

Smart Irrigation System

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Abstract

This paper on "Smart Irrigation System" is develop to create an automated irrigation mechanism which turns the pumping motor ON and OFF on detecting the moisture content of the earth using the soil moisture sensor without the intervention of human. The benefit of employing these techniques is to decrease human interference and it is quite feasible and affordable. This Smart irrigation system project is using an arduino micro-controller, that is programmed to collect the input signal according to moisture content of the soil and its output is given to the op-amp that will operate the pump.

Keywords: Irrigation, soil moisture sensor, Relay, arduino microcontroller, DC motor, op-amp

I. INTRODUCTION

In India, agriculture is the need of most of the Indians livelihood and it is one of the main sources of livelihood. Agriculture also has a major impact on economy of the country. The consumption of water increases day by day that may leads to the problem of water scarcity. Now a days, farmer are struggling hard in the agriculture field and the task of irrigating field is becoming quite difficult for the farmers due to lack of regularity in their work and negligence because sometimes they switch on the motor and then forget to switch off which may leads to wastage of water. Similarly, they even forget to switch ON the irrigation system, which again leads to damage to the crops. To overcome this problem, we have implemented a new technique by using Arduino microcontroller. In this project we are using soil moisture sensor which is used to sensing moisture level whether the soil is dry or wet. The moisture sensor is interface with arduino microcontroller that will work by the process of simulating on PROTEUS software and based on that it activate the DC motor through op-amp which compare the level of moisture content of the soil with the reference value that will operate the pump through relay.. Water is a very precious resource and must be properly utilized. Agriculture is one of those areas which consume a lot of water. Irrigation is a time consuming process and must be done on a timely basis. The aim of the article is to develop an smart irrigation system which measures the moisture of the soil and automatically turns on or off the water supply system.

The effects of the applied amount of irrigation water, irrigation frequency and water use are particularly important. To improve water efficiency there must be a proper irrigation scheduling strategy. So our project devices a simple system, using a arduino microcontroller to automate the irrigation and watering of crops with minimal manual interventions. An sensor to measure soil moisture was the basis for developing an irrigation system at a savings of 53% of water compared with irrigation by sprinklers in an area of 1000 m².

II. PROBLEM STATEMENT

In the case of traditional irrigation system water saving is not considered. Since, the water is irrigated directly in the land, plants under go high stress from variation in soil moisture, therefore plant appearance is reduced. The absence of automatic controlling of the system result in improper water control system. The major reason for these limitations is the growth of population which is increasing at a faster rate.

At present there is emerging global water crisis where managing scarcity of water has become a serious job. This growth can be seen in countries which have shortage of water resources and are economically poor. So this is the serious problem in

agriculture area. So we want to design an Smart Irrigation System which is based on PROTEUS software programming using arduino microcontroller that operate automatically by sensing the moisture content of the soil and turn ON/OFF the pump using relay without the intervention of farmer and hence save water.

III. PROPOSED MODEL

In this model, Smart Irrigation System is based on arduino microcontroller.. This prototype monitors the amount of soil moisture content in soil. A predefined value of soil moisture is set and can be varied with crops. In case the soil moisture of the soil deviates from the specified range, the watering system is turned ON/OFF. In case of dry soil, it will activate the irrigation system, pumping water for watering the plants.

This project is mainly based on PROTEUS based software C programming language. In simulation, pin2 and pin3 are used as a input pin for DC motor and switch respectively. This system can be implemented on a large scale for farming purposes, which can further prove to be more advantageous. Owing to prevailing conditions and water shortages, the optimum irrigation schedules should be determined especially in farms to conserve water.

IV. BLOCK DIAGRAM:

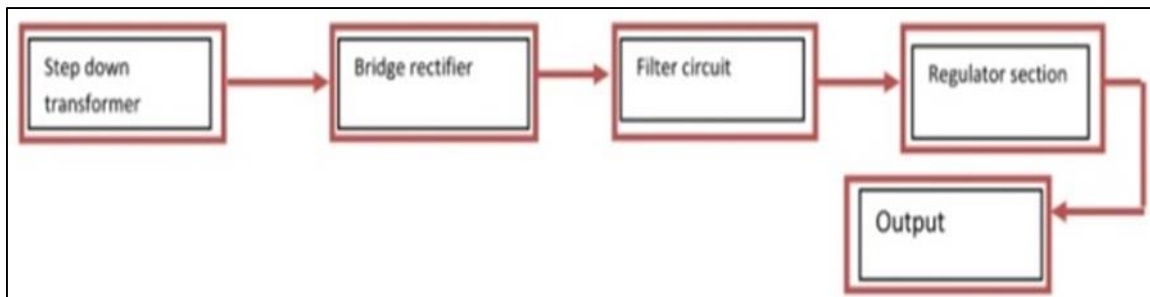


Fig. 1: Block Diagram Of Power Supply

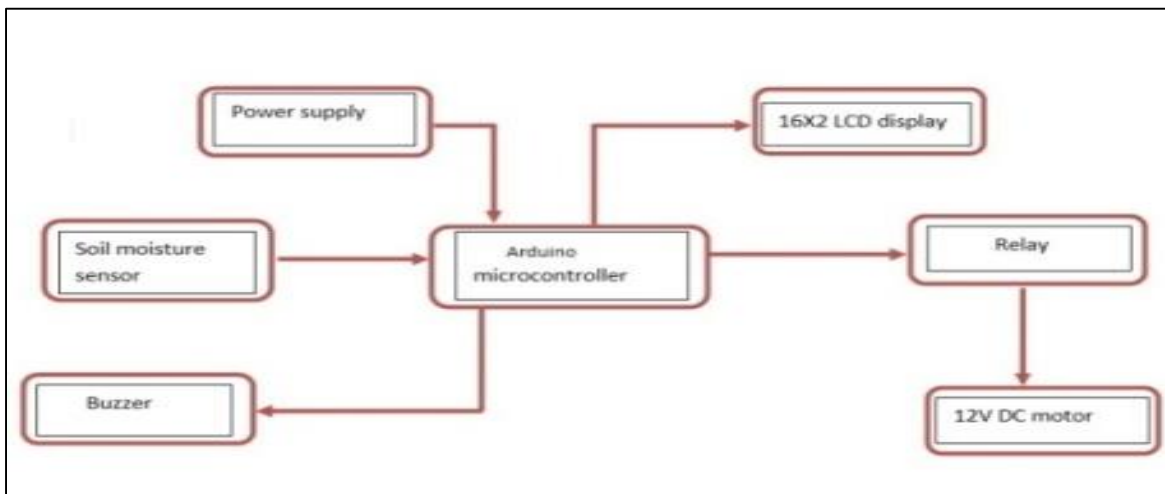


Fig. 2: Block Diagram of Smart Irrigation System

V. WORKING

It is implemented by using a PROTEUS based Arduino microcontroller which is programmed in C programming language. In simulation process we are using four components namely Arduino microcontroller, Simple DC motor, Switch, Standard resistor of 10 kilo ohm. Three components are interface with Arduino microcontroller in such a way that DC motor connected at pin2 and switch and resistor connected at pin3. All these are connected as an input pin. Sensing arrangement is made by inserting two stiff metallic rods into the field at some distance. An op-amp is used as a comparator that interfaces microcontroller and the sensing arrangement. On receiving the signal, the microcontroller produces an output that the drive a relay and operates the water pump. Also LCD is used which is interfaced with microcontroller for displaying the moisture content of the soil and water pump status.

Sensor circuit senses the condition of soil and compares the voltage with the reference voltage i.e. 5V. If the condition of soil is less than the reference voltage i.e. dry, then the high signal goes to the microcontroller [“logic 1”], this will turn ON the motor and make motor to pump water to the field. Once the microcontroller gets the data from the sensing material – it compares the

data as programmed in a way, which generates output signals and activates the relays for operating the submersible pump. The sensing arrangement is done with the help of two stiff metallic rods that are inserted into the agricultural field at some distance. The required connections from these metallic rods are interfaced to the control unit for controlling the operations of the pump according to the soil moisture content.

When the soil is wet, the voltage is greater than the reference voltage then low signal goes to the microcontroller which will turn OFF the motor and stop pumping water to the field.

The condition of soil and motor are display in the LCD screen.

VI. REQUIREMENT

S.NO	REQUIRMENT	RATING
1	Step down transformer	12V
2	Voltage regulator	LM7805
3	Relay	12V
4	LCD display	16X2 display
5	Transistor	BC547
6	Arduino microcontroller	8- bit
7	Moisture sensor	SEN92355P
8	DC motor	12V
9	Op-amp	LM393

VII.SIMULATION

Simulation setups were arranged and experimented using relevant hardware components and software components. We are simulating this project on PROTEUS. The microcontroller which is being used here is ARDUNO UNO Board. A D.C Motor at pin 2 is being used as a input pin and switch is being used as a Soil Moisture Sensor whose input is given at pin 3. A standard resistor of 10 Kilo Ohm is used to limit high value of current.

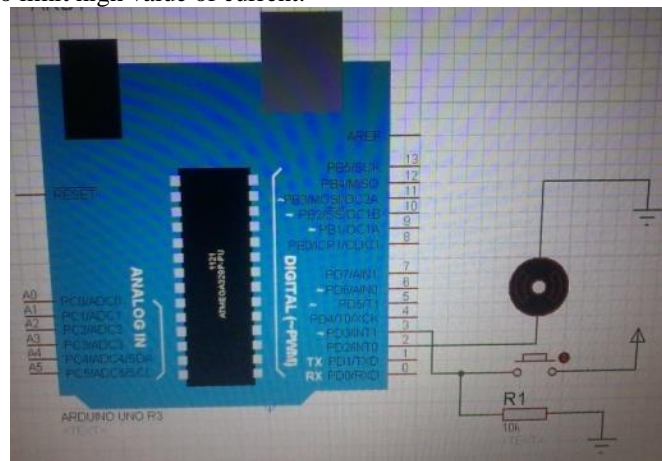


Fig. 3: Simulation

A. Soil Sensors and Actuators:

Arduino microcontroller is being used for decision making process. Predefined operational conditions were used to operate the system without any failure. Based on the Algorithms developed logically and it is used using PROTEUS software. C programming language was used to write the program in to the arduino microcontroller.

A soil moisture sensor is the part of the system that is in contact with the soil and measure the moisture level of soil and give it to the op-amp that on comparing the reference value of moisture content of soil and send signal to the microcontroller and gives the output to the relay which poerate turn ON/OFF the Pump accordingly.

VIII. CONCLUSION

The Project 'Smart Irrigation System' is used for the optimization use of water in agricultural field without the intervention of farmer by using soil moisture Sensor that senses the moisture content of the Soil using Microcontroller that turn ON/OFF the pump automatically according t the need of water for irrigation and hence helpful in saving water.

This system is quite affordable and feasible. This system of irrigation is also helpful in the region where there is scarcity of water and improves their sustainability. And can .also be adjusted according to the need of varieties of crop to be irrigated.

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