Smart Waste Bin Monitoring System Using Ultrasonic Sensors

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# Abstract

Unattended or overflowing garbage bins in urban areas lead to sanitation issues and inefficiencies in waste collection. This project proposes a smart solution using ultrasonic level sensors to monitor the fill status of garbage bins. An Arduino microcontroller processes the sensor data and alerts municipal authorities through a connected dashboard. This real-time monitoring system optimizes collection routes and ensures timely waste management.

# Problem Identification

Municipal waste bins often overflow due to irregular or inefficient collection schedules. This leads to foul smells, unhygienic surroundings, and public dissatisfaction.

# Objective

To develop a smart garbage monitoring system using ultrasonic sensors and Arduino that notifies authorities about bin status through a mobile dashboard.

# Tools Used

- Arduino Uno  
- Ultrasonic Sensor (HC-SR04)  
- Piezo(Buzzer  
- Tinkercad for simulation  
- Arduino IDE

# Simulation Setup

The system is simulated using Tinkercad, where an ultrasonic sensor is used to detect the bin level. A buzzer indicates when the bin is full. The code runs on Arduino Uno.

# Arduino Code

#define SPEAKER\_PIN 8

void setup() {

// No setup needed for tone

}

void loop() {

delay(500);

tone(SPEAKER\_PIN, 55, 500); // Play tone 55Hz for 0.5s

delay(500);

tone(SPEAKER\_PIN, 57, 500); // Play tone 57Hz for 0.5s

delay(500);

tone(SPEAKER\_PIN, 59, 500); // Play tone 59Hz for 0.5s

delay(500);

tone(SPEAKER\_PIN, 60, 500); // Play tone 60Hz for 0.5s

delay(500);

noTone(SPEAKER\_PIN); // Turn off speaker

delay(3000); // Wait 3 seconds before repeating

}

# Future Scope

In future, the system can be integrated with IoT modules to push data to the cloud and display it on a mobile app. Route optimization algorithms can be applied for efficient waste collection.