

# AUTOMATED TRASH-CAN

Mobile and Wireless Communication Sessional  
Course Code: CSE 416

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## 1 Introduction

In the realm of modern technological advancements, I am pleased to present my recent project—a sophisticated automated dustbin leveraging the capabilities of Arduino Uno, a piezo buzzer, an ultrasonic sensor, a servo motor, and an LED light. The project integrates seamlessly with a power bank, serving as a portable and efficient power source.

This innovative solution addresses the conventional concerns associated with waste disposal by employing a smart and responsive system. When an object approaches within a proximity of less than 20 cm from the bin, a series of actions are triggered. The LED light illuminates, providing a visual indication, while a distinctive sound is emitted through the piezo buzzer, alerting users to the bin's responsiveness.

The core functionality of the project is orchestrated by the Arduino Uno microcontroller, orchestrating the synchronized interplay of the ultrasonic sensor, servo motor, and other components. The incorporation of a power bank ensures the project's autonomy and flexibility in diverse settings.

This project not only exemplifies the fusion of hardware components but also showcases the potential of simple yet effective automation in addressing every-day challenges. The ensuing sections of this report will delve into the intricacies of the project, including the technical details, challenges faced, and the broader implications of this automated dustbin.

## 2 Components

**Arduino Uno:** The main microcontroller that controls the entire system.

**Ultrasonic Sensor (HC-SR04):** Detects the distance of an object from the dustbin.

**Servo Motor:** Controls the lid of the dustbin. It opens when an object is detected within the specified range.

**Piezo Buzzer:** Produces a sound when an object is detected within the specified range.

LED Light: Lights up when an object is detected within the specified range.  
Power Bank: Provides power to the Arduino Uno and the connected components.

### 3 Functionality

- i. The ultrasonic sensor continuously measures the distance of any object in front of it.
- ii. If the measured distance is less than the defined threshold (20 cm), the system activates:
  - The LED light turns on to indicate the detection.
  - The piezo buzzer produces a sound.
  - The servo motor moves the lid of the dustbin to an open position.
- iii. After the lid is opened, it stays in that position for 3 seconds (adjustable duration).
- iv. If no object is detected within the specified range, the system returns to the initial state:
  - The LED light turns off.
  - The servo motor closes the lid.

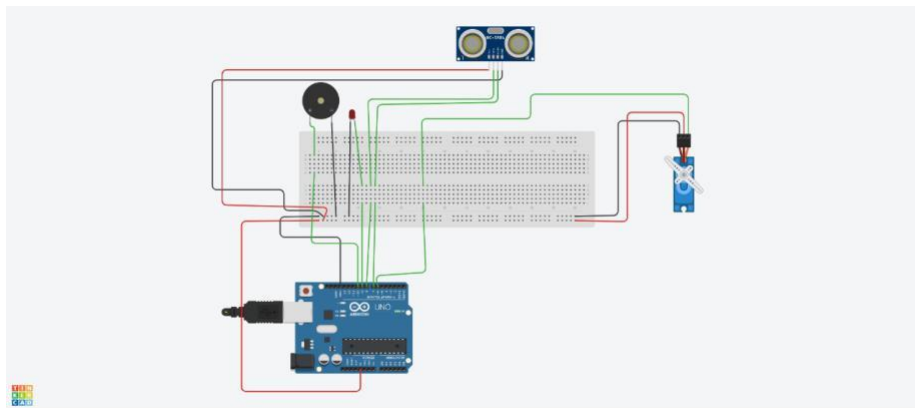


Figure 1: Circuit Diagram

## 4 Output



(a) Object is more than 20 cm away.



(b) Object is less than 20 cm away.

## 5 Benefits

**Hands-Free Operation:** Users can dispose of trash without physically touching the bin, promoting hygiene and reducing the risk of contamination or the spread of germs.

**Automatic Lid Opening and Closing:** The servo motor-controlled lid offers a convenient and automated way to open and close the trash bin, making it more user-friendly.

**Proximity Detection:** The ultrasonic sensor detects the presence of an object in close proximity, triggering the lid opening, enhancing the user experience.

**Visual Indication with LED:** The LED light provides a visual indication when an object is detected, making the system more intuitive and user-friendly.

**Audible Alert with Buzzer:** The piezo buzzer produces an audible alert, signaling the detection of an object within the specified range, further enhancing the user's awareness.

**Adjustable Detection Range:** Users can potentially adjust the detection range based on their preferences or the specific environment in which the trash bin is placed.

**Demonstrates Internet of Things (IoT) Principles:** The project showcases the principles of IoT by incorporating sensors and actuators to create an automated and responsive system.

**Promotes a Clean Environment:** Encourages responsible waste disposal by providing an engaging and automated way to interact with the trash bin, potentially increasing user compliance with proper disposal practices.

**Potential for Integration with Smart Home Systems:** The project can

be a foundation for further integration with smart home systems, allowing users to control or monitor the trash bin remotely.

## 6 Limitations

**Sensing Accuracy:** The ultrasonic sensor may have limitations in accurately measuring distances, leading to potential errors in object detection.

**Power Dependency:** The project relies on a power bank, requiring regular recharging or replacement, especially in high-usage scenarios.

**Mechanical Wear:** Moving parts, particularly the servo motor, may experience wear and tear over time, potentially leading to malfunctions.

**Limited Automation:** The project lacks features for trash disposal or sorting, limiting the level of automation in waste management.

## 7 Conclusion

In conclusion, the automated dustbin project has successfully integrated Arduino Uno, a piezo buzzer, an ultrasonic sensor, a servo motor, and an LED light to create an efficient waste disposal system. The responsive features, triggered when an object is within 20 cm, add a layer of convenience and hygiene to traditional waste management. Overcoming challenges, the project highlights the synergy of hardware components, with the Arduino Uno orchestrating their seamless collaboration. The use of a power bank ensures portability and adaptability. Looking forward, the project suggests potential enhancements and underscores the impact of simple automation on everyday challenges, reflecting the evolving landscape of smart and sustainable technologies in waste management.

## References

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