TOPIC

# SMART DUSTBIN USING ARDUINO:


SUBMITTED BY:

Tamanna chandel (23MCI10163)

SUBMITTED TO:

Dr. kavita jingal

## INTRODUCTION:

The rate increasing population in our country has increasing rapidly and also we have increase in garbage which have increased environmental issue. Dustbin is a container which collects garbage's or stores items which recyclable or non-recyclable, decompose and non-decompose. They are usually used in homes, office etc., but in case they are full no one is there to clean it and the garbage are spilled out. The surrounding of a dustbin is also conducive for increasing the pollution level. Air pollution due to a dustbin can produce bacteria and virus which can produce life harmful diseases for human. Therefore, we have designed a smart dustbin using ARDUINO UNO, ultrasonic sensor which will sense the item to be thrown in the dustbin and open the lid with the help of the motor. It is an IOT based project that will bring a new and smart way of cleanliness. It is a decent gadget to make your home clean, due to practically all offspring of home consistently make it grimy and spread litter to a great extent by electronics, rappers and various other things. Since the smart dustbin is additionally intriguing and children make fun with it so it will help to maintain cleanliness in home. It will be applied for various type of waste. Dustbin will open its lid when someone/object is near at some range then it will wait for given time period than it will close automatically. Here lid will close when you don't want to use and it will only open when it required. As cities grow larger and more populated, the amount of waste we produce increases.

## COMPONENTS USED:

1. ARDUINO UNO

Arduino Uno is a microcontroller board based on the ATmega328P.It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to- DC adapter or battery to get started.

2. ULTRASONIC SENSOR'


An ultrasonic sensor is a device that converts electrical energy into sound waves that we can't hear, usually above 20 kHz. It tracks how long it takes for those sound waves to strike an object and then bounce back to the sensor. This "echo" helps the sensor determine how far away something is with pretty good precision. The operation is not affected by sunlight or black material, although acoustically, soft materials like cloth can be difficult to detect. It comes complete with ultrasonic transmitter and receiver module.

3. SERVO MOTOR

A Servo Motor is a small device that has an output shaft. This shaft can be positioned to specific angular positions by sending the servo a coded signal. As long as the coded signal exists on the input line, the servo will maintain the angular position of the shaft. If the coded signal changes, the angular position of the shaft changes. In practice, servos are used in radio-controlled airplanes to position control surfaces like the elevators and rudders. They are also used in radio-controlled cars, puppets, and of course. Servos are extremely useful in robotics.

4. BATTERY

A battery can be defined as an electrochemical device (consisting of one or more electrochemical cells) which can be charged with an electric current and discharged whenever required. Batteries are usually devices that are made up of multiple electrochemical cell that are connected to external inputs and outputs. Batteries are widely employed in order to power small electric devices such as mobile phones, remotes, and flashlights.

5. JUMPER WIRE

A jumper is a tiny metal connector that is used to close or open part of an electrical circuit. It may be used as an alternative to a dual in- line package (DIP) switch. A jumper has two or more connecting points, which regulate an electrical circuit board.

6. DUSTBIN

## ADVANTAGES

The implementation of a Smart Dustbin utilizing Arduino technology presents numerous benefits that enhance waste management systems and contribute to cleaner, more efficient urban environments. Below are some key advantages:

A reduction in the number of waste collections needed by up to 80%, resulting in less manpower, emissions, fuel use and traffic congestion.

A reduction in the number of waste bins needed.

Maintain environment hygiene (i.e. No overflowing of waste and less unpleasant odor).

It will help in bringing evolution by technology in term of cleanliness.

## Steps

Step 1: Connecting the Ultrasonic Sensor (HC-SR04)

1. Connect the VCC pin of the HC-SR04 sensor to the 5V pin on the Arduino.
2. Connect the GND pin to the Arduino's ground.
3. Connect the Trig pin to digital pin 5 on the Arduino.
4. Connect the Echo pin to digital pin 6 on the Arduino.

Step 2: Setting Up the Servo Motor for Lid Control:

1. Connect the servo motor’s VCC (red wire) to the Arduino’s 5V pin.
2. Connect the GND (black wire) to the Arduino's ground.
3. Connect the servo signal wire (usually orange or yellow) to digital pin 9 on the Arduino.

Step 3: Writing the Code:

In the code, the ultrasonic sensor measures distance, and if the distance is within a specified range (e.g., 20 cm or less), the servo motor rotates to open the dustbin lid. The lid will close after a short delay of 3.5 seconds.

Step 4: Testing the Setup:

Place the dustbin setup in front of you, ensuring the ultrasonic sensor points outward.

Move your hand or an object close to the sensor (within 20 cm) to see the lid open.

After a delay, the lid should automatically close.

Troubleshooting Tips:

Ensure the servo motor and ultrasonic sensor are correctly wired to avoid inaccurate readings.

If the lid does not open smoothly, adjust the servo angle in the code for an optimal opening range.

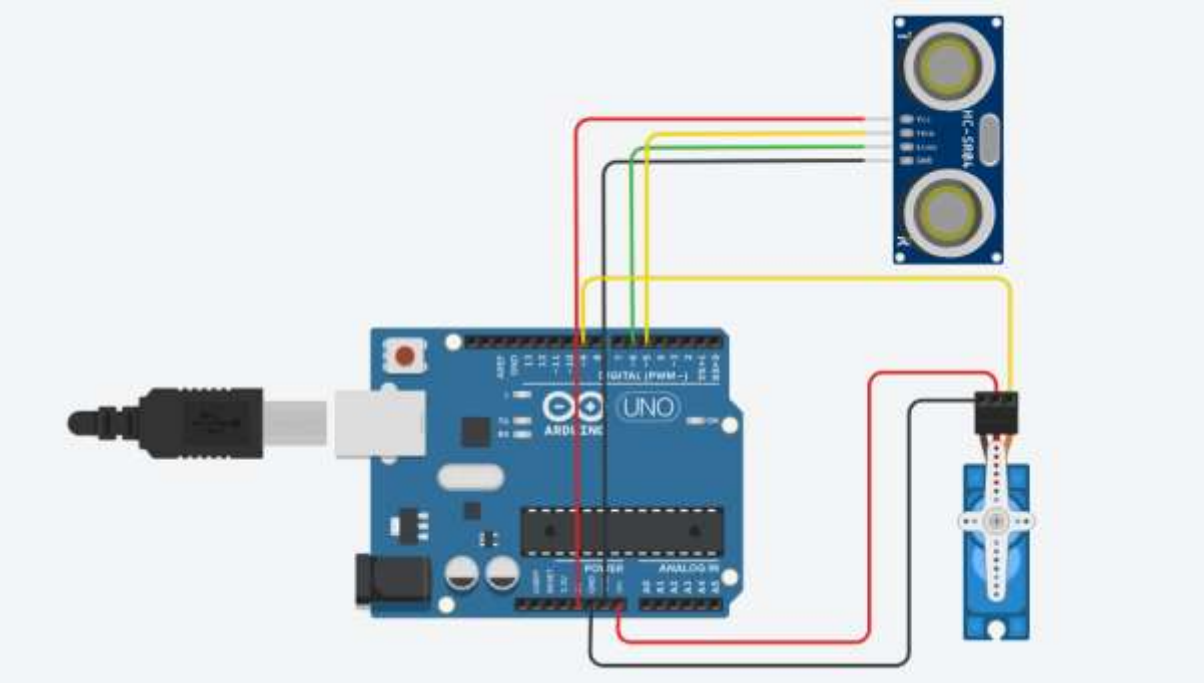
```
/*
 * Project Name: Smart Dustbin with Ultrasonic Sensor and Servo
 *
 * Project Description:
 * Build a smart dustbin that opens automatically using an ultrasonic sensor and an Arduino UNO.
 * The dustbin lid opens when an object is detected within 20 cm and closes after 3.5 seconds.
 *
 * License: GPL3+
 * This project is licensed under the GNU General Public License v3.0 or later.
 * You are free to use, modify, and distribute this software under the terms
 * of the GPL, as long as you preserve the original license and credit the original
 * author. For more details, see <https://www.gnu.org/licenses/gpl-3.0.en.html>.
 *
 *
 * Copyright (C) 2024  Ameya Angadi
 *
 *
 * Code Created By: Ameya Angadi
 * Last Modified On: December 5, 2024
 * Version: 1.1
 *
 */



#include <Servo.h>  // Includes the Servo library


Servo servo;
int trig = 5;       // Pin for triggering the ultrasonic sensor
int echo = 6;       // Pin for receiving the echo signal
int servoPin = 9;   // Pin to control the servo motor
```

```
long Duration, Distance, Average;
long aver[3];       // Array to store distance readings for averaging

void setup() {
  Serial.begin(9600);
  servo.attach(servoPin);
  pinMode(trig, OUTPUT);
  pinMode(echo, INPUT);
  servo.write(0);           // Initializes with the lid closed
  delay(100);
  servo.detach();           // Detaches servo to save power and avoid jitter
}

void measure() {
  digitalWrite(trig, LOW);
  delayMicroseconds(5);
  digitalWrite(trig, HIGH);
  delayMicroseconds(15);
  digitalWrite(trig, LOW);
  Duration = pulseIn(echo, HIGH);  // Measures the time taken by the echo
  Distance = (Duration / 2) / 29.1; // Converts time to distance in centimeters
}

void loop() {
  for (int i = 0; i <= 2; i++) {
    measure();
    aver[i] = Distance;         // Store each reading for averaging
    delay(10);
  }

  Distance = (aver[0] + aver[1] + aver[2]) / 3; // Calculate average distance

  if (Distance <= 20) {       // Opens the lid if an object is detected within 20 cm
```

```
  servo.attach(servoPin);
  servo.write(0);          // Opens the lid
```

```
  delay(3500);             // Keeps the lid open for 3.5 seconds
  servo.write(180);        // Closes the lid
  delay(1500);
  servo.detach();          // Detach to save power
```

CIRCUIT DAIGRAM



# CONCLUSION

The development of Smart Dustbins using Arduino technology represents a significant advancement in urban waste management. By integrating sensors, communication systems, and automation, these innovative bins offer a proactive solution to the challenges posed by increasing waste generation in urban environments.

Through real-time monitoring and data collection, Smart Dustbins enhance the efficiency of waste collection processes, enabling municipalities to optimize their routes and schedules. This not only reduces operational costs but also minimizes environmental impact by cutting down on unnecessary fuel consumption. The automatic lid mechanism improves hygiene, making waste disposal more convenient and sanitary for users.

Moreover, the potential for future enhancements, such as the integration of advanced sensors, AI capabilities, and user engagement through mobile applications, opens up exciting possibilities for improving waste management practices further. The ability to analyze data collected from Smart Dustbins can provide valuable insights into waste generation patterns, helping communities develop targeted strategies for recycling and waste reduction.

As cities continue to evolve into smarter, more sustainable environments, the implementation of Smart Dustbins will play a crucial role in promoting cleaner public spaces and fostering community responsibility. By investing in this technology, municipalities can not only enhance the efficiency of their waste management systems but also contribute to broader environmental goals, ultimately leading to healthier and more sustainable urban living.

In summary, Smart Dustbins utilizing Arduino technology present a promising solution to modern waste management challenges. Their advantages in efficiency, hygiene, sustainability, and community engagement make them a vital component of the future urban landscape.