Automatic Plant Watering System

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ABSTRACT

Watering is the most arduous and time-consuming ritual associated with gardening in daily life. Physically watering the plants only adds to the difficulty and is time consuming process already in place. So that we can lead a more intelligent existence, mankind has developed "Automatic plant watering system," which aids us in watering the plants naturally and conserves water. This automated plant watering system will ensure that the soil remains moist without the need for any human interaction. The AtMega328 microcontroller is used in this system. In addition to reducing labor requirements, this technique also allows us to store water, reducing the likelihood of overwatering. This technique was created with the hopes of replacing manual labor and making gardener's work easier. All plants exceed their capabilities when this design is enumerated in gardens. This Automated plant watering system eliminates the need for a human workforce and saves valuable time. To conserve energy, we can install solar panels on large administration buildings.

Keywords— Watering System, Arduino, Motor Driver, Ultrasonic Sensor, Moisture Sensor

I. INTRODUCTION

Despite the fact that the concept of a "person" is still prevalent in today's world of high-tech gadgetry, numerous automated systems are needed to ease human labor in their everyday lives. The Green House's increased humidity provides a source of water for healthy plants, which can thrive. It is common for people to neglect watering their plants owing to overly ambitious plans, causing them to fail to germinate properly. As a result, an automated plant watering system is a technique since it automatically waters the plants by going from one plant to another to measure the soil's moisture level. This system is less expensive and more reasonable than alternative systems, and it also saves time and effort because the work is completed automatically [1]. Regardless of the weather, this system is advantageous.

II. DESIGN AND IMPLEMENTATION

Figure 1 depicts a block diagram of the automatic plant watering system. The Arduino board contains both hardware and software. Arduino is connected to an L293D motor driver via a USB cable. The motor driver can also assist other parts. Motor drivers use the Arduino's programme code to control the gear motors.

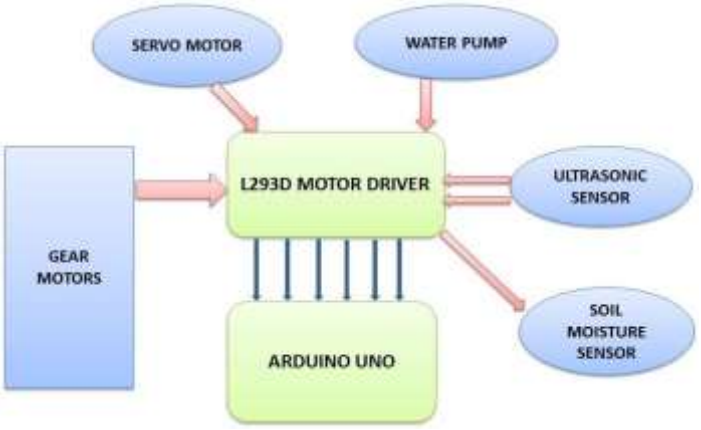

Figure 1: Block Diagram of the Plant Watering System

The completely automated system will be powered by an external power source. There are two essential components to this system. A water pump motor and moisture sensors are used. The Arduino Board can then be easily programmed using the Arduino IDE software. The moisture sensor's job is to measure the quantity of moisture in the soil at a specific spot on the plant. The motor/water pump is used to water the plants. The motor driver controls the gear motor in parallel with it. The Arduino and Motor Driver can be used to monitor the software-defined conditions as shown in Figure 2. Activating the system identifies plants and measures moisture content. The system then waters the plants if the moisture content falls below a predetermined threshold [2].

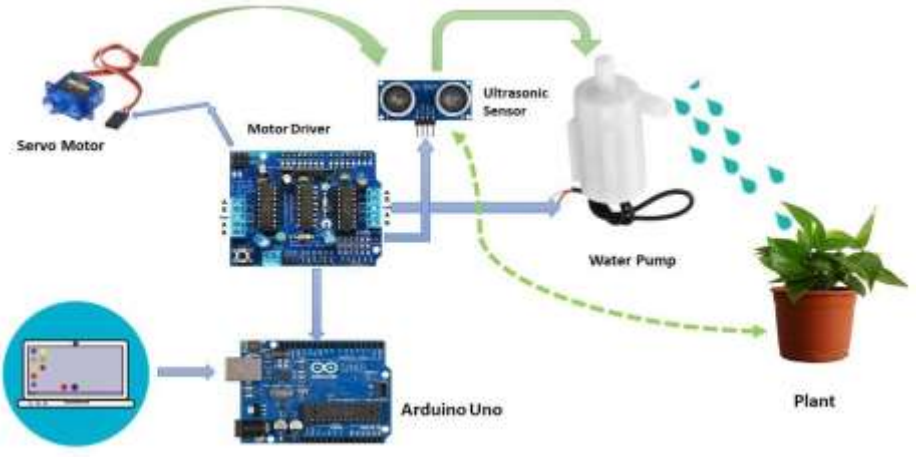

Figure 2: System architecture of the plant watering system

III. WORKING:

The circuit shown in Figure 3 is used to make the connections. In this case, Arduino is a key component that serves as an alliance for the other components. A motor driver is attached to the Arduino to control all the sensors. The motor driver monitors the gear motors attached to the portable object. Each gear motor delivers 12 volts and 500 rpm. In this case, two ultrasonic sensors are being used. One is for detecting the potted plant, and the other is for detecting the plant near a moisture sensor.

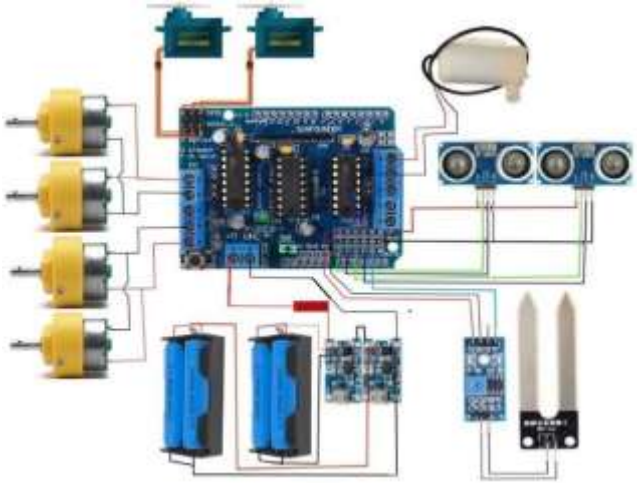

Figure 3: Circuit diagram of automatic plant watering system

To get things started, we simply swap the item around. To begin with, an ultrasonic sensor detects the pot and sends a hand signal to the servo motors that move the stick carrying the moisture sensor and an ultrasonic sensor attached to it. The servo motor has a 120-degree bend range over the stick. Soil moisture is detected by the second ultrasonic sensor, which sends signals to the moisture sensor. A reading of the sensor's moisture content is obtained every 20 seconds by the Arduino program. The program does the following two things if the value exceeds the threshold value: For a predetermined amount of time, it turns on the water pump and supplies the plant with water (refer to Fig. 4).
After returning to its starting point, the stick moves on to the next pot.

IV. COMPONENTS

A. ARDUINO UNO

Unlike proprietary platforms, Arduino relies on fully accessible hardware and software that can be used by anyone. The microcontroller board Arduino Uno has an 8-bit Atmega328P, 14 digital and 6 analogue input/output ports, a reset pin, a 16 MHz ceramic crystal oscillator, serial communication and a voltage regulator. It can be programmed using the Arduino software [3]. The input voltage ranges from 6 to 20 volts, with an ideal range of 7 to 12 volts. Each I/O pin can draw a maximum of 40 mA of DC current, while the 3.3V pin can draw a maximum of 50 mA of DC current. To power the Arduino, you can use a USB cable connected to a computer or an AC-to-DC adapter. Either of these will work.

Figure 4. Arduino UNO

B. MOTOR DRIVER

The shafts of these motors are gear-driven, allowing them to achieve their maximum performance potential. The maximum current is 600 mA per channel, and the maximum output current is 1.2 amps, with a voltage range of 5 to 35 volts. The shield contains two L293D motor drivers. An Arduino or other microcontrollers typically cannot drive these motors because they have higher current and power ratings, so motor shields or driver ICs are used as these separate a motor's power supply and use control logic from microcontroller circuitry. The 12V DC gear motors are controlled and regulated by this motor driver shield. All-terrain robots and robotic applications use motors with a 500 RPM operating speed.

Figure 5. Motor Driver Shield

C. Soil moisture sensor

As a proxy for moisture content, the sensor analyses a few soil parameters, such as the dielectric constant and electrical resistance. Both the electrical board and the probe with two pads used to measure water content go into the construction of this sensor [4]. A digital signal threshold can be set using a potentiometer. As long as the moisture value recorded is above or below the threshold, the low level (0V) or high level (5V) will be the output. A current is passed through the two probes to determine the moisture content of the soil. The resistance value is then calculated using this information. The soil moisture level is measured using a digital pin to see if it falls within the acceptable range [5-6].

Figure 6. Soil Moisture Sensor

D. ULTRASONIC SENSOR

An ultrasonic sensor is an electronic device that uses ultrasonic sound waves to bounce off of a target item to determine its distance from the sensor. Ultrasonic waves travel quicker than audible sound does. Piezoelectric crystals create sound waves, which are detected by a receiver after they've travelled to and from the target with an ultrasonic sensor's transmitter [7]. Any object in front of the ultrasonic sensor will cause sound waves to reverberate and produce an electric pulse. Sound waves are sent and echoed by the sensor to determine how far away it is from the thing being measured. It will be compared to the graph of sound waves to see whether any signals have been picked up.

Figure 7. Ultrasonic Sensor

V. OUTCOME

Figure 8 predicts the outcome of Automatic plant watering system. An ultrasonic sensor is used to detect an object and determine if it is present near a soil moisture sensor [8]. Pots of water are replenished by a DC water pump controlled by an Arduino. A servo motor is used to bend the soil moisture sensor close to the pot. The ultrasonic sensor, servomotor, soil sensor, and gear motors are all powered by the motor driver. Because the Arduino should not be supplied with direct power, charging modules are used in place of it.

Figure 8. Outcome of Automatic Plant Watering System

VI. CONCLUSION

This is a project that everybody can afford and that can be improved with the help of technology. In addition, this eliminates the need for manual watering and saves the user a significant amount of time. This entails monitoring soil moisture levels and distributing water to plants in a predictable manner. Whenever the soil is dry and in need of water, the engine begins pumping water, and it stops when the soil's moisture content is at the desired level. Gardeners and the elderly who lack the time or mobility to water their plants on a regular basis are the principal beneficiaries of this program. In other words, the system works well and can keep up with a dynamic environment.

VII. REFERENCES

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