Dry and Wet Object Segregator

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This Arduino based project is a device that intelligently identifies whether the object kept on it is dry or wet, and automatically segregates the objects into two different sections.

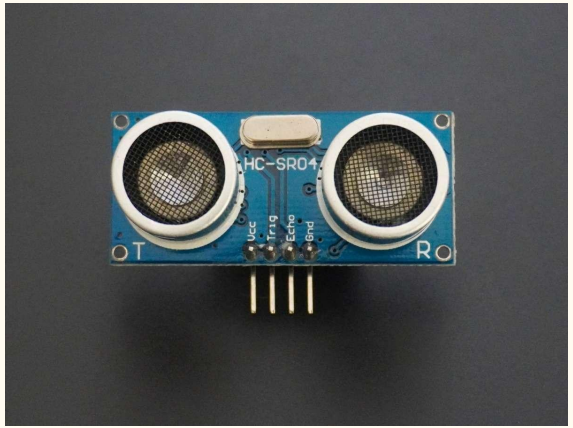
Components

Sourced entirely from College

- Arduino UNO R3
- HC-SR04 Ultrasonic sensor
- Analog/Digital Soil Moisture sensor
- Micro Servo motor
- Jumper cables
- USB cable

HC-SR04 Ultrasonic sensor

The HC-SR04 is an ultrasonic distance sensor that measures the distance to an object using sound waves. It consists of two main parts: a transmitter (which sends out ultrasonic waves) and a receiver (which listens for the reflected waves).

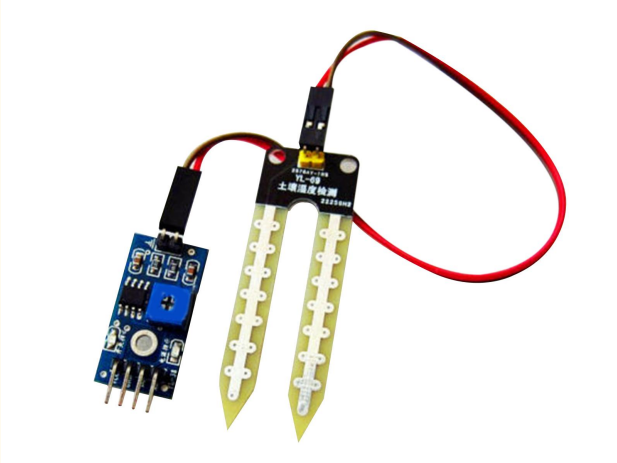


Working Principle :-

1. The sensor sends out an ultrasonic pulse through the transmitter.
2. The sound wave travels through the air and hits an object.
3. The object reflects the sound wave back to the receiver.
4. The sensor measures the time it takes for the wave to travel to the object and back.
5. Using the speed of sound (approximately 343 meters per second), the sensor calculates the distance based on the time delay.

Soil moisture sensor

A soil moisture sensor is a device that measures the water content in the soil. It's commonly used in agriculture, gardening, and environmental science to help manage irrigation and monitor soil conditions.



Working Principle :-

Most soil moisture sensors work on one of these two main principles:

1. Capacitive Method :

Measures the dielectric permittivity of the soil, which changes with moisture content. The sensor has two metal plates that form a capacitor; as soil moisture increases, the dielectric constant changes, altering the capacitance.

2. Resistive Method :

Measures the resistance between two probes inserted in the soil. Wet soil conducts electricity better (lower resistance), while dry soil has higher resistance.

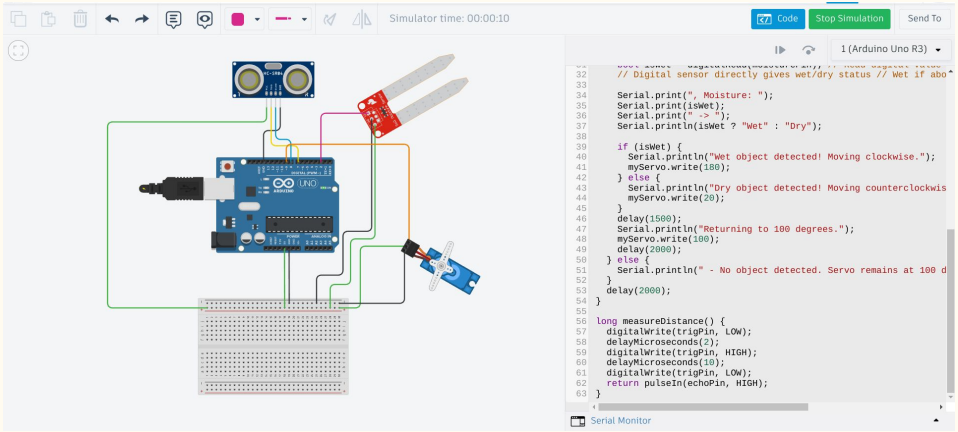
Procedure (TinkerCAD)

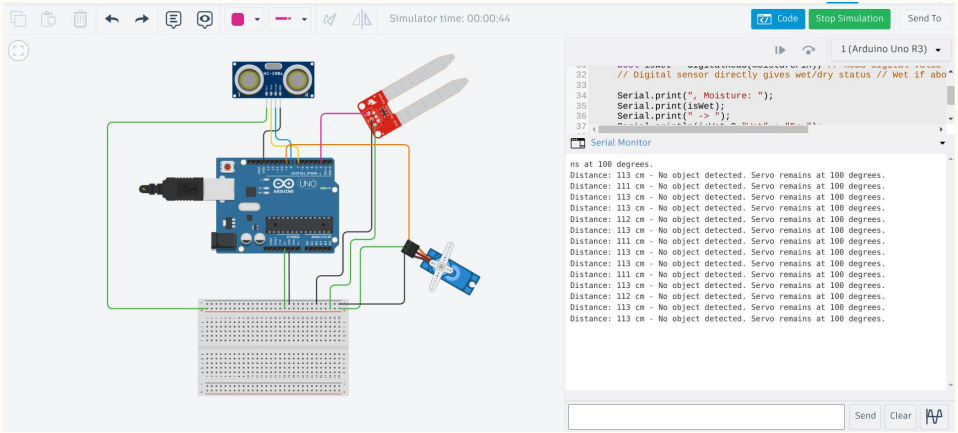
1.) Test the Arduino's functionality using a sample code.

2.) Test the functionality of each component one-by-one with sample codes.

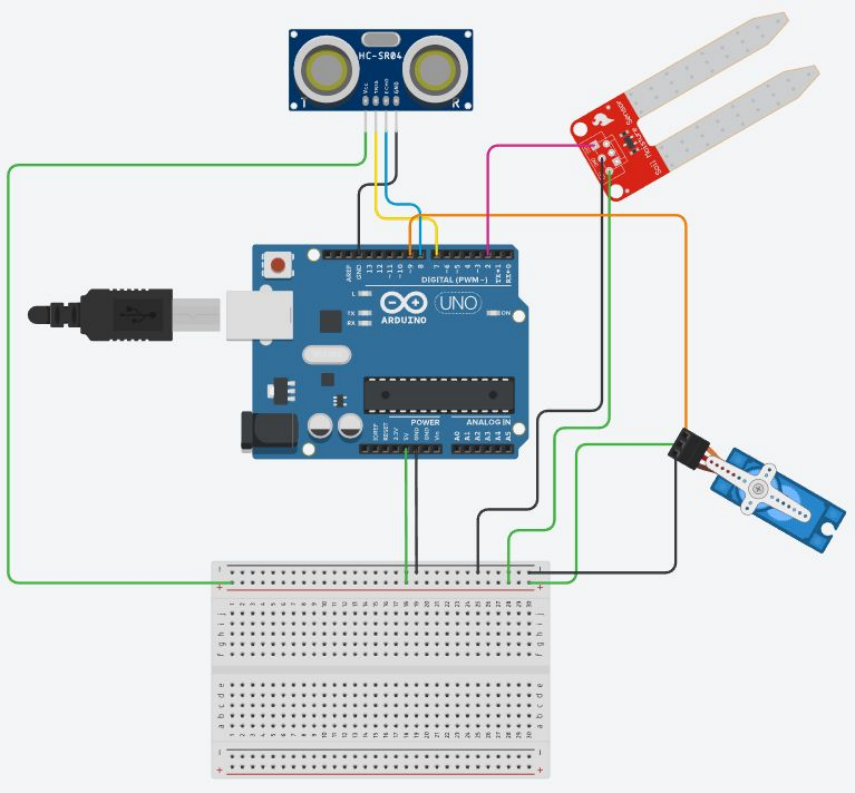
3.) Test HC-SR04 Ultrasonic sensor and Servo motor together, modify the code to moving the Servo motor if any object is detected at all.

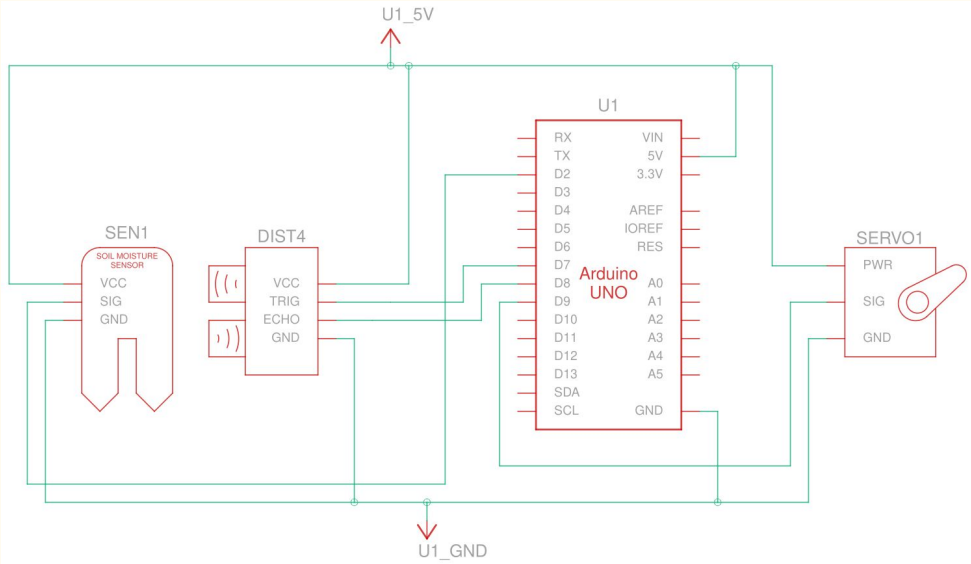
4.) Include the Soil Moisture sensor and modify the code to move the Servo motor in different directions depending on whether the detected object is dry or wet.





Circuit diagram and schematic





Schematic

Procedure (Physical)

1.) Test the Arduino's functionality using a sample code.

2.) Test the functionality of each component one-by-one with sample codes.

3.) Test HC-SR04 Ultrasonic sensor and Servo motor together, modify the code to moving the Servo motor if any object is detected at all.

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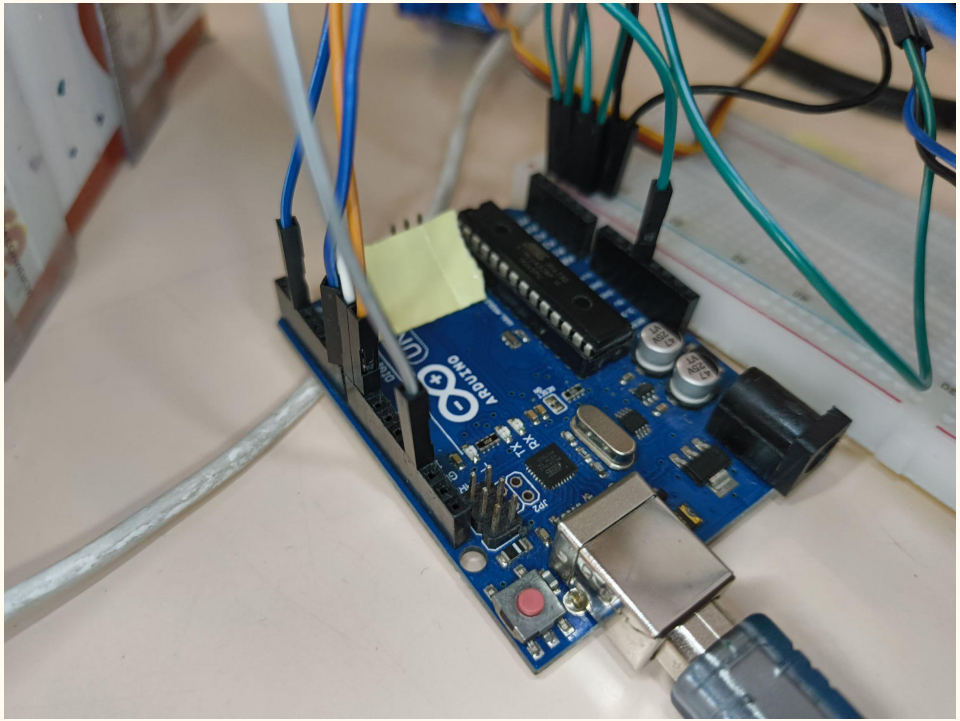


All connections made to Arduino

Pin Connections

Components to Arduino

All components :

- VCC/Power to 5v
- GND/Ground to GND

HC-SR04 Ultrasonic sensor :

- Trigger to Digital pin 7
- Echo to Digital pin 8

Servo :

- Signal to Digital pin 9 (Capable of PWM)

Soil Moisture sensor :

- Signal to Digital pin 2

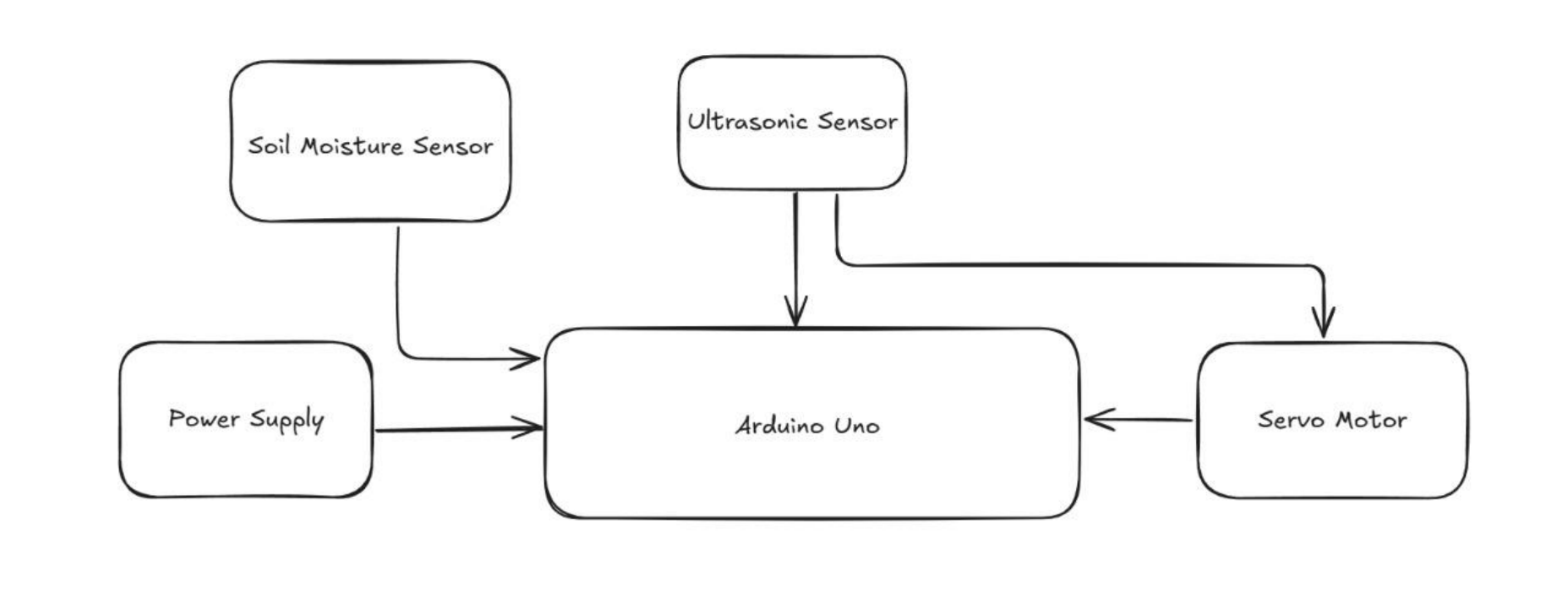
Brief Explanation of the code

The final version of the Arduino code includes libraries for the Arduino to properly use the Servo motor.

The project detects objects within a certain distance threshold (5-10 cm), and waits a small amount of time (1-2 s), for the user to properly place the object on the Soil Moisture sensor, and then moves the Servo in the direction it is supposed to depending on whether the Soil Moisture sensor detects moisture or not.

The wait is necessary for the user to properly place the object on the sensor else many objects will get falsely identified as wet.

Block Diagram



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OPEN-SOURCE
COMMUNITY

The final result

Real world applications

This project can be used in many ways to fulfill real needs :

- Industrial waste sorting
- Kitchen automation
- Seed sorting Harvest sorting
- Biohazard waste management
- Soil and water testing
- Inventory management
- Automated storage solutions

Conclusion

This project was very beneficial and fun for us to build from start to end.

We learnt how to connect components to an Arduino, and the various capabilities of different pins on the Arduino.

We learnt how to program an Arduino, which uses a programming language very similar to C, in its syntax.

This project cemented the usefulness of an Arduino for building projects with real world applications.