

Moisture Sensing Automatic Plant Watering System Using Arduino Uno

Tasneem Khan Shifa

Department of Electronics and Communication Engineering, Khulna University of Engineering & Technology, Khulna-9203, Bangladesh

Corresponding Author: Tasneem Khan Shifa

ABSTRACT: In daily operations related to farming or gardening watering is the most important cultural practice and the most labor-intensive task. No matter whichever weather it is, either too hot and dry or too cloudy and wet, you want to be able to control the amount of water that reaches your plants. Modern watering systems could be effectively used to water plants when they need it. But this manual process of watering requires two important aspects to be considered, when and how much to water. In order to replace manual activities and making gardener's work easier, automatic plant watering system is created. By adding automated plant watering system to the garden or agricultural field, all the plants reach their fullest potential as well as conserving water. In this project for implementation of the automatic plant watering system Arduino UNO, soil moisture sensor, L293D IC & DC motor are used. The code is written in such a way that, it is programmed to sense moisture level of plants at particular instance of time, if the moisture content is less than specified threshold which is predefined according to particular plant's water need then desired amount of water is supplied till it reaches threshold. So, through this prototype people can enjoy having plants, without being worried about absent or forgetfulness.

KEYWORDS: Automatic plant irrigation system, Arduino UNO, moisture sensor.

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I. INTRODUCTION

Nowadays, in the age of advanced electronics and technology, the life of human being should be simpler and more convenient, there is a need for many automated systems that are capable of replacing or reducing human effort in their daily activities and jobs. One such system, named as automatic plant watering system, which is actually a model of controlling irrigation facilities that uses sensor technology to sense soil moisture with an IC in order to make a smart switching device to help millions of people. Irregular watering leads to the mineral loss in the soil and may end up with rotting the plants [1].

Plants are very beneficial to all human beings in many aspects. Plants help in keeping the environment healthy by cleaning air naturally and producing oxygen. Many people love to have plants in their backyard. But due to civilization and insufficiency of place many people used to grow plants in a mold or dirt, pot, and placed on the windowsill. These plants are dependent on conventional breeding, watering and provide the right amount of sun to sustain life and growth. In busy schedule of day to day life, many time people forget to water their plants and due to these plants suffers many disorders and ultimately died. In addition, the world's biggest problem in modern society is the shortage of water resources, agriculture is a demanding job to consume large amounts of water. It is very essential to utilize the water resources in proper way. Thus, a system is required, to handle this task automatically [2].

Automated plant watering system estimate and measure the existing plant and then supplies desired amount of water needed by that plant. It is minimizing the excess water use as well as keeping plants healthy [3] [4]. The continuous increasing demand of food requires the rapid improvement in food production technology. In a country like India, where the economy is mainly based on agriculture and the climatic conditions are isotropic, still we are not able to make full use of agricultural resources. The main reason is the lack of rains & scarcity of land reservoir water. The continuous extraction of water from earth is reducing the water level due to which lot of land is coming slowly in the zones of un-irrigated land. Another very important reason of this is due

to unplanned use of water due to which a significant amount of water goes to waste. So, in modern irrigation system, plants can be easily monitored and can be taken care of by automatic plant irrigation system, in where DC motor is used. For this implementation Arduino UNO is used.

II. COMPONENTS & MATERIALS

Although there are some companies selling these systems made in various ways, there is a simple way in which one can build his/her own plant watering system if all required materials are available along with basic required knowledge about electronics. For the purpose of building this system following components are needed,

a) Hardware

Table 1: Hardware components

Name	Rating
Arduino UNO	Operating voltage 5V, digital I/O pin 14, clock speed 16 MHz
L293D IC	Supply voltage 36V (max)
Soil moisture sensor	Operating voltage 3.3-5V, dual output mode (analog & digital)
DC motor	
LED wires	
Wires	

b) Software

Arduino IDE: Code can be easily written and upload it to the I/O board. It runs on Windows, Mac and Linux. Environment is written in Java, and according to the processing, A VC-GCC, as well as other open source software

Soil moisture sensor and pin diagram of Arduino UNO & L293D IC are shown below,

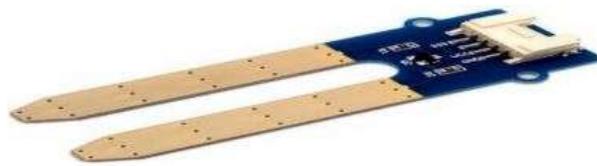


Figure 1: Soil moisture sensor

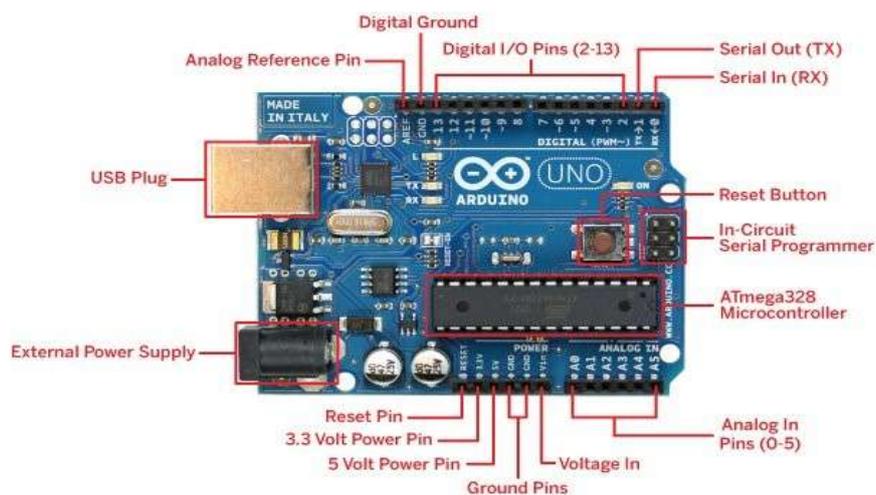


Figure 2: Pin diagram of Arduino UNO



Figure 3: Pin diagram of L293D

III. WORKING PRINCIPLE

The main working principle behind this system is in connecting the soil moisture sensor which was previously embedded into the plant to the Arduino microcontroller, which is also connected to other electronic components. Moisture sensor detects the water level. Circuit diagram for the automatic watering system is shown in Figure 4,

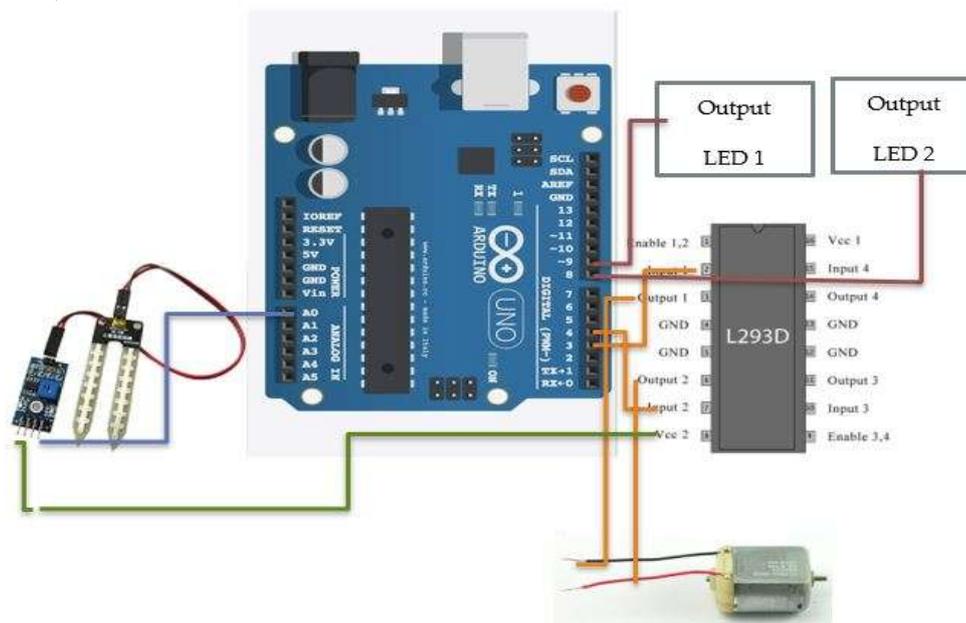


Figure 4: Circuit diagram of automatic plant watering system

Arduino UNO & soil moisture module are perfect for this purpose because of their dimensions and work performance. Necessary code is written & the threshold is set. Analog output gives the real time information regarding the moisture in the plant and this output is used in the system.

Code:

```
void setup() {
  // put your setup code here, to run once:
  pinMode(0,INPUT);
  pinMode(8,OUTPUT);
  pinMode(9,OUTPUT);
  pinMode(3,OUTPUT);
  pinMode(4,OUTPUT);
}
```

```
Serial.begin(9600);
}
void loop() {
  // put your main code here, to run repeatedly:
  int val=analogRead(0);
  Serial.println(val);
  delay(10);
  if (val>500)
  {
  digitalWrite(9,HIGH);
  digitalWrite(8,LOW);
  digitalWrite(3,HIGH);
  digitalWrite(4,LOW);
  }
  else if (val<500 &val>350)
  {
  digitalWrite(8,HIGH);
  digitalWrite(9,LOW);
  digitalWrite(3,LOW);
  digitalWrite(4,LOW);
  }
  else
  {digitalWrite(8,LOW);
  digitalWrite(9,LOW);
  digitalWrite(3,LOW);
  digitalWrite (4,LOW);
  }
}
```

Thus, after connecting all the components according to diagram & code is written, then moisture sensor detects the water level. When it's with touch of more water, it faces more current flow, and so, less resistance. And when, it gets less or no water-touch, it gets less current flow and higher resistance. So, when the level is more, plants need more water and when the level is less than that, plants don't need more water.

The Arduino alone cannot provide enough power for this whole function, so to protect the Arduino, L239D IC is used. When the water level is very down, the motor is started & red LED is on and when there is a good water level, but plants still need water, white LED is on to give a warning. Then, when the water level's good enough, there is no need to do anything.

IV. RESULT ANALYSIS

In this project, automated plant watering system have been implemented and it measure the existing plant and then supplies desired amount of water needed by that plant. Moisture content of the soil of plants or cultivated land can be controlled. The code is written in such a way that, it is programmed to sense moisture level of plants at particular instance of time. If the moisture content is less than specified threshold which is predefined according to particular plant's water need then desired amount of water is supplied till it reaches threshold. Also, it is minimizing the excess water use as well as taking care of the plant. The system also allows the delivery to the plant when needed based on soil moisture.

V. CONCLUSION

From this project, expected results were concluded from the fact that plant has successfully avoided dehydration and kept growing without any problems and this is for the the sensor that is embedded within the plant measuring the soil moisture. The system works on the principle of measuring the soil moisture level by means of the sensor technology using Arduino UNO, L239D IC & DC motor. In order to provide the plant enough amounts of water when necessary. The project may need to minimize the efforts of major agricultural regions. Many aspects of the system can be customized and used software to fine-tune the requirements of the plant. The result is a scalable, supporting technology.

There are many other possibilities for future works like creating complex connections of plants of similar variety. Also, using more than one sensor is another idea for an experimental venture, but there are also many other experimental and challenge-like ideas such as using solar power supply, timer for setting irrigation system, message alert about plants moisture to the user in his/her mobile phone etc.

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Author:



Tasneem Khan Shifa has completed her BSc in Electronics and Communication Engineering (ECE) at Khulna University of Engineering & Technology, Khulna-9203, Bangladesh. She had completed her SSC and HSC in the year of 2011 and 2013 with the GPA of 5.00 (out of 5.00). The duration of study in completing graduation was from 2014 to 2018. The areas of her research interest are thermal stress analysis, simulation, renewable energy etc.

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