IoT Irrigation Monitoring & Controller System

Abstract

In agriculture, managing irrigation efficiently is essential to prevent water wastage and ensure proper crop growth. Farmers with large lands often find it difficult to monitor moisture levels manually. Over-watering can lead to waterlogging, while under-watering causes soil to dry, both of which can damage crops. To overcome this, an **IoT-based Irrigation Monitoring and Controller System** is proposed. This system allows users to monitor soil moisture remotely and control a water pump via the internet. Using an Arduino Uno, soil moisture data is collected and displayed on a web platform (IoT Gecko). The user can turn the pump ON or OFF based on real-time moisture data, enabling efficient and remote irrigation control.

Aim

To design and implement an IoT-based system that monitors soil moisture and allows remote control of water pumps, ensuring efficient irrigation and water conservation.

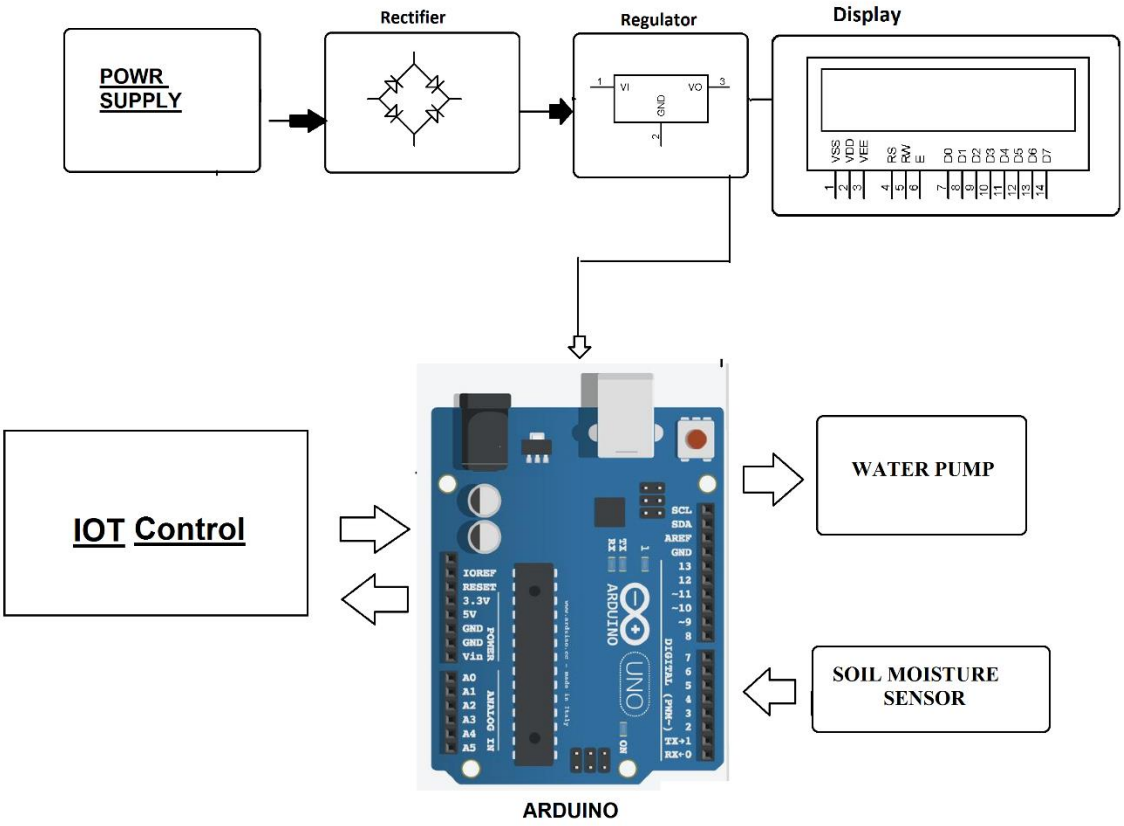
Objectives

- To continuously monitor soil moisture using sensors.
- To transmit moisture data to a web platform via Wi-Fi.
- To enable users to control the water pump remotely.
- To reduce human intervention in crop irrigation.
- To optimize water usage and protect crops from damage.

Working Principle

The system operates by continuously measuring the moisture level of the soil using a **soil moisture sensor** connected to an **Arduino Uno**. This data is transmitted via a **Wi-Fi module** (ESP8266 or similar) to an **IoT platform (IoT Gecko)**. The user can view current soil moisture levels and motor status on the website. If the moisture level is below a threshold, the user can remotely switch ON the water pump. Once the soil reaches sufficient moisture, the pump can be turned OFF via the same interface. The system ensures real-time monitoring and remote control, reducing manual labor and improving irrigation efficiency.

Block Diagram:



Hardware Components

- Arduino Uno
- Soil Moisture Sensor
- Water Pump
- Wi-Fi Module (ESP8266 or NodeMCU)
- LCD Display (optional)
- Power Supply Unit
- Rectifier & Voltage Regulator

Software Requirements

- Arduino IDE (Compiler)
- Programming Language: Embedded C
- IoT Platform: IoT Gecko

Advantages

- Efficient water usage and conservation.
- Remote irrigation control via smartphone or PC.
- Reduces manual labor and farmer workload.
- Prevents overwatering or under-watering.
- Real-time monitoring improves crop health.

Disadvantages

- Dependent on internet connectivity.
- Requires initial setup and calibration.
- Limited scalability for very large farms.

Applications

- Agriculture fields (small to medium scale).
- Greenhouses and polyhouse systems.
- Home gardens and lawns.
- Horticulture and plantation monitoring.

Future Scope

- Automatic motor control using predefined thresholds.
- Integration with weather forecasting APIs.
- Solar-powered version for energy efficiency.
- Mobile application for enhanced user interface.
- Multi-sensor deployment for large farm segmentation.

Conclusion

The IoT Irrigation Monitoring and Controller System is an efficient solution to modern irrigation challenges. It helps farmers and gardeners monitor soil moisture levels in real-time and control water pumps remotely. This not only conserves water but also ensures healthy crop growth. With potential for further automation and expansion, this system contributes to the advancement of smart agriculture.