PROJECT REPORT

On

“Smart Dustbin”

This project & Research Report has been independently developed by me and is not submitted to any college or university for academic evaluation

Developed by

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SKMP PROJECT MANAGEMENT

SKMP PROJECT MANAGEMENT

DEPARTMENT OF IOT

POLISHLINE.BALASORE,ODISHA, INDIA

JUNE -2026

"Dedicated to my beloved parents, and teachers who have worked hard throughout my education"

CERTIFICATE

This is to certify that the project entitled " SMART DUSTBIN " has been independently developed and completed by Suzen Kumar Mohanty for the purpose of enhancing technical knowledge, skills, and practical understanding.

This project is a self-initiated work carried out with personal interest and research. It has not been submitted to any college, university, or institution for the award of any degree or diploma.

The work presented in this project is genuine and has been completed by the developer himself.

Suzen Kumar Mohanty
(Project Developer)

Date: 10 /06 / 2026
Place:Balasore,Odisha,India

SELF ATTESTATION

I hereby declare that I have personally worked on the project entitled " SMART DUSTBIN ".

All the data, analysis, and implementation presented in this project are the result of my own efforts and genuine work. Any external sources of information, if used, have been properly acknowledged.

This project is created solely for learning, skill development, and professional improvement, and has not been submitted to any institution for academic purposes.

Suzen Kumar Mohanty
(Project Developer)

Date: 10 /06/ 2026
Place:Balasore,Odisha,India

DECLARATION

I hereby declare that the project titled “SMART DUSTBIN” is an original work carried out by me based on my own idea, research, and implementation.

This project has not been submitted previously, in part or in full, to any college, university, or institution for the award of any degree, diploma, or certification.

I confirm that all the information presented in this project is true to the best of my knowledge. Any references or sources used have been properly acknowledged.

I take full responsibility for the authenticity and originality of this work.

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Institution : [Srinix Collage Of Engineering , Independent]
Date: [10/06/2026]
My PortPolio Link:- https://suzen-kumar-mohanty-8fdv.vercel.app/

ACKNOWLEDGMENTS

I would like to express my sincere gratitude to everyone who directly or indirectly supported me in the successful completion of my personal project "SMART DUSTBIN".

This project is a result of my own idea, research, and continuous effort to enhance my technical knowledge and practical skills in the field of Internet of Things (IoT). Working on this project has provided me with valuable learning experiences and improved my understanding of real-world applications.

I would also like to thank my family and friends for their constant encouragement, motivation, and support throughout the development of this project.

Finally, I am thankful to all the online resources, tutorials, and communities that helped me gain knowledge and solve challenges during the project development.

Developed By:
Suzen Kumar Mohanty

ABOUT MY SELF

I am **Mr. Suzen Kumar Mohanty**, a passionate and dedicated **Web Developer** from the field of **Computer Science and Engineering**, with strong expertise in HTML, CSS, JavaScript, and Vue.js. I specialize in building scalable, responsive, and high-performance web applications that deliver seamless user experiences across all devices and screen sizes.

With a keen eye for detail, I focus on writing clean, maintainable, and well-structured code. My development approach is centered around creating intuitive user interfaces, ensuring both functionality and aesthetic quality. I follow modern front-end development practices such as component-based architecture, responsive design principles, and performance optimization techniques to build efficient and user-friendly applications.

Beyond web development, I actively work on **IoT-based solutions**, where I integrate hardware and software to create smart, real-world systems. I have hands-on experience with Arduino Uno and various sensors, enabling me to develop projects such as environmental monitoring systems, smart automation solutions, and real-time data tracking applications.

One of my key strengths lies in connecting IoT devices with web technologies. I build interactive dashboards that allow real-time data visualization, giving users the ability to monitor, analyze, and control devices remotely. My work focuses on bridging the gap between the physical and digital world by transforming raw sensor data into meaningful insights.

I am deeply interested in developing innovative, data-driven solutions that combine web technologies with embedded systems. My goal is to create impactful applications that solve real-world problems while improving efficiency, automation, and user experience.

With a strong passion for continuous learning and innovation, I consistently explore new tools, frameworks, and technologies to enhance my skills and deliver high-quality, future-ready solutions.

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ABSTRACT

The level of intelligence possessed by both humans and objects continues to rise. While the concept of smart cities is intriguing, there is a pressing need for intelligent approaches to waste
management. The Smart Dustbin was conceived as a solution for use in intelligent buildings, such as
colleges, hospitals, and bus stops. Because of this, it is believed that the Smart Trashcan is an upgrade on
the traditional dustbin by making it smart via the use of sensors and logics. Via ultrasonic sensors for waste
level monitoring and delivering message to the user updating the state of the bin using GSM module,
smart dustbins are a novel concept of implementation that makes a regular dustbin smart. Smart dustbins
are also known as intelligent garbage cans. As soon as the trash can is brimming, a system for collecting
intelligent solid waste will be activated. It is not uncommon to see rubbish scattered in and around the
wastebaskets as it has been known to happen. Insects that might transmit illness, such as mosquitoes, flies,
bees, and driving ants, may make their home in the area around dust bins that have not been adequately
managed. The surroundings of a garbage can are also likely to contribute to an increase in the amount of
pollutants in the air. The contamination of the air caused by a trashcan may lead to the production of
germs and viruses, both of which can lead to life-threatening illnesses in humans.

LIST OF FIGURES

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Chapter 1

INTRODUCTION

One of the most serious challenges facing modern society is **solid waste management**. Although the world is experiencing rapid technological and urban development, the problem of garbage disposal continues to grow. Overflowing dustbins are a common sight in many cities, causing unpleasant surroundings and creating breeding grounds for insects, mosquitoes, and harmful bacteria. This leads to the spread of diseases and negatively affects public health.

Solid waste management has become a major challenge not only in **India** but also in many countries around the world. Rapid urbanization and population growth have significantly increased the amount of waste generated every day. Therefore, there is an urgent need for an efficient waste management system that can reduce this problem and maintain a clean and healthy environment.

The concept of **Smart Cities** has brought new opportunities to improve urban infrastructure, including waste management. The Government of India proposed the development of **100 Smart Cities** to provide better living standards through the use of modern technologies. As these cities continue to grow, effective waste collection and disposal systems become increasingly important.

Cleanliness is one of the basic requirements of a smart city, and proper waste disposal begins with well-managed garbage bins. Strategically placing dustbins and ensuring their timely collection can greatly improve sanitation and environmental cleanliness. However, in many Indian cities, overflowing and poorly maintained dustbins remain a major issue due to inefficient monitoring and collection systems.

To address this problem, it is essential to develop a **smart waste management system** that can monitor the fill level of garbage bins,

optimize waste collection, and prevent overflowing. Such a system not only improves public hygiene but also supports the vision of cleaner, greener, and smarter cities.

Chapter 2
LITERATURE REVIEW

1. Twinkle Sinha, K. Mugesh Kumar, and P. Saisharan (2015)

Twinkle Sinha, K. Mugesh Kumar, and P. Saisharan proposed the concept of **Smart Dustbins** to improve waste management in urban areas. Their system aims to prevent roadside garbage accumulation, reducing the spread of diseases caused by insects and mosquitoes. It also minimizes environmental pollution and prevents stray animals from consuming waste. The proposed smart dustbin contributes significantly to maintaining a clean, hygienic, and sustainable environment, making it suitable for smart city applications. **[1]**

2. Swati Sharma and Sarabjit Singh (2018)

Swati Sharma and Sarabjit Singh developed an **IoT-based Smart Garbage Management System** using IoT hardware and the Ionic framework. The system continuously monitors the garbage level and notifies waste collection authorities when the bin becomes full. If the waste is not collected within a specified time, the information is automatically forwarded to higher authorities for appropriate action. The system also incorporates **PIR sensors, IR sensors, a servo motor, and an APR voice**

module to provide automated lid operation and voice assistance, improving user convenience and waste management efficiency. **[2]**

3. Narayan Sharma, Nirman Singha, and Tanmoy Dutta (2015)

Narayan Sharma, Nirman Singha, and Tanmoy Dutta proposed a **smart-bin communication system** that transmits waste collection information from different locations to a central monitoring system. The collected data can be analyzed to understand waste generation patterns and optimize collection schedules. Over time, historical datasets can be generated to support better planning and decision-making in municipal waste management. **[3]**

4. Fady E. F. Samann (2018)

Fady E. F. Samann proposed a **solar-powered smart waste bin** based on an **Arduino Nano**, an ultrasonic sensor, and a GSM module. The system monitors the fill level of the dustbin and sends SMS notifications when the bin becomes full. It is powered by a solar panel with a lithium battery backup, making it energy-efficient. A PIR sensor records usage events, while a memory card stores operational data and plays an audio alert through a speaker when the bin reaches maximum capacity. The system is cost-effective and demonstrated satisfactory performance during testing. **[4]**

5. U. Nagaraju, Ritu Mishra, Chaitanya Kumar, and

Rajkumar (2017)
U. Nagaraju, Ritu Mishra, Chaitanya Kumar, and Rajkumar proposed an **Arduino Uno-based Smart Dustbin** integrated with a GSM modem and an ultrasonic sensor. The ultrasonic sensor measures the garbage level inside the bin, while the GSM module sends notifications when the waste reaches a predefined threshold of **10 cm** from the top. The system addresses the growing challenge of urban waste management by enabling timely waste collection and reducing overflow. **[5]**

Summary of Literature Review

Authors	Year	Technology Used	Key Contribution
Twinkle Sinha, K. Mugesh Kumar, P. Saisharan	2015	Smart Dustbin	Prevents garbage overflow, improves hygiene, and supports smart cities.
Swati Sharma, Sarabjit Singh	2018	IoT, PIR, IR, Servo Motor, APR Module	IoT-based monitoring with automated notifications and authority escalation.
Narayan Sharma, Nirman Singha, Tanmoy Dutta	2015	Smart Bin, Data Analytics	Collects waste data for optimized collection routes and historical analysis.
Fady E. F. Samann	2018	Arduino Nano, GSM, Ultrasonic Sensor, Solar Panel	Solar-powered smart bin with SMS alerts and audio notifications.

Authors	Year	Technology Used	Key Contribution
U. Nagaraju, Ritu Mishra, Chaitanya Kumar, Rajkumar	2017	Arduino Uno, GSM, Ultrasonic Sensor	Monitors garbage level and sends GSM alerts for timely waste collection.

Chapter 3

PROPOSED SYSTEM

- **Proposed System**

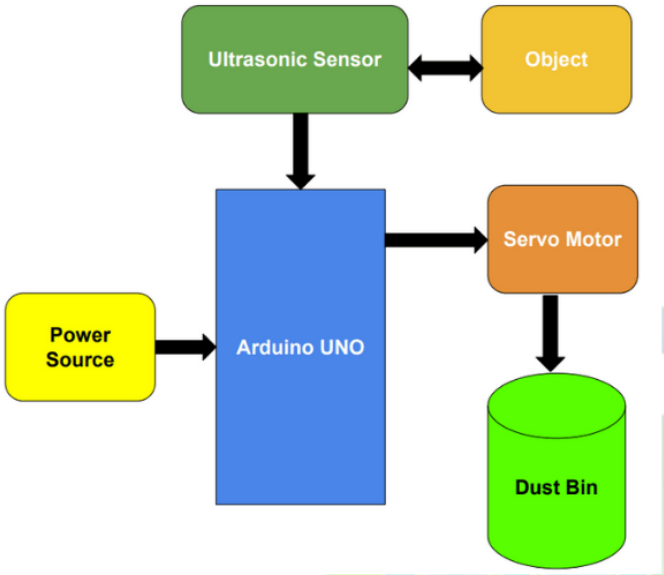
In the present day, the garbage can is overflowing; the proposed system will help to prevent this problem from occurring in the future. Mosquitoes and houseflies primarily breed in garbage, and these insects are a major factor in the transmission of a variety of diseases, including malaria, dengue fever, and chikungunya, amongst others .Additionally, this results in an increase in the degree of tension and headaches. It will provide information in real time on the amount of trash that is in the bin. When the trash can is at capacity, it will promptly send the notification to the recipient. The placement of trash cans accord the real
requirements. The expense of using this technique is low. The resources can be obtained with little effort. Increases the overall quality of the environment by eliminating odours and making cities more sanitary. It opens on its own without the need to touch the lid. It is to maintain and create a clean atmosphere.

Chapter 4

METHODELOGY

- The system continuously monitors the garbage level inside the dustbin.
- An **ultrasonic sensor** measures the distance between the dustbin lid and the garbage.
- The measured distance is compared with a predefined threshold value based on the bin's height.
- If the measured distance is less than the threshold, the bin is considered **full**.
- The **microcontroller (Arduino Uno)** processes the sensor data and detects the full-bin condition.
- Once the bin is full, the microcontroller activates the **GSM module**.
- The GSM module sends an **SMS alert** to the registered sanitation authority.
- The alert message includes the **Bin ID** and a notification indicating that the dustbin is full.
- The sanitation worker identifies the bin using the Bin ID and proceeds to empty it.
- After the garbage is collected, the sensor detects the empty condition.
- The system automatically resets and resumes normal monitoring.
- This process ensures timely

waste collection, prevents garbage overflow, and maintains a clean and hygienic environment.



(FIG-01 BLOCK DIAGRAM

Chapter 5

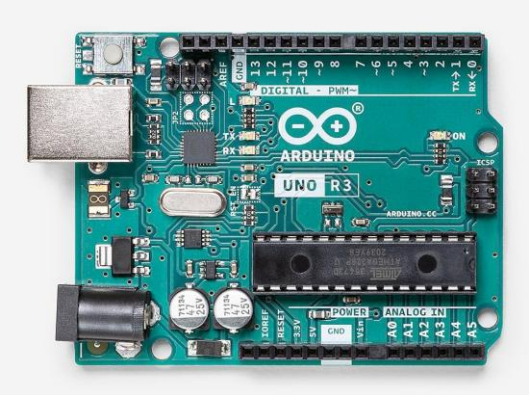
COMPONENTS REQUIRED

➢ Ultrasonic Sensor

(FIG-02 ULTRASONIC SENSOR)

(The HC-SR04 Ultrasonic Distance Sensor is a sensor used for detecting the distance to an object using sonar).

➢ Arduino UNO



(FIG-03 ARDUINO UNO BOARD)

(The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino cc.The board is equipped with sets of digital and analog input/output pins).

➢ Buzzer-

(FIG-04 BUZZER)

(A piezo buzzer is basically a tiny speaker that you can connect directly to an Arduino; from the arduino you can make sounds with a buzzer by using tone).

➢ 9V Battery –

(FIG-05 BATTERY)

The battery is used to provide power supply to the system for its operation.

➢ LED

(FIG-06 LED LIGHT)

(A light-emitting diode is a semiconductor light source that emits light when current flows through it).

➢ LCD

- LCDs (Liquid Crystal Displays) are used for displaying status or parameters in embedded systems.
- LCD 16x2 is a 16 pin devices which has 8 data pins (D0-D7) and 3 control pins (RS, RW, EN). The
- remaining 5 pins are for supply and backlight for the LCD.
- The control pins help us configure the LCD in command mode or data mode. They also help
- configure read mode or write mode and also when To read or write.
- LCD 16x2 can be used in 4-bit mode or 8-bit mode depending on requirement

(FIG-04 12C Display)

Chapter 6

SOFTWARE DISCRIPTION

1. Arduino IDE:

- Arduino IDE is open source software that is mainly used for writing and compiling the code into the Arduino Module.
- It is official Arduino software, making code compilation too easy that even a common person
- with no prior technical knowledge can get their feet wet with the learning process.
- It is easily available for operating systems like MAC, Windows, and Linux and runs on the Java
- Platform that comes with inbuilt functions and commands that play a vital role for debugging,
- editing and compiling the code in the environment.
- This environment supports both C and C++ languages.

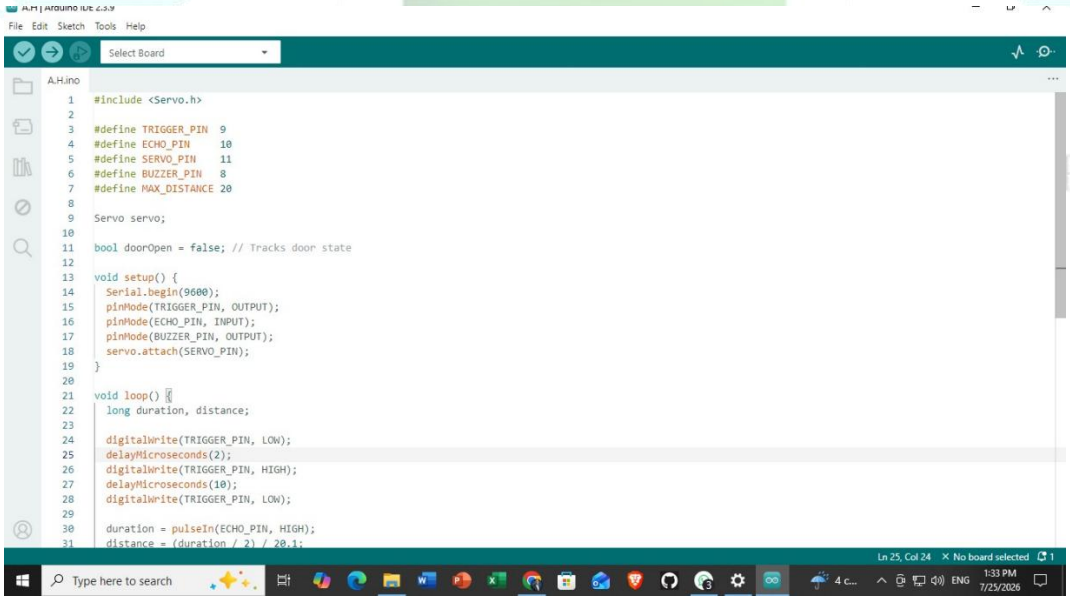
➢ SOURCE CODE


```
#include <Servo.h>

#define TRIGGER_PIN  9
#define ECHO_PIN     10
#define SERVO_PIN    11
#define BUZZER_PIN   8
#define MAX_DISTANCE 20

Servo servo;
```

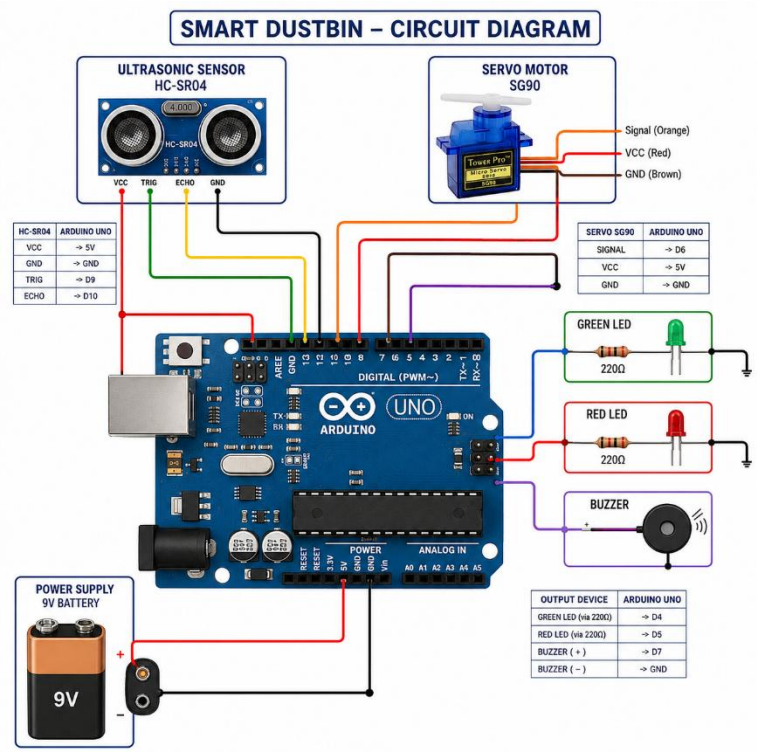
```
bool doorOpen = false; // Tracks door state

void setup() {
  Serial.begin(9600);
  pinMode(TRIGGER_PIN, OUTPUT);
  pinMode(ECHO_PIN, INPUT);
  pinMode(BUZZER_PIN, OUTPUT);
  servo.attach(SERVO_PIN);
}

void loop() {
  long duration, distance;

  digitalWrite(TRIGGER_PIN, LOW);
  delayMicroseconds(2);
  digitalWrite(TRIGGER_PIN, HIGH);
  delayMicroseconds(10);
  digitalWrite(TRIGGER_PIN, LOW);

  duration = pulseIn(ECHO_PIN, HIGH);
  distance = (duration / 2) / 20.1;

  if (distance <= MAX_DISTANCE) {
    // Open door
    servo.write(80);

    if (!doorOpen) {    // Beep only once when opening
      tone(BUZZER_PIN, 1000);
      delay(200);
      noTone(BUZZER_PIN);
      doorOpen = true;
    }

    delay(1000);
```

```
  } else {
    // Close door
    servo.write(0);

    if (doorOpen) {    // Beep only once when closing
      tone(BUZZER_PIN, 500);
      delay(200);
      noTone(BUZZER_PIN);
      doorOpen = false;
    }
  }

  Serial.print("Distance: ");
  Serial.print(distance);
  Serial.println(" cm");

  delay(1000);
}
```

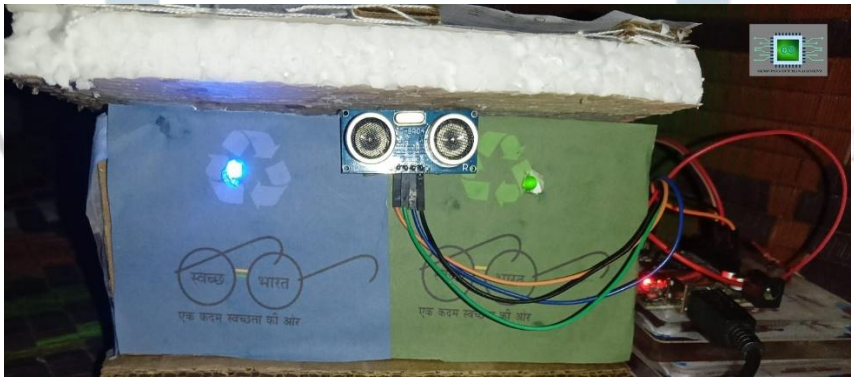
- **Code Snippets-**



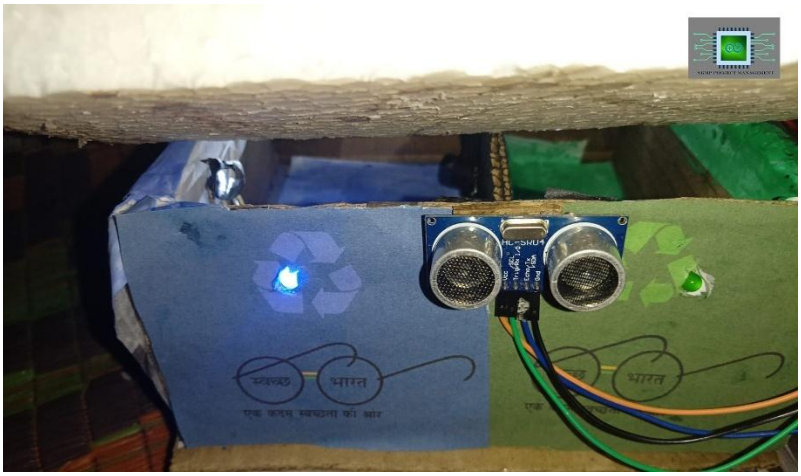
(Fig:-05 CODE SNIPPETS)



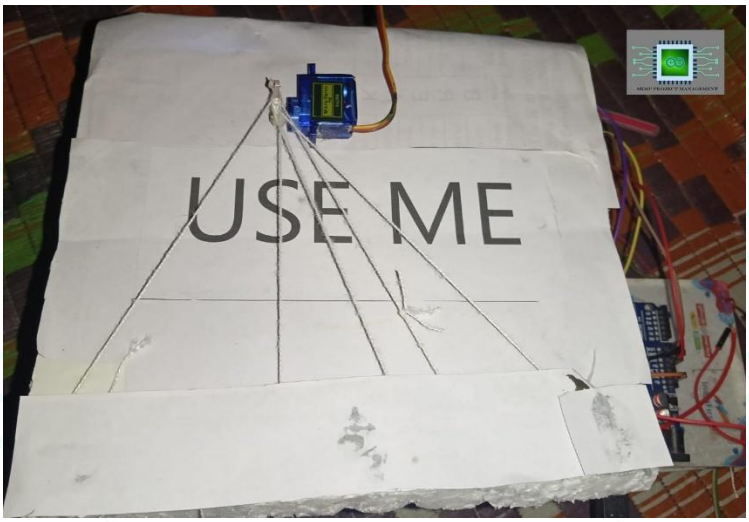
(Fig:-06 Circuit Diagram)



(Fig:- 07 Smart Dustbin.)



(Fig:-08 Hardware Implementation 01)



(Fig:-09 Hardware Implementation 02)

(Fig:- 10 Hardware Implementation 03)

Chapter 7

CONCLUSIONS AND FUTURE SCOPE

➢ FUTURE SCOPE

The Smart Dustbin project can be enhanced with advanced technologies to improve waste management and promote cleaner, smarter cities. Some future improvements include:

1. **IoT Integration** – Connect the dustbin to the internet to monitor its fill level remotely and notify municipal authorities when it is full.
2. **Mobile Application** – Develop an Android/iOS app to display real-time dustbin status, location, and maintenance alerts.
3. **GPS Tracking** – Integrate a GPS module to track the location of smart dustbins and optimize waste collection routes.
4. **AI-Based Waste Segregation** – Use Artificial Intelligence and computer vision to automatically identify and separate biodegradable and non-biodegradable waste.
5. **Solar Power System** – Power the dustbin using solar panels to reduce electricity consumption and support sustainable operation.
6. **Automatic Odor Control** – Add gas sensors and automatic air fresheners to detect and reduce unpleasant odors.
7. **Voice Assistance** – Incorporate voice guidance to assist users, especially children and visually impaired individuals.
8. **Cloud Data Storage and Analytics** – Store waste

collection data on the cloud to analyze usage patterns and improve waste management strategies.

9. **Smart Compaction Mechanism** – Install an automatic waste compactor to increase the dustbin's storage capacity and reduce collection frequency.
10. **Integration with Smart City Systems** – Connect the smart dustbin with municipal smart city infrastructure for centralized monitoring and efficient waste management.

➢ CONCLUSIONS

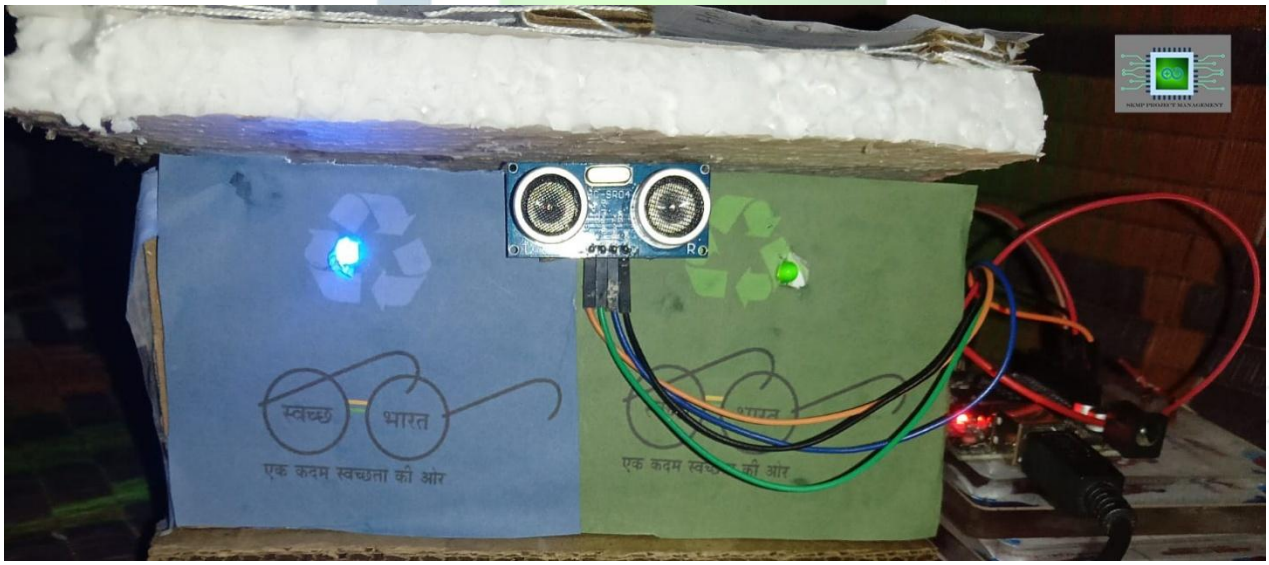
When designing these intelligent waste containers, consideration is given to a wide range of aspects, including longevity, cost-effectiveness, resistance to damage, and ease of upkeep and repair. When it comes to creating a smart city, this smart dustbin has the potential to make significant contributions toward maintaining a clean and sanitary environment. However, since this technology is relatively new in India, sufficient education and awareness need first be provided to the general population before it can be used on a widespread basis. In such case, delicate electronics such as sensors run the risk of being harmed as a result of the physical actions of the users

PROJECT LINK

Website lnk:- https://skmp-project-management.vercel.app/

Google Drive Link:- https://drive.google.com/drive/folders/1p8xpfANrqWeyPn-OYv9KE-Qf4833JZyp?usp=sharing

Video Link:- https://youtu.be/I3J4u5-NZBs



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SKMP PROJECT MANAGEMENT

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DEPARTMENT OF IOT