Automatic Water Sprinkler using Arduino

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Abstract: Sprinkler system is a method of watering in a controlled manner. a sprinkler can easily used for irrigation purpose in landscapes, golf courses, industries, agriculture etc. this system can also be used for cooling purposes and for the control of airborne dust. This product is introduced because watering the plants everyday or more than 2 to 3 days of week is not possible. applying water for a short period of time will deliver water shallowly to the ground. watering too long can also causes issues. In order to avoid the area of excessive moisture or dryness this product will be helpful. We come up with the product AUTOMATIC WATER SPRINKLER USING ARDUINO this sprinkler works according to the moisture content of the soil. components used here are soil moisture sensor, servo motor, arduino UNO, LM module, water pipes and tap. This project is about a moisture-sensing automatic water sprinkler system using Arduino UNO. The system reads the moisture content of the soil using soil moisture sensor and switches ON the motor when the moisture is below the set limit. When the moisture level rises above the set point, the system switches off the pump.

The soil moisture sensor module used here have two output pins(Digital output and Analog output). The output from the probe of the moisture sensor is compared with a reference value using a lm393 comparator. The reference value can be changed by turning the potentiometer in the module. The digital pin gives an active low output when the soil is wet. Here we are using the analog output from the module by connecting it to one of the analog pins of Arduino. While using the analog output the wet detection value can be set or adjusted within the program itself. When we keep the sensor into soil, the soil is dry automatically sprinkler gets ON and when it is wet sprinkler gets OFF. We are giving a particular threshold value and time limit in the program. While soil sensor indicated the above the threshold value the servo motor starts rotates and below the threshold value it stops.

Keywords: Sprinkler, watering, Arduino, automatic, sensor, motor

I. INTRODUCTION

An Irrigation sprinkler is a device used to irrigate agricultural crops, landscapes, and other areas. They are also used for cooling and for the control of airborne dust. Sprinkler irrigation is the method of applying water to a controlled manner in that is similar to rainfall. The water is distributed through a network that may consist of pumps, valves, pipes, and sprinklers. Irrigation sprinklers can be used for residential, industrial, and agricultural usage. . Watering every day for a short period of time will deliver water shallowly to the landscape. Watering for too long or not long enough based on the precipitation rate of the system. This will create either areas of excessive moisture or dryness. Excessive water loss is also happening while gardening. The usage of sprinkler system aims at reducing the amount of water used for irrigation of crops. The usage of sprinkler system can often lead to wastage of water when it is not controlled or operated properly.

The main disadvantages associated with sprinkler systems are related to climatic conditions, water resources and cost. Even moderate winds or high temperature can seriously reduce the effectiveness of sprinkler systems and also there are variations in water droplets. When operating under high temperatures, water can evaporate at a fast rate reducing the effectiveness of the irrigation.

A sprinkler system consists of: A pump unit which takes water from the source and provides pressure pipe system , Main pipes and secondary pipes which deliver water from the pump to the laterals, The laterals deliver water from the pipes to the sprinklers, Sprinklers, water-emitting devices which convert the water jet into droplets and sprinkle them to the crops.

The sprinkler system is used for minimizing the water used for irrigation. Yet the improper opening and closing of water to the sprinkler system can increase the amount of water lost during the operation of sprinkler. Water is lost due to the un scientification and off control of the sprinkler system. The water lost due to the unscientific opening and closing of sprinkler can be reduced when the sprinkler is controlled automatically working with set conditions mainly the moisture content of the soil.

This problem of sprinkler can be solved by our new project 'AUTOMATIC SPRINKLER USING ARDUINO'. The system is mainly controlled by the Arduino UNO. It analyses the moisture content of the soil using a moisture sensor. If the moisture content of soil is below a set limit the sprinkler is made on by the control system using a motor and if the moisture content of soil is above the required amount of moisture the controller automatically switches off the sprinkler system using the same motor.

II.   LITERATURE REVIEW

The conventional methods that for the irrigation purpose are wastes a lots of water, high cost of electricity required to run the pump set for irrigation. Automation saves time, money as well as human effort.

1) *Automatic Drip Irrigation:* Automatic drip system can be implemented with the help of single moisture sensor and an AVR microcontroller. It senses the moisture level of the soil and automatically switches the pump on when the power is on. It mainly has 3 sections: sensor, microcontroller and water pump system. The sensor circuit detects soil condition by measuring the soil voltage and comparing it with reference voltage. Sinaprog software is used to set the fuse bits for AVR microcontroller. The more advanced technologies and implemented these days using Arduino. We can easily implement the automation system using Arduino Uno which is easier to handle, less cost, less maintenance.

2) *IOT Automatic Plant Watering System:* This system is much useful especially for users who have a day job and travel lots. This system helps to water the plants only when necessary without any human intervention. This system will alert the user from time to time achieved. The overall system is very useful to human that save the time, money, human effort. In this system an email could be sent when either the water level or moisture level is low so that we can turn on the power.

3) *AIS:* Automated irrigation systems have been developed using sensors technology with Arduino. The soil moisture sensor inserted into soil of plants and water level sensor into water tank from where water to be pumped. An algorithm has been set for threshold values of soil moisture sensor to control the water quantity in soil and also a water level sensor has been implemented to measure the water quantity in soil. Arduino board is required for this mechanism. Soil sensor will detect when to turn ON or OFF the pump system. Human effort can be reduced and increase the savings of water by using this efficient technique.

A. *System Design*

1) Arduino UNO- Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.[2][3] The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.[1] The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable.[4] It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts.

2) Servo motor-A Servo Motor is a small device that has an output shaft. This shaft can be positioned to specific angular positions by sending the servo a coded signal. As long as the coded signal exists on the input line, the servo will maintain the angular position of the shaft.

3) Water tap- Controls the flow of water.

4) Pipes and connectors - Provides a network or pathway for the water to flow into the sprinkler.

5) Soil moisture sensor- Soil moisture sensors measure the volumetric water content in soil.[1] Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.
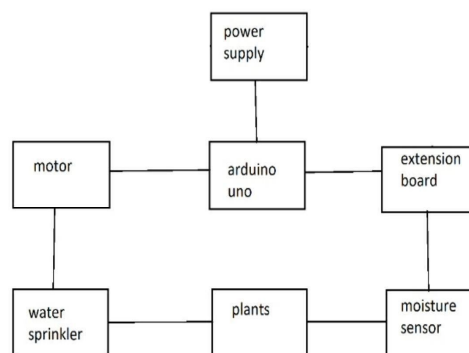
B.   Detailed Working

The main part of the system is Arduino. It monitors and controls the entire process. The moisture sensor serves as the input to the arduino. It measures the moisture content of the soil at each second and sends the data to the arduino after amplifying he sensed signal. Arduino is already set with a limiting value of the moisture content. If the value of moisture content in the soil is below the fixed value the servo motor which causes the opening and closing of water tap, is made to rotate in a direction which causes the tap to open and supply water to the sprinkler. If the sensed value of moisture is above the sensed value the opened tap is closed rotating the motor in the opposite direction. The servo motor acts as the output of the arduino.

III. RESULT AND DISCUSSION

The system is mainly controlled by the Arduino UNO. It analyses the moisture content of the soil using a moisture sensor. If the moisture content of soil is below a set limit the sprinkler is made on by the control system using a motor and if the moisture content of soil is above the required amount of moisture the controller automatically switches off the sprinkler system using the same motor.The arduino was set at a value '100' for the moisture content. When the moisture of the soil is below the fixed value, the arduino gives a high signal to the servo motor causing it to rotate in a direction that opens the water tap and water is fed to the sprinkler. Now when the moisture is above the value the motor rotates in opposite direction and closes the tap. In this way the sprinkler is automatically controlled and the water lost is reduced.

IV. FUTURE SCOPE AND CONCLUSION

The proposed solution for the problem can be included in the home automation project. The automatic control of sprinkler system using the moisture content of the soil reduces the amount of water used for the irrigation purpose. The system can be implemented in a very large scale or for the small scale irrigation. Apart from moisture of soil the rainfall pattern and ground water sources must be analysed for proper irrigation to be carried out. These features are to be included in the system. Apart from the automatic control a user interface must be created so as to manually control the system of sprinkler.Similar systems can be implemented for control of lights and fan. This system prevents loss of water. Usage of similar system to control power devices like washing machine can reduce energy loss.Sprinkler irrigation is a type of pressurized irrigation that consists of applying water to the soil surface using mechanical and hydraulic devices that simulate natural rainfall. The usage of sprinkler system aimed at reducing the amount of water used for irrigation of crops. The Usage Of sprinkler system can often lead to wastage of water when it is not controlled or operated properly. The Water lost due to the unscientific opening and closing of sprinkler can be reduced when the sprinkler is controlled automatically working with set conditions mainly the moisture content of the so soil.

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