

AUTOMATED TRASH CAN

Introducing the Smart Waste Management Project

Mobile and Wireless Communication Sessional
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1 Introduction

In the realm of contemporary technological innovations, I am thrilled to introduce my recent endeavor—a cutting-edge automated waste bin harnessing the capabilities of the Arduino Uno microcontroller, a piezo buzzer, an ultrasonic sensor, a servo motor, and an LED light. This project seamlessly integrates with a power bank, providing a portable and efficient power source for enhanced versatility.

This forward-thinking solution aims to address traditional concerns associated with waste disposal by implementing a smart and responsive system. Upon detecting an object within a proximity of less than 20 cm from the bin, a series of actions are triggered. The LED light illuminates, offering a visual cue, while a distinctive sound emanates from the piezo buzzer, notifying users of the bin's responsiveness.

The pivotal functionality of this project is orchestrated by the Arduino Uno microcontroller, harmonizing the synchronized interplay of the ultrasonic sensor, servo motor, and other essential components. The inclusion of a power bank ensures the project's autonomy and adaptability in various settings.

Beyond being a testament to the amalgamation of hardware components, this project serves as an exemplar of the potential of simple yet effective automation in addressing everyday challenges. Subsequent sections of this report will delve into the intricacies of the project, encompassing technical details, challenges encountered, and the broader implications of this innovative automated dustbin.

2 Components

The heart of this pioneering automated dustbin lies in its sophisticated components, seamlessly working together to create an intelligent and responsive waste disposal system. The key elements driving this innovation include the Arduino Uno microcontroller, a piezo buzzer, an ultrasonic sensor, a servo motor, and an LED light.

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.

Bread Board: Also called plugblock and used for temporary circuits.

3 Functionality

The core functionality of this automated dustbin project is ingeniously orchestrated by the Arduino Uno microcontroller, serving as the central nervous system. This microcontroller acts as the brains behind the operation, enabling the synchronized interplay of various hardware components for an efficient and responsive waste disposal system. Below are the functionalities of the project:

- 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.

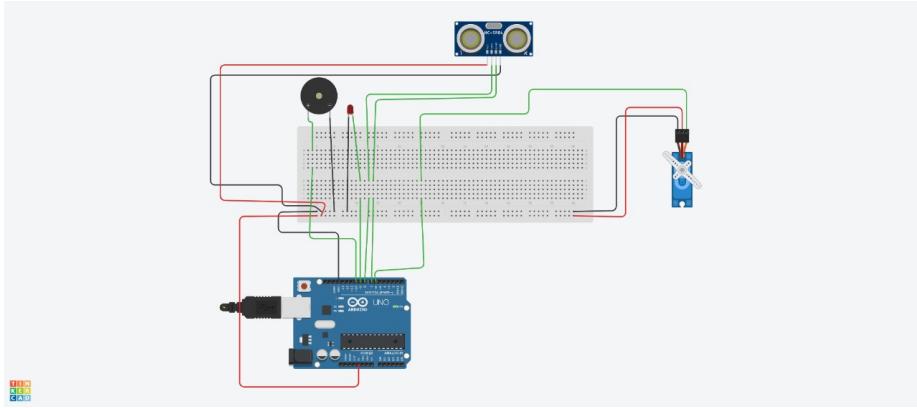


Figure 1: Circuit Diagram

4 Output



(a) Object is more than 20 cm away(LED light off and lid closed)



(b) Object is less than 20 cm away(LED light on and lid opened)

5 Benefits

The benefits derived from this innovative automated dustbin project are both numerous and impactful, revolutionizing traditional waste disposal methods. At its core, this technological marvel provides heightened efficiency and convenience in managing and disposing of waste. Let's explore the key advantages:

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.

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.

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 successfully integrates Arduino Uno, a piezo buzzer, an ultrasonic sensor, a servo motor, and an LED light, providing an efficient and responsive waste disposal system. Overcoming chal-

lenges, the synergy of hardware components, orchestrated by the Arduino Uno, exemplifies seamless collaboration. The incorporation of a power bank enhances portability, while the triggered features within a 20 cm proximity add convenience and hygiene. Looking ahead, the project hints at potential enhancements and underscores the impact of simple automation on everyday challenges, contributing to the evolution of smart and sustainable waste management technologies.

References

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