Automated Plant Irrigation System

I. Abstract

Our team has created a more efficient and convenient way for farmers and planters to use an Automated Plant Irrigation System with a mobile application user interface. The mobile application allows its users to adjust plants' moisture levels, watering cycle, watering timer/interval, manual watering control, and view the age/lifespan of each registered plant to be monitored and managed for the irrigation to be more convenient and automated.

Keywords: plant irrigation, Arduino, automated system, agriculture, water system

II. Introduction

1.1 Background of the Study

Today several individuals quarantined at home have started to grow their plants at home. There are times that we don’t have the time to properly maintain the routine and cycle to water and monitor our plants at home. Some plants have different characteristics with regards to moisture, water-levels.

1.2 Gap and Opportunity

Farmers can now spend their time in other ways other than waiting, measuring, Arduino, and knowing different irrigation methods for every crop they plant. With this automated water irrigation system, farmers do not have to worry about it. They can make a computerized farm in their backyards with simple arduino tools and following steps in our project.

1.3 Problems of the Study

Farmers do not have experience with Arduino and are not that wealthy to afford materials apart from what they have in their farms. Therefore, it takes time to create the whole board, and it has a high monetary value to generate the whole simulation project.

1.4 Objectives

To create an automated water irrigation system with Arduino Uno that has scheduling features and soil moisture detection.

1.5 Significance of the Study

This study is helpful for farmers to maintain the needed conditions for their plants and crops. Even left unattended, the plants are still being monitored, which does not require human supervision. In the future, this technology can be used as an innovative creation for smart plant ecosystems.

1.6 Scope and Limitations

The scope of this is used with the platform of an Arduino board. As of now, our project is only applied in a plant at home. Further studies may be applied to a more extensive scale system.

III. Review of Related Literature

A. The study, “An Automated Irrigation System Using Arduino Microcontroller,” by Aslinda et al. showed that an irrigation system is possible with an Arduino board. We got some concepts from this academic paper and tweaked them to apply to our idea and design.

B. The study “Soil moisture monitoring using IoT enabled arduino sensors with neural networks for improving soil management for farmers and predict seasonal rainfall for planning future harvest in North Karnataka — India” was performed by S. Athani, C. H. Tejeshwar, M. M. Patil, P. Patil, and R. Kulkarni, et al. gave as additional insight for our execution to use the Arduino soil moisture monitoring for our simulation, as the equipment has been used and tested in their study and the results from the kit was beneficial for our system.

C. The aim of the study, “Automated Irrigation System Using a Wireless Sensor Network and GPRS Module,” is to maximize water consumption for crops. An automated irrigation system was designed by Gutierrez, J. Villa- Medina, J. Nieto-Garibay, and A. Porta-Gandara, M. (2013). In the root zone of the plants, the system has a dispersed wireless network of soil moisture and temperature sensors. A gateway unit also takes care of sensor data, triggers actuators, and sends data to a web application.

D. In the smart agriculture industry, advances in the Internet of Things (IoT) are assisting in making water management smarter and optimizing use. The study, “Smart Agriculture Using IoT Multi-Sensors: A Novel Watering Management System” by Khoa, T. Man, M. Nguyen, T. Nguyen V. Nam, N. (2019), presents a new sensor node topology based on the utilization of low-cost, high-performance components like water level, soil moisture, temperature, humidity, and rain sensors.

E. The researchers of the study, “Smartphone Controlled Fertilizing and Plant Watering Garduino” by Reddy, A. Reddy, U Teja, Rajam, A. Kapileswar, N. A (2020), claims to have created a robot with a water and fertilizer tank, a soil sensor, and a digital display that is controlled by a Bluetooth module. The soil is first fertilized, after which the soil sensor is implanted, and the moisture percentage is displayed on the digital display. The plants are then irrigated until the moisture content reaches 100%. This technique aids in the proper watering and fertilization of plants, allowing them to grow.

IV. Project Details

a. Components:

Components and Price	Item

Arduino Uno - 300 PHP	
Soil Moisture Detector - 55 PHP	
Mini 5-Volt Water Pump - 159 PHP	

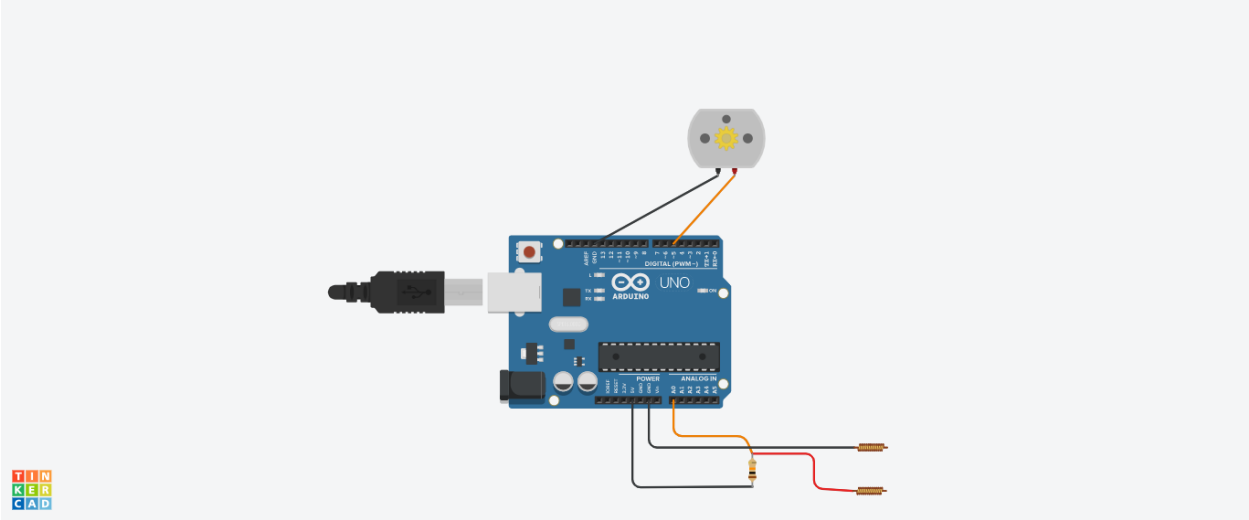
Cables / Jumper Wires - 49 PHP	
Water Tube - 40 PHP	

b. Source Code:

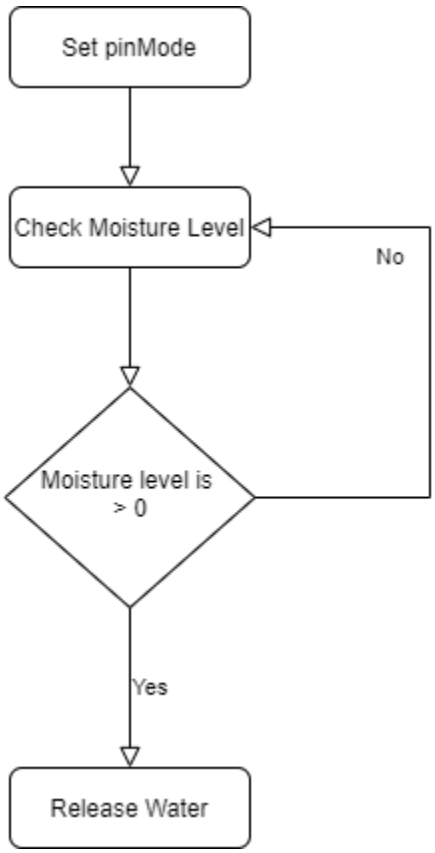
```
int sensor_pin = A0; // Soil Sensor input at Analog PIN A0

int output_value ;


void setup() {
```

```
      // put your setup code here, to run once:
      pinMode(4,OUTPUT);
        Serial.begin(9600);
      Serial.println("Read Data From Sensor...");
      delay(3000);
    }

     void loop() {
      output_value= analogRead(sensor_pin);
      output_value = map(output_value,550,10,0,100);
      Serial.print("Moisture Level: ");
      Serial.print(output_value);
      Serial.println("%");
      if(output_value<0){
        digitalWrite(4,HIGH);
       }
       else{
            digitalWrite(4,LOW);
       }
      delay(1000);
}
```

C. Schematic



D. **Flowchart**



V. Conclusion

We, therefore, conclude that our automated water irrigation system was effective. We were able to fulfill our objectives and create a computerized system with the help of the Arduino UNO. We recommend that this project can be further extended to a larger scale, such as a farming field that is supervised and used by farmers and in the future introduced to our agricultural department for an automated system.

VI. References

[1] Gutierrez, J. Villa- Meddina, J. Nieto-Garibay, A. Porta-Gandara, M. (2013) https://ieeexplore.ieee.org/abstract/document/6582678

[2] Khoa, T. Man, M. Nguyen, T. Nguyen V. Nam, N. (2019) Smart Agriculture Using IoT Multi-Sensors: A Novel Watering Management System Retrieved from https://www.mdpi.com/2224-2708/8/3/45

[3] Reddy, A. Reddy, U Teja, Rajam, A. Kapileswar, N. A (2020) Smartphone Controlled Fertilizing and Plant Watering Garduno. Retrieved from https://dergipark.org.tr/en/pub/ijamec/issue/57538/803817

[4] Sritar, V. Vinod, V. Sweata, K.M. Gurubarani, K. Abirami K. (2021) A Smart Plant Watering System for Indoor Plants with Optimum Time Prediction for Watering. Retrieved at https://link.springer.com/chapter/10.1007/978-981-16-1395-1_34

[5] Hassan, Aslinda & Sheng, Siah & Md Shah, Wahidah & Bahaman, Nazrulazhar. (2018). An Automated Irrigation System Using Arduino Microcontroller.

[6] S. Athani, C. H. Tejeshwar, M. M. Patil, P. Patil, and R. Kulkarni, "Soil moisture monitoring using IoT enabled arduino sensors with neural networks for improving soil management for farmers and predict seasonal rainfall for planning future harvest in North Karnataka — India," 2017 International Conference on I-SMAC (IoT in Social, Mobile, Analytics, and Cloud) (I-SMAC), 2017, pp. 43-48, DOI: 10.1109/I-SMAC.2017.8058385.

VII. Appendices

Figure 1: Plantitio Application UI

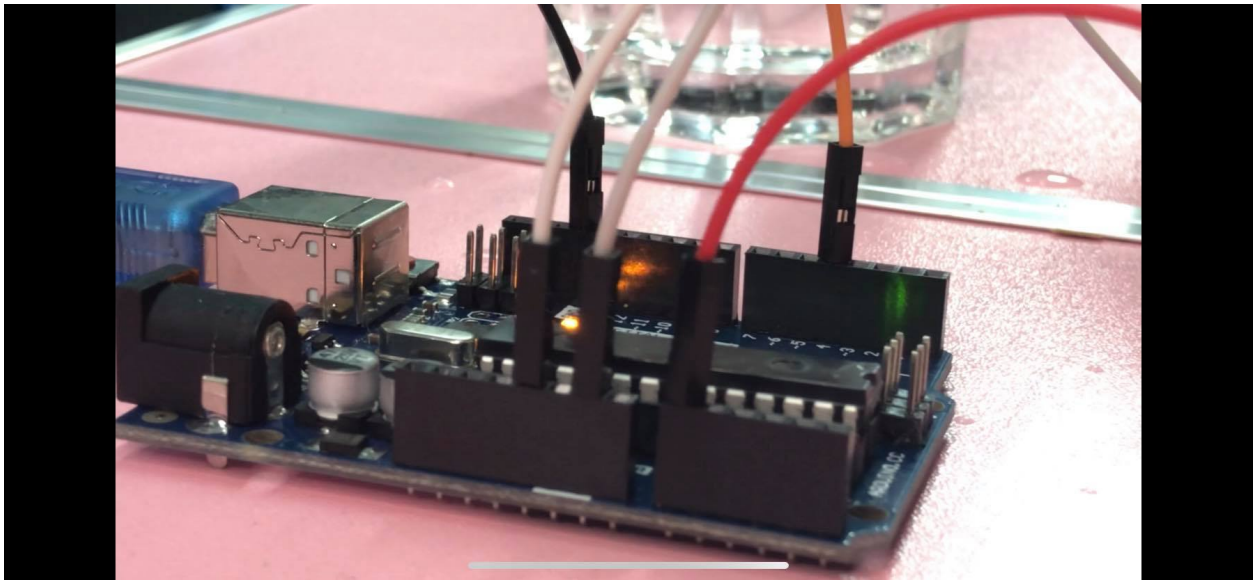


Figure 2: Arduino Set-up

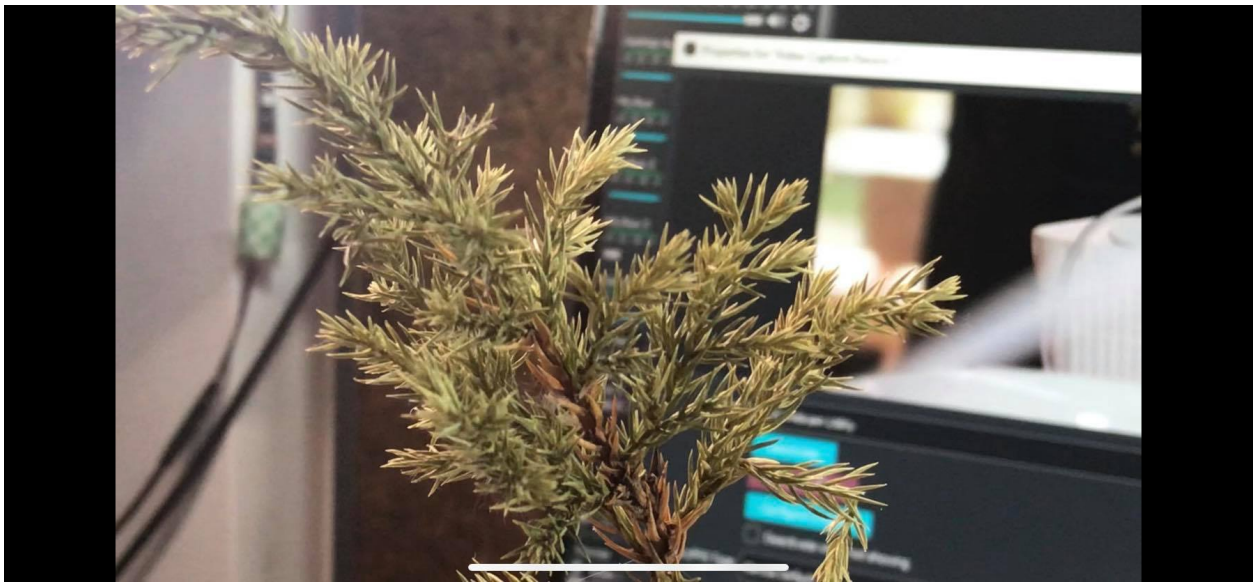


Figure 3: Plant

Figure 3.1: Plant Set Up

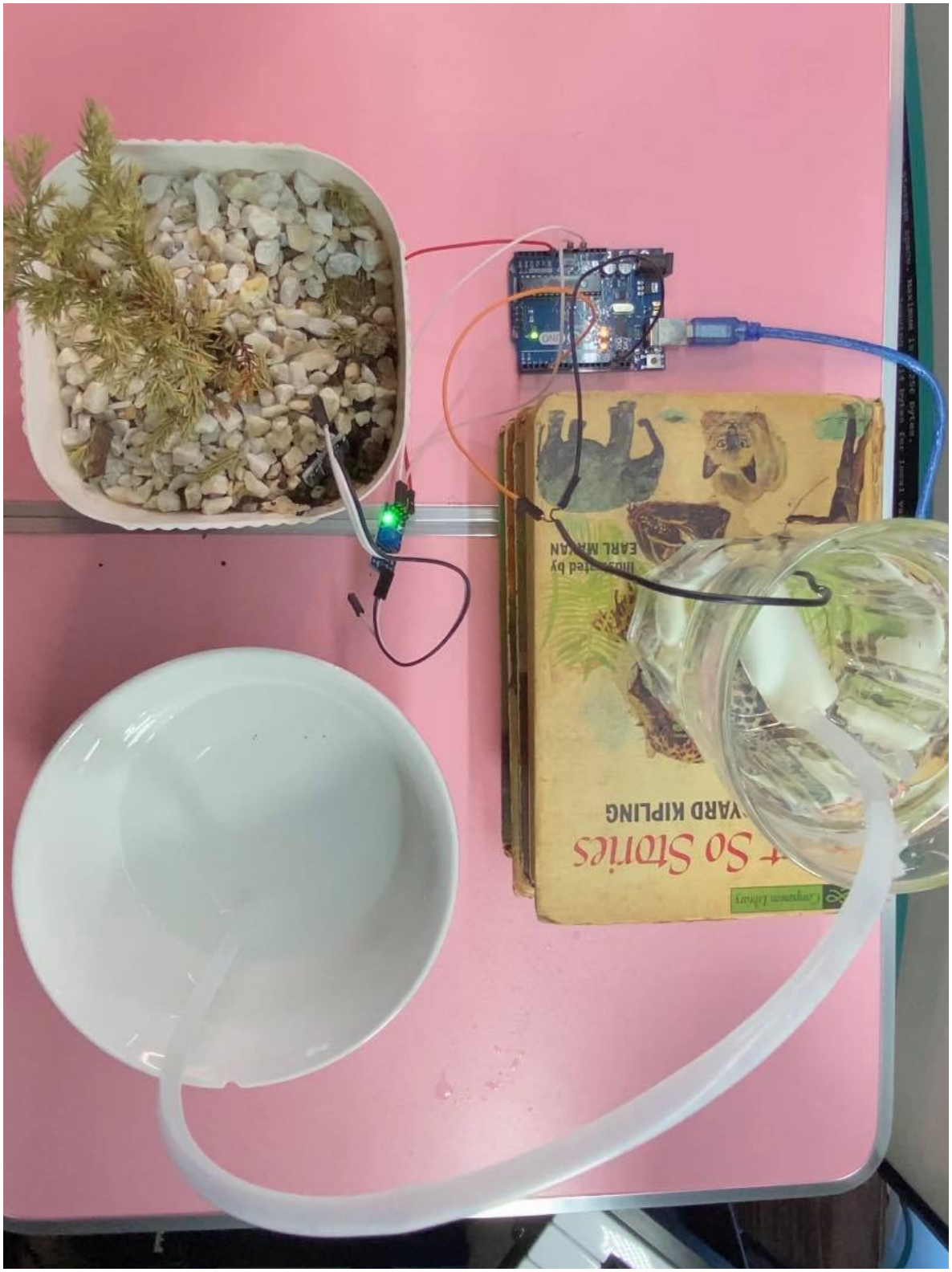


Figure 4: Simulation Set-up