

# Smart Irrigation System using Soil Moisture Sensor

Prince Rai<sup>1</sup> Ruksar Shaikh<sup>2</sup> Prof. Swapna Nikale<sup>3</sup>

<sup>1,2</sup>Department of Information Technology

<sup>1,2,3</sup>B.K. Birla College, Kalyan, India

**Abstract**— With the help of IOT we are achieving new way of using components, so we are design a Smart irrigation system technology and it's useful for the agriculture or in the botanical garden (Nurseries). Purpose of this paper is to control the wastage of the water. Because, Water is the main for the agriculture and also for the sampling of trees which is situated in the botanical gardens (Nurseries). In the Agriculture Farmers wants a water for the farming. So using the IOT device the work load for the farmers get decrease and the wastage of water also get decreased. Here in the smart irrigation system the soil moisture sensor are used to sense the moisture of the soil. Then automatically water pump motor pump-out the water. While the system is running it also indicates the level of moisture in the soil and send the SMS (messages) to the farmers or to the assistant of the botanical garden using the GSM module.

**Keywords:** Soil moisture Sensor, Agricultural Field, Botanical Gardens, Arduino, GSM Module, Irrigation, Water Pump, Soil

## I. INTRODUCTION

In India, Agriculture is the main source to the growth of economic status and there are many Botanical Gardens (Nurseries) are also available in the India Where in the Botanical Gardens(Nurseries) there are many Sampling are present. The Samplings means Small-Small Plants they requires accurate amount of water for the growth. There are the Problem in agriculture field, in many area of the India there is a scarcity of the water and also the wastage of water in many area of India. To prevent the wastage of water the Smart irrigation system is useful and also it work's where the are having scarcity of water. Basically, the Smart Irrigation System is an IOT based device having that much of capability to solve the problems of the farmers for the agriculture and also in the Botanical Gardens (Nurseries). In the Smart Irrigation system there are many components which are used like

### A. Arduino Uno:

It is used to analyze the Signals from the Sensors such as Soil moisture sensor.

### B. Soil Moisture Sensor:

It is used to smartly sense the moisture of the Soil and the agricultural field where the farmers used to farming.

### C. Pump Motor:

It is used to pump the water in the irrigation water, when the sensors give the signals that time the pump motor starts pumping the water and they give the water to the soil and the agricultural field.

## II. PROBLEM STATEMENT

In India, There are many problems which are related to water. The water is the main source for the agriculture and

plantation. The Consumption of water is increasing day by day in a country. Nowadays both farming and plantation requires a large amount of water. There are many modern type of irrigation system or technique are present But those irrigation system doesn't have that much of capability to solve the problem of irrigation. Those techniques are slow. Because, they don't have that much of capacity to give the accurate amount of water to the root zonal are of the plant.

There is a Traditional system which is used in agriculture. These is done only by the farmers they irrigate the water directly to the land or a plants itself. In the traditional system, there is an absence of automatic system. There is a disadvantages of traditional system because it requires a lot of waters and time i.e., wastage of time and the wastage of water. In this system the farmers physically work to control the drip irrigation.

Now, the Smart irrigation system has many advantages over the modern and traditional irrigation system. The smart irrigation system optimizes the level of water based on things such as soil moisture. This can be done using soil moisture sensor it can sense the moisture of the soil and passes the messages that the soil requires water or not. The smart irrigation system is based on IOT which is capable to handle the automating irrigation system by analyzing the level of water in the soil.

### A. Advantages of Smart Irrigation System:

- 1) Reduces the wastage of water and time.
- 2) Decreases the infrastructure to store the water.
- 3) Save the water resources for future.
- 4) Reduces the soil erosion.
- 5) Wide reaching system.

In the botanical garden, there are some plants whose are going to be extinct at that stage the plants require proper amount water. Also there are many other plants they requires accurate amount of water so the smart irrigation system help to irrigate the water to the plants.

If this system get install in the nurseries it will very helpful for the plants.

These are the some benefits for the gardens (Nurseries) to use this irrigation system.

## III. PROPOSED SYSTEM

The major parts of the system are Sensing the moisture, Passing the signals (Controlling) and Output section where the water pump out using motor pump. The moisture of the Soil was detected using Soil moisture sensor. The control of the system is based on Arduino platform. The output of the system is controlled by the control unit in that the switching on and off that depends on the soil moisture, whether the soil is dry or wet if the soil get wet then they give the signal to irrigate the water and this happens automatically.

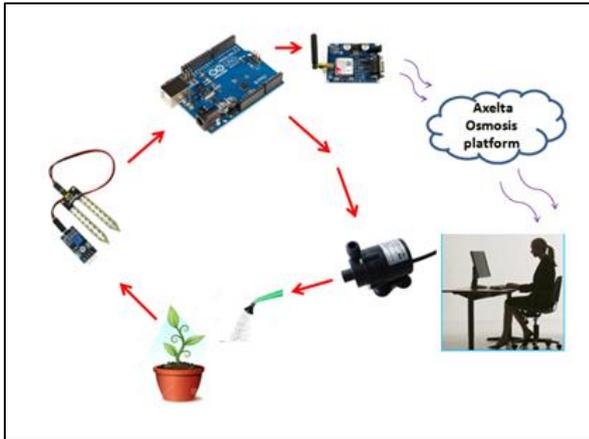


Fig. 1: System flow diagram

There are components to design the system:

A. *Arduino UNO*



Fig. 2: Arduino UNO

Arduino is an open-Source platform which is based on easy to use the hardware and software. It is Micro-controller based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. It has Analog and digital input and output pins. Arduino Boards are used to read the input and turns on to the output. Example: Turn-on motor.

B. *Relay Module*



Fig. 3: Relay Module

Relay Module is a relay-interface board. A relay is an electrically switched which get turn on and turn off and it is connected to a low voltage power like an Arduino pins it requires only 5V of power.

C. *Soil Moisture Sensor*

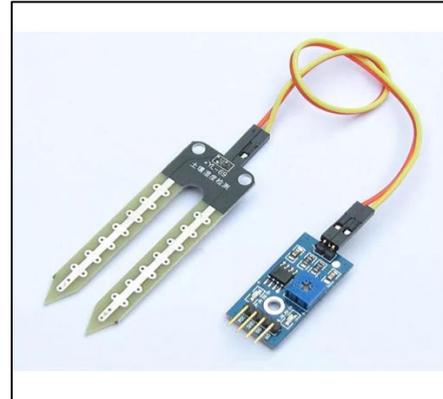


Fig. 4: Soil moisture sensor

The Soil moisture sensor used to sense the amount of water in the soil. If there is a water present above the range in the soil it passes the signals to the control unit.

D. *Jumper Wires*



Fig. 5: Jumper wires

The jumper wires is an electrical wire that have connector at each side of a wire. There is a several wires like male-to-male, female-to-female, and male-to-female. It is used to interconnect the components to microcontroller or to a sensor.

E. *GSM Module*



Fig. 6: GSM Module

It stands for Global System for mobile Communication. It is a chip or a circuit which is used to establish the communication between mobile phones and computing system.

#### F. Water Motor Pump



Fig. 7: Motor Pump

The water motor pump is a submersible motor. It is used to pump out the water when the signal is received. This motor easily get deeper in to the water and works properly. This motor also requires power supply the AC and DC both power can implies on the motor.

#### G. Water



Fig. 8: Water Flow

Water is the main sources for the plantation and the agriculture. The water get pump out as shown in above fig.

#### H. Plants



Fig. 9: Botanical Plants and Agricultural Plants

There is botanical plants and the agricultural plants both requires accurate amount of water for their growth. Using smart irrigation system it is possible to give them water in a proper manner.

The working principle of the system is to connect the soil moisture sensor, whether the device is embedded into the soil, to the microcontroller that is connected to the other components of the system. The soil moisture used to detect the moisture of the soil, firstly it will sense the moisture and pass the signals to the microcontroller, which is a control unit used to control the pump. Here if the level of the moisture is low then the sensor pass the signals to the control unit and it will the water using pump motor, if it get proper water then it will disconnect the connection and stop the pumping of water, the input power supply range should from 7V to 12V. The Relay module is a simple circuit consists a single transistor and it is use to pass the current. When the signals passes to the control unit and the response is negative then the motor pump will pump the water, the pump motor is used to pump out the water.



Fig. 10: Smart Irrigation System Model

##### 1) Smart Irrigation System Connection

This System using Arduino microcontroller UNO R3, in this we programmed such that it gives the signals to the motors. The soil moisture sensor get connected to the Arduino using jumper wires then the relay module connected to the UNO and to the motor. Here, the Arduino is the control unit of the system. The VCC, GND, V0 of the soil sensor get connected to the Arduino the V0 must be connected to the digital pin of the Arduino and the VCC, GND get connects to the analog VCC, GND of an Arduino. The Relay module IN1 pin connected to the digital pin of Arduino and the VCC to the 5V of analog pin of the Arduino and the channel of the relay get connected to the motor. The GSM module which gives the notification that also connects to the Control unit UNO R3. For the Power supply we can use AC supply and DC supply also, for the DC power there is 5V to 12V and for the AC supply there is 220V.

2) Block Diagram

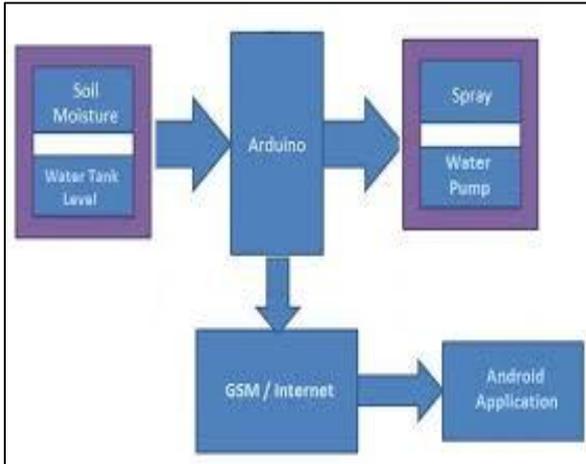


Fig. 11: Block diagram

3) Analysis

SOIL CONDITI ON	MOISTU RE VALUE	RELA Y STATU S	MOTO R STATU S	RESUL T
DRY	<1200 >800	ON	ON	TRUE
WET	<600	OFF	OFF	FALSE

IV. CONCLUSIONS

Thus the “Smart irrigation system using soil moisture sensor” has been run and tested successfully. It is developed by using some integrated features of all the hardware components which are used. The system is tested whether it is working automatically. The soil moisture sensor used to sense the water level of the different plants and the agricultural fields, the sensor sends the signals to the Arduino that there is a requirement of water and it also give the notification to the farmers, then the control unit sends the signals to the water and then using motor the water get pump out. When the water level reached the connection get cut then the relay also cut and it cut out the power of motor then the motor turned OFF. Thus, the functionality of the whole system has been tested thoroughly and it is said that the system run successfully.

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