

# Smart Irrigation System

Using Internet of Things

Prachi Patel  
Computer Science  
SUNY Binghamton  
Binghamton NY USA  
ppatel85@binghamton.edu

Ayushi Agrawal  
Computer Science  
SUNY Binghamton  
Binghamton NY USA  
aagraw11@binghamton.edu

Amera H Al-Amery  
Computer Science  
SUNY Binghamton  
Binghamton NY USA  
aalamer1@binghamton.edu

## ABSTRACT

Watering plants is a daily and tedious job to do. Moreover, each plant has different moisture requirements for their proper growth. So smart irrigation system is a mechanism which needs to implement and need attention once and we can get benefit throughout. When we plant a tree, we just need to set the moisture need for that particular plant and we are done. This system keeps on watering the plant when the moisture content of the soil where the plant is goes low than desired.

## 1 Introduction

The proposed system aims at detecting the moisture content of the soil using sensor that are placed directly into the soil near the root of the plant. The sensor senses the water level of the soil and if the water level is not adequate then the user will be notified through an application on user's phone that the moisture level of the soil is low and water pump has been turned on. This will allow people to continuously monitor level in the soil and control the water supply through android based application at their own time and convenience. In this technique soil moisture sensor is placed near the root of plant. The soil moisture sensor will sense the moisture content of the soil and transfer the soil moisture information to the Arduino controller which in turn sends the information to the relay and relay operates the water pump and send the moisture value and the status of water pump to the android application. Water pump automatically switches on and off depending on the moisture content of soil and the notification is sent to the user on mobile phone whether the water pump is on or off and the value of soil moisture sensor. This on a larger level will help farmers to continuously monitor the moisture level in the field.

## 2 Hardware Components

Following are the hardware we used in our project:

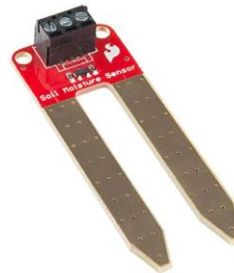
1. Arduino UNO R3
2. SparkFun soil moisture sensor
3. Relay module 5V
4. Water pump DC 3.3V



Arduino UNO R3



Relay



SparkFun soil moisture sensor



Water pump

## 3 Design

Following the design flow of smart irrigation system (Figure 1), where we first set the soil moisture requirement of the group of the plant where we are using this system. Then after setting that value we need to set the water supply for water pump, and we need to make sure that the water supply for the water pump never goes off. Then we need to set the soil moisture sensor near the root of the plant we need to water.

It starts with soil moisture sensor measuring the soil moisture and then it sends the data to IoT platform (Arduino). At IoT platform the data is collected and sent in an analog form. In the Arduino program, it checks the value of soil moisture. If the value is greater than threshold then it will turn the pump off and if the value is less than the threshold then it will give the command to turn on the water pump. And then the value and the status of water pump will be sent to the android phone and user will get notification about that.

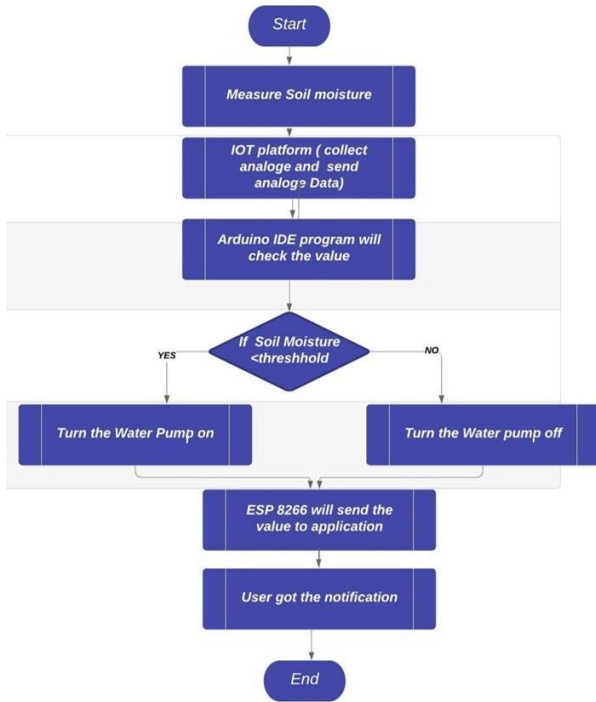


Figure 1: Design flow of smart irrigation system

## 4 Implementation

Relay is an electrically operated switch that can be turned on or off, letting the current go through or not, and can be controlled with low voltages, like the 5V provided by the Arduino pins. The following diagram shows the connection using pin 13. Figure 2.

SparkFun Soil Moisture Sensor is pretty straightforward to use, all you will need is to connect the VCC and GND pins to your Arduino-based device (or compatible development board) and you will receive a SIG out (Pin A0) which will depend on the amount of water in the soil. The following diagram shows the connection. Figure 3.

Pump Motor DC 3V: small water pump motor used to push water out to soil. connected to Arduino using GND pin and 3.3 Vcc power pin connected to relay. The following diagram shows the connection. Figure 4.

The application connected to Arduino using pins V5, V6.

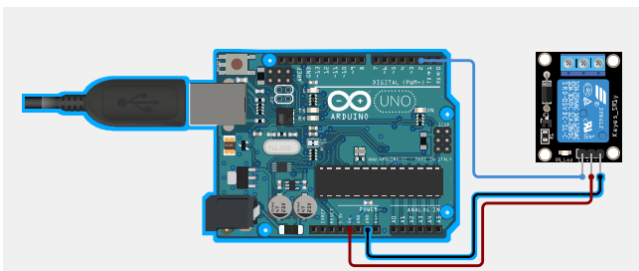


Figure 2: Connection of Arduino and relay

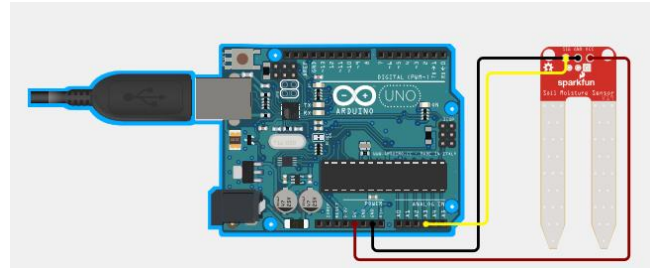


Figure 3: Connection of Arduino and soil moisture sensor



Figure 4: Connection of Arduino and relay to water pump

## 5 Evaluation

We have used Arduino Uno R3 for our connection. For soil moisture sensor detection, we have used sparkfun soil moisture sensor. We have used a water pump of DC 3.3V and for connecting that pump we have used a 5V relay. We have used an Android application Blynk for connection with the cloud and running an Android application which displays the soil moisture sensor level and status of the pump whether it is on or off.

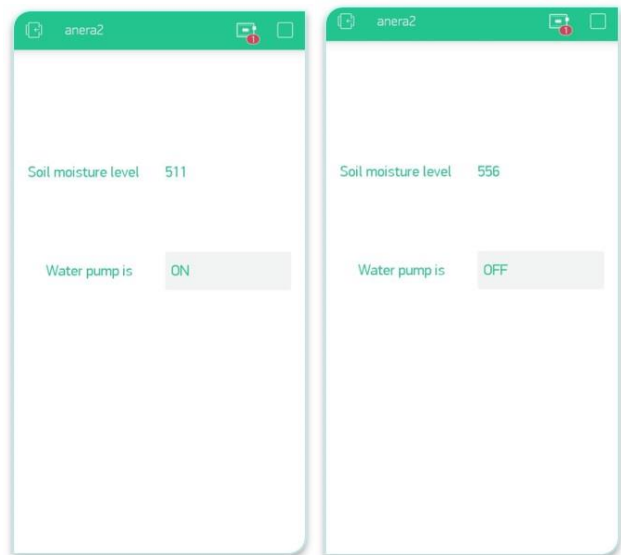


Figure 5: Display of android application with soil moisture level and water pump status

## Smart irrigation system

We have set the threshold of soil moisture level to 520 for this project experiment. When we keep soil moisture sensor inside water, the soil moisture level is 556 and so that is higher than the threshold so the water pump will be off. But when I remove the soil moisture sensor from water and keep it in dry surface the moisture level is 513 which is lesser than the threshold so it will start the water pump. Here are the images how it will look in the android application where the soil moisture level and the status of water pump is fetched. Figure 5(a), 5(b).

We have kept the timer for 30 seconds so after every 30 seconds it will check and control the water pump accordingly.

For this system to work successfully, we need to take care of the water supply that it never goes off. We also need to take care of the plant that it is not exposed to snow. Since the soil moisture need for each plant category is different, we need to set it when you install this system for a plant. Since the moisture need for each plant is different, we can't keep 2 plants of different category together. The water supply where the water pump is connected need to be filled with water always.

## 6 Conclusion

Smart irrigation system solves the day to day problem of watering the plant daily and in particular amount. When setting up the device with the plant we just need to set the moisture needed for that plant and then check the water supply. And our job is done. Then the mechanism will control the moisture level of the soil and maintain it. It will turn the pump on and off depending on the soil moisture level of the soil at that time.

## ACKNOWLEDGMENTS

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