RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

25 years OF ACADEMIC EXCELLENCE

Department of Computer Science and Engineering

IT23A31 –IOT

SMARTDUSTBIN REVOLUTIONIZING WASTE MANAGEMENT

SANJAIKUMARAN K
230701284
MONESH D J
230701193

ABSTRACT

In today's rapidly urbanizing world, efficient waste management has become a critical challenge. Traditional waste collection systems often lead to overflowing dustbins, environmental pollution, and inefficient use of resources. This project proposes the development of a Smart Dustbin using Internet of Things (IoT) technology to revolutionize waste management practices.

Introduction

- Effective waste management is vital for maintaining clean and healthy cities. Traditional systems often suffer from inefficiency, leading to overflowing dustbins and environmental hazards. To address this, we propose a Smart Dustbin using IoT technology.

- The system uses sensors to monitor waste levels and sends real-time updates via Wi-Fi to waste management authorities. When the bin is full, it triggers an alert for timely collection. This smart approach ensures cleaner surroundings, optimizes collection routes, and supports the vision of smarter, greener cities.

Problem Statement

Traditional waste management systems are inefficient, leading to overflowing dustbins, unhygienic conditions, and unnecessary resource usage. There is a need for an automated solution that can monitor dustbin status in real-time and alert authorities for timely waste collection. This project aims to develop a Smart Dustbin using IoT technology to make waste management smarter, faster, and more efficient.

Proposed Work

- The proposed system involves designing a Smart Dustbin equipped with an ultrasonic sensor, a microcontroller (such as Arduino or NodeMCU), and a Wi-Fi module. The sensor will continuously monitor the waste level inside the bin. When the waste reaches a predefined limit, the microcontroller will send a real-time notification to the waste management authorities via a mobile app or web server.

Implementation

Component Procurement

Procured all essential components: Arduino Uno, Ultrasonic Sensor (HC-SR04), Servo Motor (SG90), jumper wires, and USB cable.

Verified the quality and specifications of each item before use.

Circuit Assembly

Connected the ultrasonic sensor's VCC, GND, Trig, and Echo pins to the Arduino.

Connected the servo motor's VCC, GND, and Signal wires to appropriate Arduino pins.

Testing and Debugging

Performed individual testing of ultrasonic sensor and servo motor.

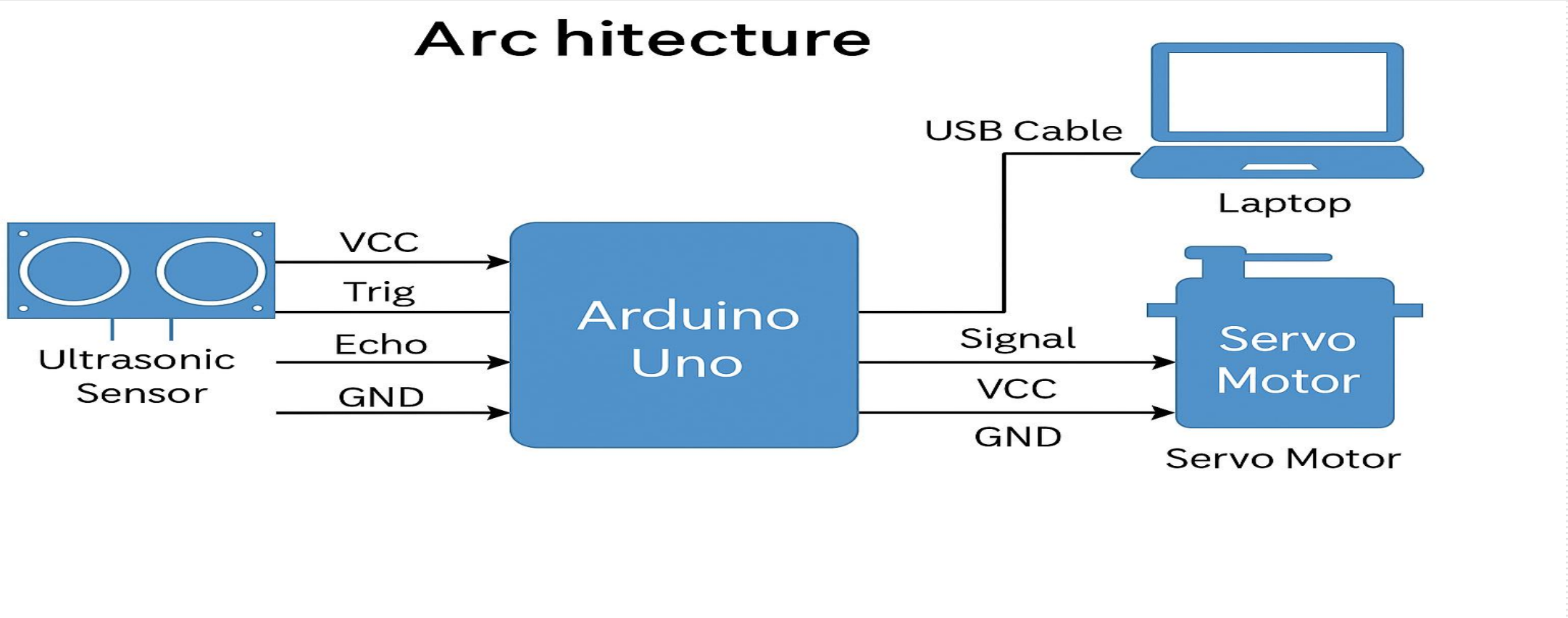
Calibrated the sensor distance threshold for accurate detection.

Programming

Used Arduino IDE to write and upload the program (sketch).

Programmed the Arduino to read distance from the ultrasonic sensor.

Architecture



System requirements

- Arduino UNO
- Servo Motor (SG90)
- GSM
- Ultrasonic sensors
- Buzzer
- Power Supply
- Jumper wired
- **Frontend**: React.js
- **Backend**: Node.js
- **Database**: Supabase

Advantages of the proposed system

- **Automation:**

-The system operates automatically without human intervention, enhancing convenience and reducing manual effort.

- **Low Cost:**

-Components like Arduino Uno, HC-SR04 sensor, and SG90 servo motor are inexpensive, making the system cost-effective.

- **Energy Efficient:**

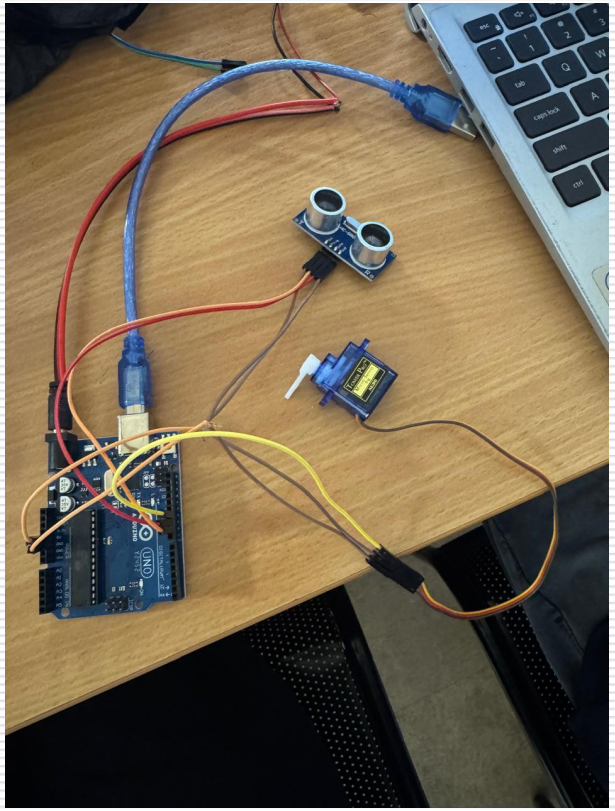
-The system consumes very little power, especially when running on Arduino and small servo motors.

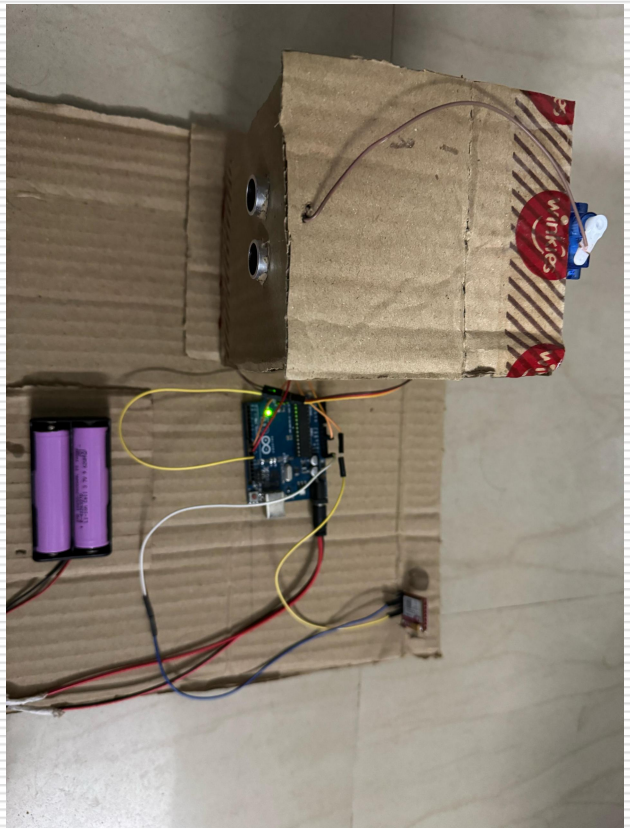
- **Increased Safety:**

-In applications like obstacle avoidance or touchless control, it minimizes human contact and enhances safety.

-You can extend the system by adding WiFi (using ESP8266) or Bluetooth for remote monitoring/control.

Inventory





Implementation of inventory

- This project, inventory refers to managing the essential hardware components required for system assembly and operation. The necessary components — Arduino Uno, Ultrasonic Sensor (HC-SR04), Servo Motor (SG90), jumper wires, and a USB cable — are listed, procured, and verified before implementation. Each component is tested individually to ensure proper functioning. The system is then assembled according to the designed architecture, and the Arduino is programmed to coordinate sensor input and servo motor control. Proper inventory management ensures smooth project development and easy scalability for future enhancements.

Conclusion

The proposed IoT-based system successfully demonstrates efficient automation using an Arduino Uno, an ultrasonic sensor, and a servo motor. It offers a cost-effective, reliable, and scalable solution for real-time object detection and actuation. The project highlights the potential of simple IoT integrations in creating smart, touchless, and energy-efficient applications. With further enhancements, this system can be adapted for various industrial, commercial, and domestic uses.

References

- S. Kumar, "Inventory Management Systems: Challenges and Solutions," *International Journal of Business and Management Studies*, vol. 9, no. 3, pp. 45-59, 2022.
- P. Gupta and S. Sharma, "Automated Inventory Control System," *International Journal of Engineering and Technology*, vol. 8, no. 7, pp. 72-85, 2021.
- A. Smith and B. Thomas, "Barcode Scanning in Retail Management," *Journal of Retail and Consumer Services*, vol. 34, pp. 101-112, 2019.
- S. Lee, "Email Notification Systems for Inventory Management," *International Journal of Computer Science and Technology*, vol. 10, no. 6, pp. 112-121, 2020.

Thank You