



Intelligent Soil Moisture-Controlled Watering System

Shahriar Karim Shafin, Muhtasim Fuad Saad, Morshed Fahim

Department of Mechanical Engineering, Bangladesh University of Engineering and Technology

Objective

- The primary objective of this project is to develop an **automatic watering system** that monitors soil moisture in real-time and controls a water pump to ensure optimal hydration of plants. The system minimizes human involvement and promotes efficient water usage.

Component



- Sensor:**
 - Soil Moisture Sensor
 - DHT 11
- Data Processing:**
 - Arduino Uno
- Connectivity:**
 - Relay Module
- User Interface:**
 - LCD Module
- 12 V Water Pump**



Soil Moisture Sensor



Relay Module



Arduino Uno



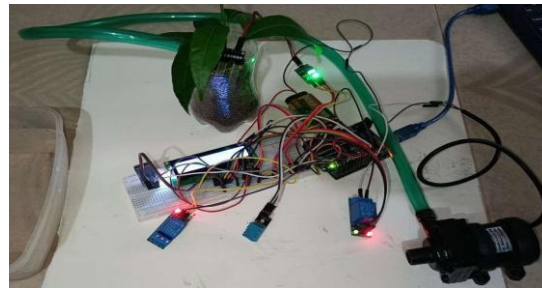
LCD Module



DHT 11 Sensor



12 V Water Pump



Methodology



Electronic Architecture:

- The **Soil Moisture Sensor** feeds data to the Arduino.
- The Arduino processes this data and compares it to a pre-set threshold.
- When the moisture is low, the **Relay Module** is triggered, which powers the **Water Pump**.
- The **LCD Module** displays the current status of the system.



Mechanical Architecture:

- The **Water Pump** is the key mechanical component that irrigates the plants. It is activated and deactivated automatically based on the sensor data, with no manual operation required.
- The system's framework (such as hoses or drip lines) can be configured for various plant setups.



Software Architecture:

- The **Arduino sketch** contains the logic to read the soil moisture levels and decide when to activate the pump.
- It includes a pre-programmed threshold for moisture, which can be fine-tuned.
- The user can monitor and debug the system using **serial communication** through a computer interface.



Application



This system can be applied in several contexts:



- Home Gardens:** Automates watering in small home-based gardens to ensure plants get the right amount of water.



- Greenhouses:** Maintains controlled watering conditions for plants, reducing manual labor and increasing productivity.

- Small-Scale Agriculture:** For farmers managing small plots, this system conserves water while ensuring crops receive consistent hydration.

Opportunity



- Water Conservation:** By automating irrigation based on real-time soil moisture data, the system minimizes water wastage, making it ideal for regions facing water scarcity.



- Smart Agriculture:** This project fits into the growing trend of precision agriculture, where farmers use technology to optimize crop growth, potentially scaling the project for larger fields and integrating with IoT systems for remote monitoring.



- Home Automation Market:** With an increasing interest in smart home devices, this system can be marketed to hobbyists, gardeners, and those looking to maintain indoor or outdoor plants with minimal effort.

Summary

The **Smart Plant Watering System** automates plant irrigation using a soil moisture sensor and Arduino. It reads soil moisture levels and activates a water pump when the soil is dry, and deactivates it when moisture is sufficient. Temperature and humidity are monitored with a DHT11 sensor, and all data is displayed on an LCD. The system also supports Bluetooth control, allowing manual pump operation. This efficient system is ideal for home gardens and small-scale farms, ensuring optimal plant care with minimal human intervention.

Significance



Automation Reduces Labor:

Automating the watering process saves time and effort, making it ideal for individuals with busy schedules, gardeners, and small-scale farmers who can't constantly monitor plant conditions.



Cost-Effective:

The system uses affordable components and is easy to set up, providing a low-cost solution for automated irrigation compared to commercial systems.

Flow Chart:

