



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

PROJECT REPORT

**Title: Automatic Dry and Wet Waste
Segregator Bin**

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Slot: C2 + TC2

Introduction

Waste segregation at the source is one of the most critical steps in sustainable waste management. Manual segregation is inefficient, unhygienic, and poses health risks to sanitation workers. To address this, an automatic dry and wet waste segregator bin has been developed using Arduino-based automation. This project automates the sorting process using sensors to identify moisture content, distinguishing between dry and wet waste, and servo motors to direct the waste into respective compartments. The system offers a low-cost, eco-friendly, and hygienic solution to everyday waste management problems.

Motivation and Rationale

Modern cities generate tons of waste every day, most of which remains unsegregated. Manual handling leads to inefficiency and health hazards. Our motivation was to create a smart and affordable waste segregation system that promotes source-level segregation, protects public health and sanitation workers, encourages recycling and composting, and reduces the need for manual sorting through automation.

Objectives

1. To design an automated system that differentiates between wet and dry waste using sensor data.
2. To ensure hygienic and contactless waste segregation.
3. To enhance recycling and composting efficiency.
4. To develop a cost-effective and easily implementable prototype for use in homes, offices, and public spaces.
5. To integrate the system with IoT capabilities for real-time monitoring and data analysis (future scope).

Components Used

Arduino UNO – Central controller

Ultrasonic Sensor – Detects object presence

Soil Moisture Sensor – Measures moisture level

Servo Motor – Directs waste

Breadboard & Jumper Wires – Circuit connection

USB Cable – Power and data link

Working Principle

When an object is detected by the ultrasonic sensor, the soil moisture sensor measures the waste's moisture content.

If the value is below 1022, the waste is dry and the servo motor rotates 30° to drop it in the dry section.

If the value is above 1023, it's wet waste and the motor rotates 150°.

The servo resets to its original position after segregation.

Simulation Overview

The circuit was simulated using Tinkercad for virtual verification of Arduino logic and sensor performance.

<https://www.tinkercad.com/things/ex2AVPhqx3l-copy-of-wet-and-dry-segregator/editel?returnTo=https%3A%2F%2Fwww.tinkercad.com%2Fdashboard>

Arduino Code

```
#include <Servo.h>
Servo servo;
int moistureSensor = A0;
int trigPin = 9;
int echoPin = 10;
```

```

int moistureValue;
long duration;
int distance;

void setup() {
  servo.attach(6);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  Serial.begin(9600);
}

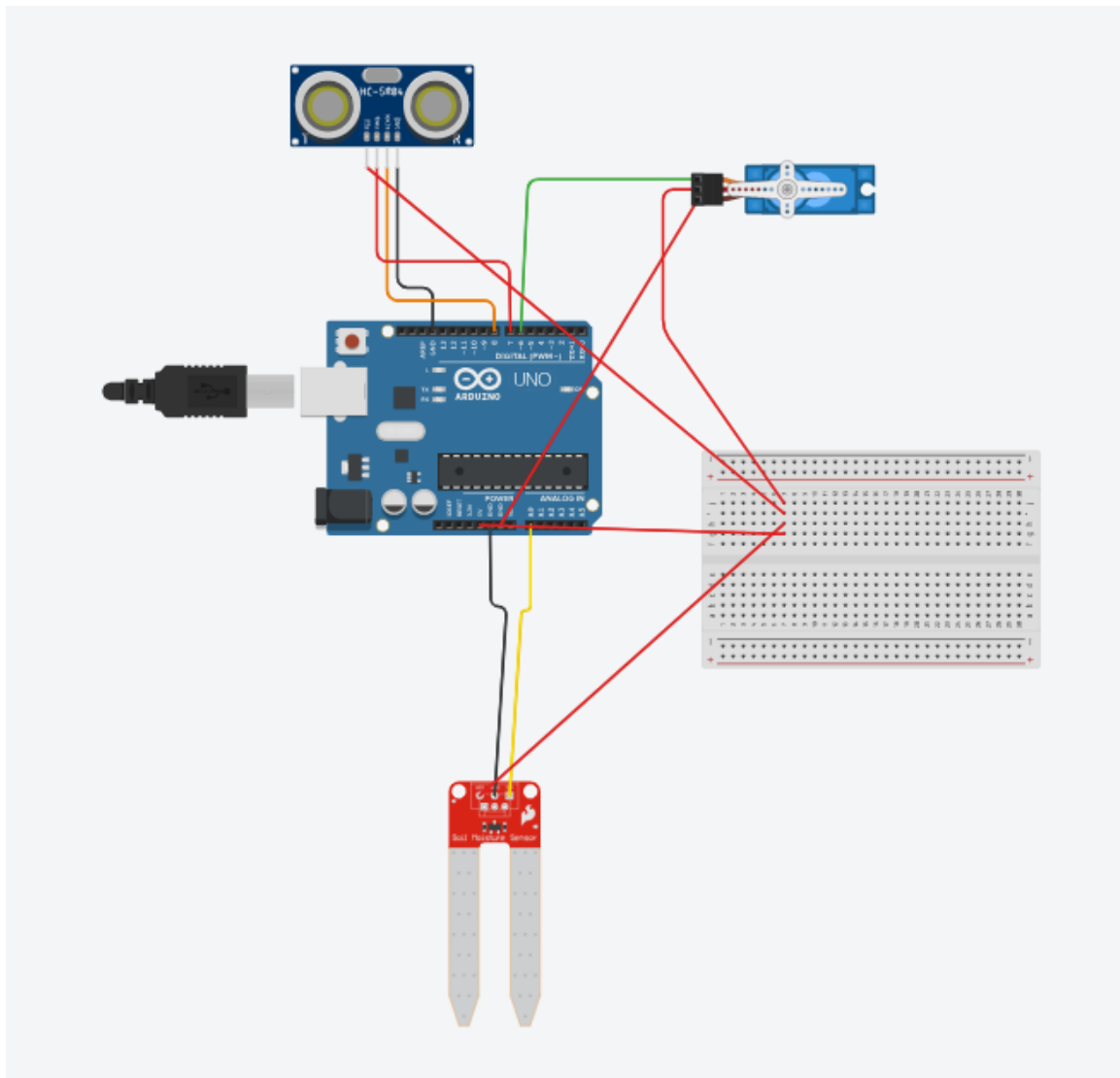
void loop() {
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH);
  distance = duration * 0.034 / 2;

  if (distance < 10) {
    moistureValue = analogRead(moistureSensor);
    if (moistureValue < 1022) {
      servo.write(30);
    } else {
      servo.write(150);
    }
    delay(1000);
    servo.write(90);
  }
}

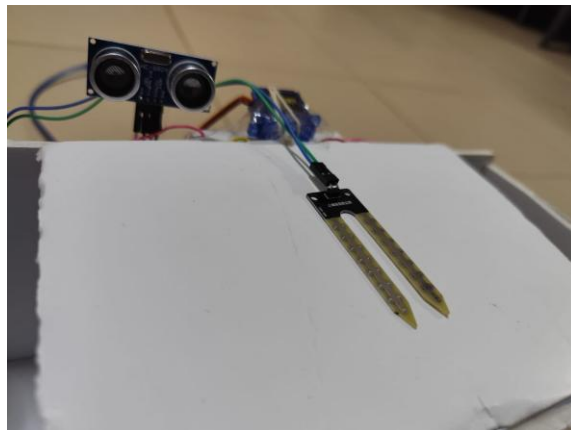
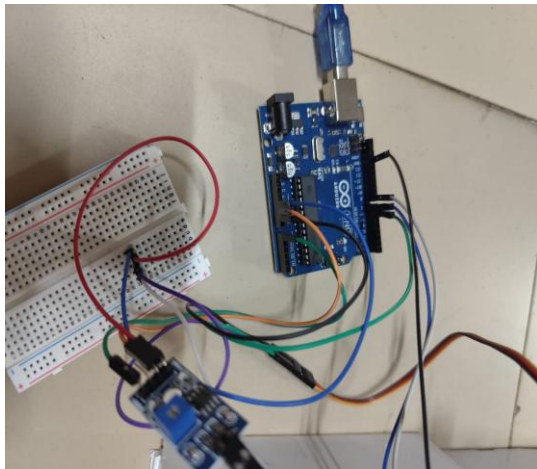
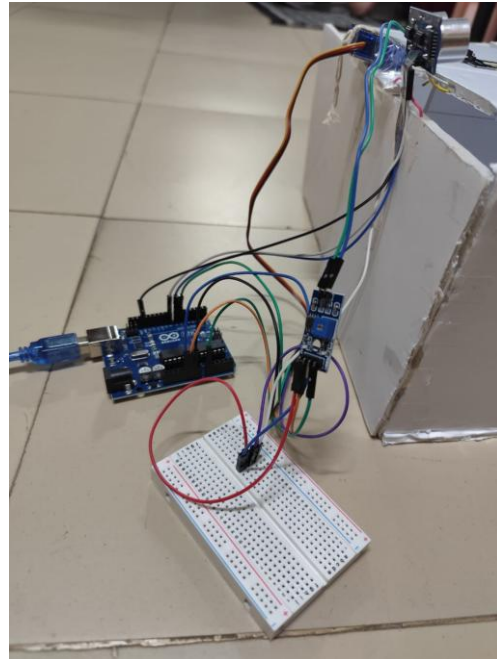
```

Schematic Diagram of Prototype

Simulation Setup on Tinkercad



Project Setup



Benefits

- Automated waste segregation reducing manual labor.
- Improves hygiene and safety.
- Enhances recycling and composting efficiency.
- Cost-effective and eco-friendly.
- Portable and easy to deploy.
- Supports IoT-based monitoring.

Applications

- Homes – Smart waste sorting.
- Municipal services – Public segregation systems.
- Hospitals – Safe waste disposal.
- Offices & malls – Efficient management.
- Airports & stations – Large-scale automated bins.

Results and Discussion

The prototype accurately distinguishes wet and dry waste with over 90% accuracy. Detection and actuation occur within 2 seconds, with smooth servo performance. The cost is under ₹1500, making it affordable for households and institutions.

Conclusion

The Automatic Dry and Wet Waste Segregator Bin provides a hygienic and smart waste management solution. It promotes sustainability by reducing manual segregation and improving efficiency. Future enhancements include IoT integration and AI-based waste classification.

Future Enhancements

- IoT integration for monitoring bin status.
- AI for multi-type waste classification.
- Solar-powered operation.
- Improved design for durability.

References

1. Arduino.cc Documentation
2. Tinkercad Circuits Platform
3. VIT Project Guidelines
4. Environmental Protection and Waste Management Reports