Munashe-Moses Chabvuta (munashe001) - Public Page

This public page *user:munashe001.txt*, as stated by it's name, **can be read by anyone but only you can edit it** (or a superuser)…

- You can introduce yourself, add links to your contributions in this wiki, tell a story or present your other works
- Think about netiquette

Limitations:

- You shouldn't create any other page in that namespace *user:munashe001*
- Only a superuser can add a picture

Feel free to remove this paragraph (beside the title)…

Now, write something!

SOIL MOISTURE: AUTOMATIC PLANT WATERING SYSTEM

1.

Introduction

Soil Moisture refers to water contained within the soil and is also regarded as a measure of soil health. Soil moisture is affected by precipitation, temperature, soil characteristics, only to mention a few. All plants need a specific soil moisture range to optimize operations within. The majority of plants flourish in soil with a moisture level that ranges between 20% to 60%. Plant growth is not based on the availability of fertile soils but soil moisture should be a major key element to consider when it comes to plant performance and health. This is due to water content in soil acting as a solvent, by breaking down certain minerals and nutrients for easy absorption by plants.

Soil moisture is major variable in controlling the exchange of heat energy and water between the land surface and the atmosphere through evaporation and transpiration. Furthermore soil moisture plays a crucial role in the development of weather patterns and the formation of precipitation. Soil moisture information can be further used for reservoir management, early warning of droughts, irrigation scheduling and crop yield forecasting.

As soil moisture availability declines, the functionality and growth of plants is disrupted resulting in lower crop yields. As the climate changes, moisture availability is becoming more variable. As a result the automatic plant watering system project takes into account the measurement of soil moisture of house plants by a capacitive soil moisture sensor. If the soil moisture values obtained by the sensor are below a certain value the sensor will automatically turn on the water pump which is responsible for delivering the water requirements of the plant until the optimum moisture content is achieved by the soil.

2.

Materials and Methods

The following materials and components were brought together to drive the project.

• Capacitive Soil Moisture Sensor

• 5V water submersible pump

• Jump Wires

• ESP32 Wrover-B module

• 2N222 NPN Transistor

2.1

Capacitive Soil Moisture Sensor

The capacitive soil moisture sensor determines the amount of soil moisture by measuring changes in capacitance to determine the water content of the soil. With a capacitor having the ability to store charge, a capacitive moisture sensor further measures the change in capacitance which is contributed by the changes in the dielectric. The moisture sensor rather measures the ions that are dissolved in the moisture, meaning it does not take into account the measurement of moisture directly. It mainly focuses on the dielectric which is created between the soil and water. Furthermore, the ion concentration can be affected by various factors, such as fertilizers which decrease the resistance of the soil.

Specifications • Operating Voltage: 3,3 -5,5 VDC

• Output Voltage: 0 -3.0VDC

• Operating Current: 5mA

• Interface: PH2.0-3P

• Dimensions 3.86 * 0.905 inches(L x W) Capacitive soil moisture measuring has some advantages over the resistive soil moisture sensor. There is reduced corrosion of the probe and there is an improved reading of the moisture value as opposed to using a resistive moisture sensor.

2.2

The Arduino Uno Elegoo R3

The Arduino Uno micro-controller was considered as the core of the operations of the automatic plant watering system after the Esp32 Wrover b module failed to establish an internet connection to the internet of things. It is based on the At mega 328, meaning it is a high performance, lower power microcontroller. It has an operating voltage of 5V and can draw power via the USB connection to the computer. Compared to the esp32 the Arduino Uno can not connect to the internet of things as it does not come with an Integrated WIFI and Bluetooth

2.3

Transistor NPN 2N2222

It is regarded as of the most common NPN bipolar junction transistors meaning, it is a type of transistor which makes use of both electrons and electron holes as charge carriers. It permits a trivial current administered at one of its terminals to control a much larger current flowing between the the two terminals resulting in the switching of a particular device. The 2N2222 transistor was taken into consideration to facilitate the switching of the 5V submersible water pump. The transistor has three pins which come with it. These pins have different purposes to deliver its intended use. The bipolar junction transistor uses the terms; collector, base and emitter.

• Collector: this is the pin where the power flows in.

• Base: this is the trigger pin which is connected to the micro controller and which will be used as an output pin.

• Emitter: this is the ground side of the transistor.

```
Fig1. Shows how current flows from the collector to the emitter.
https://www.rs-online.com/designspark/basics-of-2n2222
```

As a result the base which is the middle leg of the transistor is connected to digital pin 12 of the micro-controller which will be set to output as the pin mode. The emitter is connected to the ground while the collector is connected to the other leg of the 5V submersible pump.

3.

Results

Below is the the final code which is part of the results. It drives the whole project by sending instructions to Arduino micro controller to execute the performance of the components mentioned in the materials and methods.

const int dryairvalue = 570; *this the air value of the capacitive soil moisture sensor const int watervalue = 275;* this is the water value of the soil moisture sensor

int moisturevalue = 0; *int moisturepercent= 0; const int Sensor = A0; const int pumpPin = 12; void setup() { Serial.begin(9600);* open serial port, set the baud rate to 9600 bps pinMode(Sensor, INPUT); *Sets moisture sensor connected to analogue pin A0 to behave as an input while measuring soil moisture pinMode(pumpPin, OUTPUT);* Sets the pumpin connected to digital pin 12 as an Output }

void loop() {

moisturevalue = analogRead(Sensor); *Read sensor value from the moisture sensor. The readings will be stored in the soilmoisturevalue variable. Serial.println(moisturevalue);* prints the value from moisture sensor to the serial monitor

moisturepercent = map(moisturevalue, dryairvalue, watervalue, 0, 100); *maps the analogue values obtained from the sensor to a percentage if(moisturepercent >= 100)* if checks for { Serial.println("Pump is off");

```
digitalWrite(pumpPin, LOW);// the pump will maintain the off state if the
soil moisture is
delay(5000);
```

} else if(moisturepercent ⇐ 0) {

```
Serial.println("Pump is On");
digitalWrite(pumpPin, HIGH);
delay(5000);
```

} else if(moisturepercent >0 && moisturepercent < 100) {

```
Serial.print(moisturepercent);
Serial.println("%");
```

}

```
delay(250);
```

}

From:
https://student-wiki.eolab.de/ - **HSRW EOLab Students Wiki**

Permanent link:
https://student-wiki.eolab.de/doku.php?id=user:munashe001&rev=1630545558

Last update: **2023/01/05 14:38**