electrical power to operate the entire system. It could be a battery, DC adapter, or any other suitable power source depending on the system's design and requirements. The Arduino and other components need a stable power source to function correctly.

6. Connecting Wires and Breadboard: These are used to establish connections between the various components and the Arduino. The breadboard serves as a platform for easy prototyping and circuit building, allowing components to be connected without soldering.

3. Circuit Diagram:



4. Code:

```
const int pump =3;
const int soil_sensor =6;
int water;
void setup() {
  pinMode(pump,OUTPUT); //output pin for relay board, this will sent signal to
the relay
  pinMode(soil_sensor,INPUT); //input pin coming from soil sensor
  Serial.begin(9600);
}

void loop() {
  water = digitalRead(soil_sensor);  // reading the coming signal from the
soil sensor
  if(water == HIGH) // if water level is full then cut the relay
  {
  digitalWrite(pump,HIGH); // low is to cut the relay
  Serial.println("the water pump is on");
  }
  else
  {
  digitalWrite(pump,LOW); //high to continue proving signal and water supply
  Serial.println("the water pump is off");
  }
  delay(4000);
}
```

5. Procedure Step by Step:

- Connect the soil moisture sensor and relay module to the Arduino as per the circuit diagram.
- Upload the provided Arduino code to the Arduino board.
- Place the soil moisture sensor probes in the plant's soil.
- Power up the Arduino using an appropriate power supply.
- The system will now monitor soil moisture levels and activate the water pump/solenoid valve when necessary.

6. Working: The soil moisture sensor measures the moisture level in the soil. The Arduino processes this data and triggers the relay module to activate the water pump or solenoid valve, delivering water to the plants when the soil moisture falls below a specified threshold.

7. Applications:

- Agriculture and farming
- Gardening and landscaping
- Greenhouses and nurseries
- Urban and indoor gardening setups

8. Future Scope:

- Integration with weather forecasting for predictive watering.
- Incorporating IoT for remote monitoring and control.
- Implementing machine learning algorithms for adaptive watering schedules based on plant type and environmental conditions.
- This Automatic Soil Irrigation System offers a cost-effective and efficient way to maintain optimal soil moisture levels for healthy plant growth while conserving water resources. Its versatility allows for widespread applications and potential future enhancements.