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COMPUTATIONAL ENGINEERING AND NETWORKING

EMBEDDED SYSTEMS REPORT

Automatic Plant Watering System Using Arduino Uno

REGARDING EMBEDDED COMPUTING FOR DATA SCIENCE

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Abstract

Watering is the most important cultural practice and most labor intensive task in daily greenhouse operation. Watering systems ease the burden of getting water to plants when they need it. Knowing when and how much to water is two important aspects of watering process. To make the gardener works easily, the automatic plant watering system is created. There have a various type using automatic watering system that are by using sprinkler system, tube, nozzles and other. This system uses Arduino UNO board, which consists of ATmega328 microcontroller. It is programmed in such a way that it will sense the moisture level of the plants and supply the water if required. This type of system is often used for general plant care, as part of caring for small and large gardens. Normally, the plants need to be watered twice daily, morning and evening. So, the microcontroller has to be coded to water the plants in the greenhouse so plant will never feel thirsty.

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1 Introduction

I used to get worried about my plants because they need water on regular basis. Because I used to forgot to properly irrigate them regularly and I gone through several options to solve this problem as plants need water according to the moisture level of soil. So I have made Automatic Plant Watering System Using Arduino UNO.[2]

In this system, soil moisture sensor senses the moisture level of the soil. If soil will get dry then sensor senses low moisture level and automatically switches on the water pump to supply water to the plant. As plant get sufficient water and soil get wet then sensor senses enough moisture in soil. After which the water pump will automatically get stopped.

1.1 Literature review

In early 1961 G. L. Wolflin a avocado farmer and also an electrician while he was planting a small Hass avocado grove near Escondido (107 miles one way), the urgent need for some degree of automation for the very troublesome and costly irrigation soon became noticed by him[3].

During that days in the absentee owner, the method of irrigation available to him at the beginning was to hire someone to drive out to the grove and run the pump in the well some specified time, and assume that a proper job of irrigation had been accomplished. As long as the trees were small and the duration of irrigation was short, this was not too bad. However, this satisfactory arrangement was short-lived in that the only source of water at this time was the well, which soon became too small to do the job. The water shortage even while still using “spitters” at 1/3 gpm became critical when the irrigation period was increased to two and three hours and of course was utterly impossible as whirling sprinklers (Star) were required.

Also, when the water was low in the well with air being sucked into the pump inlet, there was considerable agitation of the remaining water and considerable sand and dirt was sucked up into the system and the sprinklers would plug badly.

The first “must” was to prevent the pump in the well from “sucking air”, and investigation revealed a device perfected a long time ago that would stop the pump motor when the level of water in the well had been lowered to some dangerous point, then restart the pump motor when the water level in the well had come up above the pump suction by some safe and desirable distance. This was accomplished not by a float switch but by two electrodes hung in the well at different levels and connected into the pump electrical circuit by a system of suitable relays. Under the setting which was

finally selected, the pump would operate when the water was five feet over the suction and shut down when the water level dropped to about two inches above the pump suction

Pump and panel box showing the mounting of the two timing clocks.

Figure 1: Pump and panel box showing the mount of the two timing clocks

1.2 Problem statement

So, in order to supply proper water to the plant on regular basis and to exclude the excess amount of water supply. So the person can spend his time properly in completing his office work and if irrigation need to happen for a very large number of plants also for golf stadium to maintain the moisture content one need to employ automatic water plant watering system.[1]

1.3 Objectives

To automate the plant watering system which monitors the plant at regular basics and supplies the water when the soil moisture sensor senses low moisture level of water in the soil with out the presence of human being so one can do there work in an effective way and no need to worry about watering there plants frequently.

2 Background

2.1 Scope of work

The use of soil moisture sensor in areas other than research and development is the rising trend in the soil moisture market.

The agricultural applications of the soil moisture sensor market is major driving factor of the market. Increased adoption of modern agricultural practices is boosting the soil moisture sensor market. The use of soil moisture sensors in agricultural lands has improved the farm's productivity and there has been a reduction in water consumption by farms. The soil moisture sensors help to avoid over irrigation problems.

The scope of soil moisture sensor is increasing day by day, the use of soil moisture sensors in residential areas is aiding the soil moisture sensor market. This help residential society in maintain green lawns and also helps builders to get idea of water content in the soil which helps him lay the foundation for construction accordingly.

Soil moisture market is now backed by sports segment, which has resulted in increased demand of soil moisture sensors to maintain the grounds. For instance soil moisture sensors are used to maintain golf turfs the rise in such practice will be addition to the market of soil moisture sensors.

Weather Forecasters make use of soil moisture sensors which is another driving factor for the soil moisture sensor market. As soil moisture sensors are helpful in providing reading that is helpful in weather forecasting.

Research Studies is among another factor driving the soil moisture market. Rising awareness among government agencies will help in expansion and strengthening of the soil moisture market. Increase in number of agricultural research projects.

The restraint of the soil moisture sensor market is the lack of awareness among the farmers. As use of traditional farming practices is hindering the exponential growth of the soil moisture sensor market.

3 Proposed Work

3.1 Hardware and Software details

I used arduino IDE interface as a software to tyoe the code and to upload code to the arduino UNO which makes the microcontoler to process the task accordingly. The soil moisturising sensor has a control board attached to it which acts as a interface between the sensor and the UNO which has a in LM393 comparator IC which acts a comparator to regulate the voltage in the comparator box and the moisture led indicator indicates that whether the sensor has sensed the moisture content in the soil or not. Moisture senor pins are attached to the soil moisturising sensor which sends the information from soil to the comparator and later to the atmega 328P. There is a 10KΩ which is used to adjust the sensor sensitivity.

3.2 Circuit

Following is the circuit connection

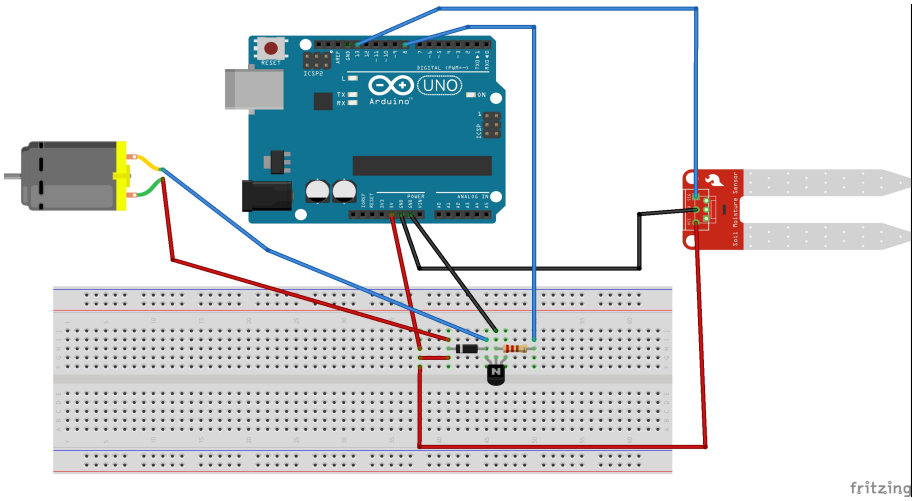

Figure 2: Circuit Diagram

3.3 Code

```
int WATERPUMP = 13; //motor pump connected to pin 13
int sensor = 8; //sensor digital pin vonnected to pin 8
int val; //This variable stores the value received from Soil moisture sensor.

void setup() {

  pinMode(13,OUTPUT); //Set pin 13 as OUTPUT pin
  pinMode(8,INPUT); //Set pin 8 as input pin, to receive data from Soil moisture sensor.
  //Initialize serial and wait for port to open:
  Serial.begin(9600); // opens serial port, sets data rate to 9600 bps
  while (! Serial);// wait for serial port to connect. Needed for native USB
  Serial.println("Speed 0 to 255");
}

void loop()
  {
  if (Serial.available()) //loop to operate motor
  {
    int speed = Serial.parseInt(); // to read the number entered as text in the Serial Monitor
    if (speed >= 0 && speed <= 255)
    {
      analogWrite(WATERPUMP, speed);// tuns on the motor at specified speed
    }
  }
  val = digitalRead(8);  //Read data from soil moisture sensor
  if(val == LOW)
  {
  digitalWrite(13,LOW); //if soil moisture sensor provides LOW value send LOW value to motor pump and motor pump goes off
  }
  else{
  digitalWrite(13,HIGH); //if soil moisture sensor provides HIGH value send HIGH value to motor pump and motor pump get on}
  delay(400); //Wait for few second and then continue the loop.
}
```

Figure 3: Code

4 Conclusion

4.1 Results and Discussion

This miniature model of automatic plant irrigation is being tested in two different soils. One soil is wet and the other is dry. Only in the dry condition the pump will start working, since the requirement of water is more for that soil for the proper growth of the crops and in wet soil the pump won't work since the soil does not need any water due to the presence of water in it hence this project will conserve water during irrigation.

5 Summary Conclusions

Automatic plant irrigation system has been designed and constructed. The miniature model of the system worked according to specifications quite properly. This system components are easily available and they work quite reliable. By improving the irrigation efficiency in agricultural sector, this industry become more competitive and sustainable. Also in dry areas, where there is no sufficient rainfall, proper irrigation is not possible. Hence by using this irrigation system by monitoring the moisture content of soil are can meet the water requirements necessary for the field. To save effort of farmers, the important considerations are water and time. In present condition, they need to wait until field is fully watered. This restricts them to do other activities. This idea is not only meant for farmers but also for watering the plants. In our present era, the farmers are irrigating their crops at regular interval of time. The techniques they use will consume more water by creating water logging and results in water wastage. This system that we designed will completely eliminate the stress of manual labour.

Two types of soils have been tested and it will only work when the soil condition is dry. For the future work, this project can be implemented in large scale by using many number of moist sensors and temperature sensors and by using a powerful motor to pump the water more efficiently. This will result in energy conservation and it is one of the great solution for water depletion and water scarcity.

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