



Smart Water Sprinkler System Based on Arduino Microcontroller

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Abstract:

The system is designed to implement a “Smart water sprinkler which is based on Arduino Microcontroller”. Today whole world is facing scarcity of water including India. In irrigation the water requirement is large and in the process lot of water is wasted too. In addition the plants require continuous observation. The main motive of designing this system is to impart a water delivering schedule to the plants. This smart system aims at minimizing the water loss and also reducing the constant supervision required for plants. It also avoids the damaging of plants by providing the exact amount of water which is needed by the plants. The system contains a soil moisture sensor which acts as a sensing element in the system. A gateway unit which consists of Arduino Microcontroller, switching device, actuators like servo motor and pump is present. A program is developed in accordance with the threshold values of the sensing element and the actuators. The Arduino microcontroller used here acts as the data processing element it processes the input data from sensing element and accordingly takes decision based on its predefined values. The switching device used here is a relay which controls the pump according to the instruction provided by the microcontroller. The servo motor acts as an actuator which provides water to the direction where it is needed. This system is highly efficient with high accuracy and low cost. It consumes low power which makes it a resource efficient technology.

Keywords: Arduino Microcontroller, Soil moisture sensor, Servo motor, Water pump

1. INTRODUCTION

Water is a resource that is needed by all living species. So it is necessary for us to check the water usage and preserve it for the future generation to come. One industry that uses large amount of water is the agriculture industry. In India still 14.5% of GDP is dependent on agriculture which shows the status of agriculture in India. A large amount of water resource is wasted also by this industry. So in this project report an efficient smart sprinkler system is designed which will check the water usage and will also reduce the human supervision required. The smart model implements sensor technology with Arduino microcontroller to make a smart switching device. The system displays the basic switching mechanism of motor and pump using sensors. This system will avoid over watering of already saturated soil. There are many innovations done in this area but some are very expensive and some cannot be implemented on the ground. This system is implemented easily and also it is cost effective. It is user friendly and can be easily reprogrammed for any requirement.

2. COMPONENTS USED

2.1 Arduino Microcontroller

The Arduino Uno microcontroller board used here is based on Atmega328P. It consists of 14 digital input/ output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button.

2.2 Soil Moisture Sensor

A capacitive contact soil moisture sensor is used. Soil moisture sensor measures the volumetric water content of the soil by some indirect methods which includes measuring different properties of soil like electrical resistance, dielectric constant and interaction with neutrons. It has one probe like structure

which will be dipped inside the soil. The circuit part of the sensor contains 4 pins i.e. V_{in} , ground, AO (analog output), DO (digital output). The moisture sensor provides an analogue output which can be easily interfaced with the Arduino.

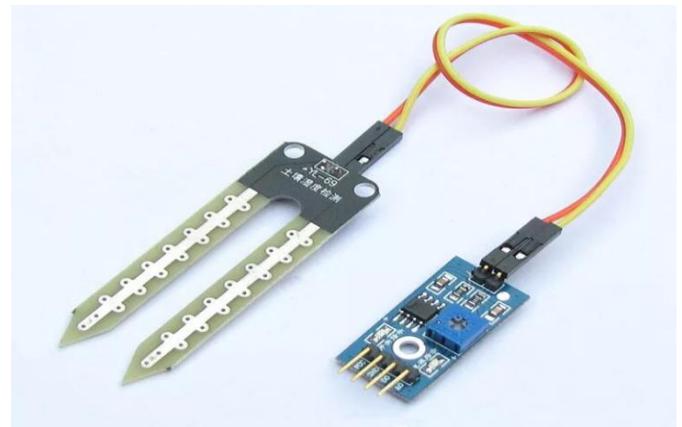


Figure.1. Soil Moisture Sensor

2.3 Relay

Relay is a switch which is operated electrically. Relay is used when it is necessary to control a circuit by separate low power signal. Here it is used to control the water pump. The relay used here also contains an inbuilt motor driver required for the pump.

2.4 Servo Motor

Servo Motor is used as a rotary actuator here. It allows the precise control of angular position which is required. The servo motor is a closed loop servo mechanism that uses position feedback to control its motion and position

2.5 Water Pump

A pump is used to transport the water from the tank or reservoir

2.6 Connecting leads and Pipe

Connecting leads are required to connect all components and pipe to transfer water.

3. SOFTWARE DESCRIPTION

Arduino IDE

The Arduino Integrated Development Environment contains a text editor for writing code in the embedded C language, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuine hardware to upload programs and communicate with them.

4. WORKING

At first the moisture sensor will sense the amount of moisture present in the soil and accordingly it will send its output to the microcontroller through the input/output pins provided in the Arduino board. The program allows the microcontroller to read

the moisture value every 20 seconds. If the value reaches the threshold value as determined initially. It will first moves the horn of the servo motor along with the pipe which is attached to it towards the plant whose moisture level decreased. The servo motor is connected to the 9th number output pin of Arduino board through which the microcontroller is giving instruction to the motor. Then the microcontroller will start the water pump which is connected to the 3rd number output pin of the board, the pump will pump water for some time interval. Then the microcontroller will bring the servo motor's horn back to the initial position. The switching of the water pump is done by the relay which controls the AC power supply which is provided to the pump. Initially the relay is in NO (normally open) condition which signifies that the motor is in normal position and pump is in OFF state. As soon as the signal that soil is dry from the moisture sensor reaches the microcontroller the motor horn turns to the direction of the plant and the NO changes to NC (normally closed), due to which pump starts pumping water to the plants.

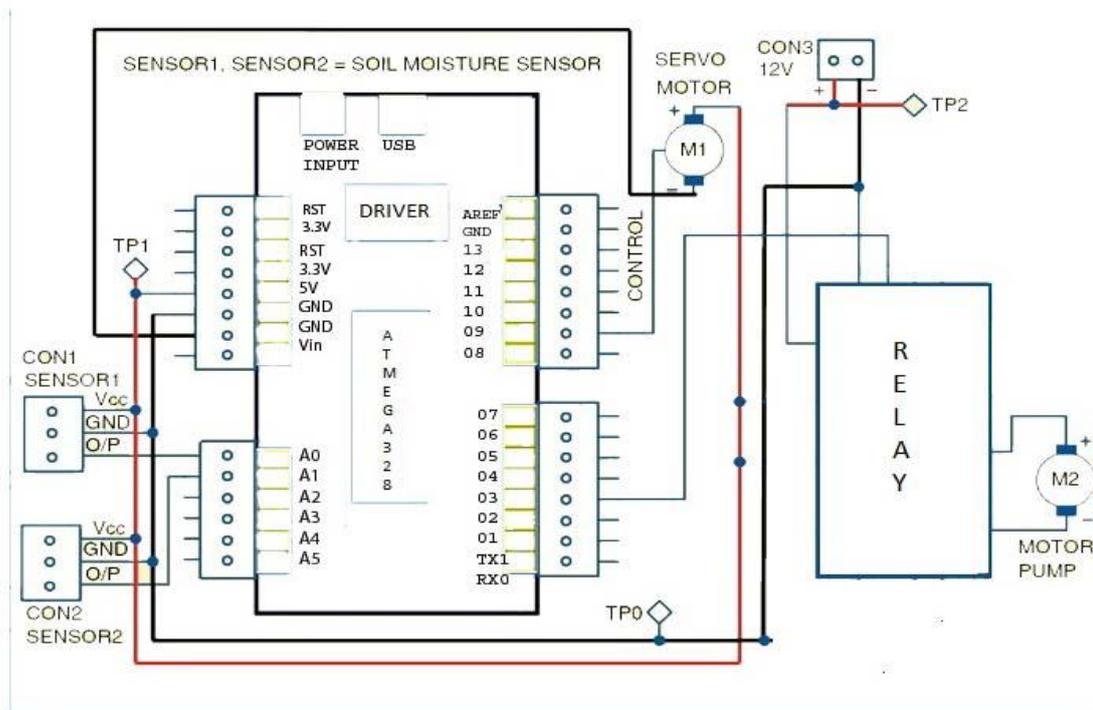


Figure.2. Block diagram of the system

5. RESULTS ANALYSIS

This Smart sprinkler system is tested in the garden plants on a small scale. It has shown best results. A plant requires an average of 600-800mm of water every day. In Arduino code the moisture range is set as 300-700 which delineates the corresponding resistance value in digital format. It is proved to be a good care taker of the plants in absence of the human. Moreover it is pretty cheap and a robust design as compared to the similar design available in the market.

6. CONCLUSION

As the smart sprinkler system has a user friendly design so it can be used by the household users as well as the commercial user. Further this system will reduce the human supervision and also make the irrigation automated and tech friendly. The best benefit is that it will reduce the wastage of water during

irrigation and helps in saving the precious water resource. Also it consumes less power due to the usage of the microcontroller.

7. FUTURE SCOPE

This Smart system can be further enhanced by using a Webscaper which will help the Smart system to work according to the weather forecast, if heavy rain is forecasted then less water is supplied to the plants.

7. REFERENCES

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