



**Smart Dustbin Using  
ARDUINO UNO**

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## **Abstract**

The main objective of the project is to design a smart dustbin which will help in keeping our environment clean and also eco friendly. We are inspired from Swaach Bharat Mission. Nowadays technologies are getting smarter day-by-day so, as to clean the environment we are designing a smart dustbin by using Arduino. This smart dustbin management system is built on the microcontroller based system having ultrasonic sensors on the dustbin. If dustbin is not maintained than these can cause an unhealthy environment and can cause pollute that affect our health. In this proposed technology we have designed a smart dustbin using ARDUINO UNO, along with ultrasonic sensor, servo motor, and battery jumper wire.

After all hardware and software connection, now Smart Dustbin program will be run. Dustbin lid will when someone comes near at some range than wait for user to put garbage and close it. It's properly running or not. For social it will help toward health and hygiene, for business for we try to make it affordable to many as many possible. So that normal people to rich people can take benefit from it.

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**Keywords:**

arduino, microcontroller, IOT, circuitry.

## **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. 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.

## **Background:**

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. 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.

## **Problem Definition:**

Prepare 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.

## **METHODOLOGY:**

SMART DUSTBIN USING ARDUINO is an IOT based project. Here we are using arduino for code execution, for sensing we used ultrasonic sensor which will open lid and wait for few moment. It will bring drastic changes in term of cleanliness with the help of technology. Everything is getting with smart technology for the betterment of human being. So this help in maintaining the environment clean with the help of technology. It is a sensor based dustbin so it would be easy to access/use for any age group.

Our aim is also to make it cost effective so that many numbers of people can get the benefit from this. And it should be usable to anyone and helpful for them.

To complete our project, we require some software as well as some hardware.

### **Software Requirements:**

- 1). ARDUINO IDE

### **Hardware Requirements:**

- 1). ARDUINO UNO
- 2). ULTRASONIC SENSOR

- 3). SERVO MOTOR
- 4). 9V BATTERY
- 5). DUSTBIN
- 6). JUMP WIRES



**1). Arduino Uno R3**

## **PROCEDURE:**

### **Servo Motor Connection Setup:**

Now, let me take you through the actual setup and build process of the Smart Dustbin using Arduino. First, I will start with the mechanism to open the lid. As you might have already guessed, I have used a Servo Motor for this purpose. In order to open the lid, I have fixed a small plastic tube (like an empty refill of a ball-point pen) to the servo horn (a single ended horn) using instant glue. For this mechanism to be able to open the lid of the dustbin, it must be placed near the lid. In this the actual setup of dustbin design and build the system by using Arduino. Starting with the mechanism of opening the lid of dustbin, for this purpose Servo motor has been used. To open the lid, I have attached a small plastic tube (like an empty refill of a ball-point pen) to the servo horn (a single ended horn) using instant glue.



**2). Micro Servo Motor 9G**

### **Ultrasonic Sensor Connecting:**

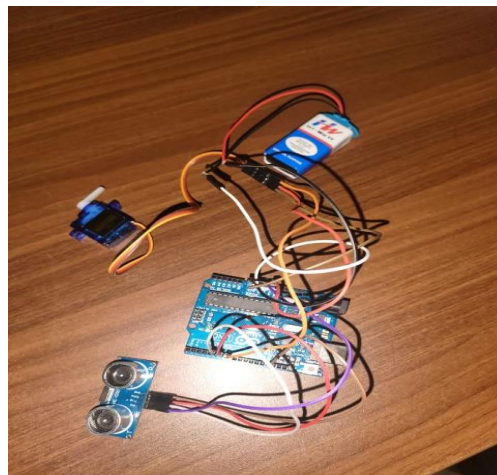
After successfully servo motor is placed now it's time for sensor, so HC-SR04 Ultrasonic sensor is placed at the front of the dustbin.



**3). Ultrasonic Sensor module HC-SR04**

### **Wiring Up The Components:**

The final step in the build process is to make the necessary connections using long connecting wires as per the circuit diagram and securing these wires so that they don't hang around. All the wires from both the components i.e. Ultrasonic Sensor and Servo Motor are connected to respective pins of Arduino. This finishes up the build process of the Smart Dustbin. In Arduino Code has been submitted, and with all hardware and software connection in Dustbin. We will run our dustbin, wait its working or not.



**4). Hardware Setup**

### **Circuit Diagram:**

The circuit diagram of smart dustbin is shown in given below. Arduino Uno board consist ATmega328 P microcontroller, it is important component of UNO board. In this other components are present like a power supply, ultrasonic module and servo motor etc.

The ultrasonic sensor echo pin and trigger pin is connected to pin digital pin D7 and D8. The +Vcc pin is connected to +5V supply and GND pin is connected to ground pin of arduino Uno board. The control (PWM) pin of servo motor is connected to digital pin D9 of arduino. Hence, servo motor is used to open the cap of dustbin.

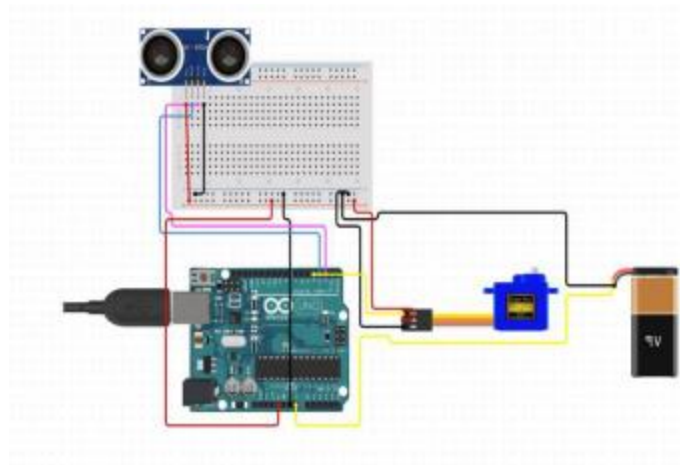
For this project and components used, the preset level of distance between dustbin and hand is fixed to 40 cm.

**Ultrasonic Sensor:** This sensor is used in to locate the distance between the smart dustbin and hand/object come near to it. The principle behind finding distance of obstacle is sonar wave. It only detects obstacle when Trigger pin receive high pulse for the period more than 10 us. When this sensor verifies the presence of hand (obstacle) it starts to send eight cycles of ultrasonic burst at 40 KHz and then it waits for reflected ultrasonic signal.

Ultrasonic sensor module has two drums. One of the drums is used for transmitting the pulse of ultrasonic and the second drums are for receiving the ultrasonic signal.

When ultrasonic detect/sense object, the echo pin of module is set high. Waiting period of reflected pulse is completely dependent upon the location of obstacle. When the echo signal is obtained, we can calculate the distance by using the formula

$$\text{Distance (in cm)} = (\text{duration}/2) / 29.1$$



**5).Circuit Diagram**

Initially, the cap of dustbin is switched back to zero-degree position (Close) by the servo motor. The controller keeps on monitoring the signal receive from ultrasonic module. When ultrasonic module detects an obstacle, the controller check if it crosses a threshold distance value set for open the cap of dustbin.

As soon as that happens, the controller triggers the servo motor when then open the cap for limited line (as set in code part). For this system prototype set time is given for 2 second.

Here in this project also used an ON/OFF switch, in order to activate and de-activated the smart dustbin whenever require as per situation. A pull-up resistor of 10K is connected in series of switch as shown in circuit diagram in order to solve the de-bouncing problem.

We can also use Arduino NANO instead of Arduinouno. Do not have to change source code because the board use identical pin for controlling servo motor, switch and ultrasonic sensor.

The simplest part of the project smart dustbin using arduino is software part because it is clean, simple and easy to understand. The program check the distance had also used “Servo.h” inbuilt library function for servo operation. It can assume any value of motor rotation using “myServo.write(angle)” function but here we had only use two state of position zero degree and 180°.

## **Result:**

After wiring and attaching all the devices and setting up to the Smart Dustbin, now observe all the important setup whether they are well connected or something missed.

After connection set up now next step is to submit/upload code in Arduino and supply power to the circuit.

When system is powered ON, Arduino keeps monitoring for any things that come near the sensor at give range.

When Ultrasonic sensor detect any object for example like hand or others, here Arduino calculates its distance and if it less than a certain predefines value than servo motor get activate first and with the support of the extended arm of the lid.

Lid will open for a given time than it will automatically close.

## **Advantages:**

Following are the advantages of using Smart dustbin:

- 1). A reduction in the number of waste collections needed by up to 80%, resulting in less manpower, emissions, fuel use and traffic congestion.
- 2). A reduction in the number of waste bins needed.
- 3). Maintain environment hygiene (i.e. no overflowing of waste and less unpleasant odor).
- 4). It will help in bringing evolution by technology in term of cleanliness.





#### **6). Complete Prototype**

#### **Conclusion:**

Here we are going to make an evolution changes toward cleanliness. The combination of intelligent waste monitoring and trash compaction technologies, smart dustbins are better and shoulders above traditional garbage dustbin. It is equipped with smart devices like sensor Arduinoetc.Lid of the dustbin will automatically open when an object comes near to the dustbin and after certain time period it will close the lid.

For social it will help toward health and hygiene, for business for we try to make it affordable to many as many possible. So that normal people to rich people can take benefit from it. Believe this will bring something changes in term of cleanliness as well technology.So our next work will be adding one more sensor which will sense whether our dustbin is full or not. And there will be a display will be added so that user can notify that dustbin is full or not.

## References:

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- 2). Reddy PS, Naik RN, Kumar AA, Kishor SN. Wireless dust bin monitoring and alert system using Arduino. In2017 Second International Conference on Electrical, Computer and Communication Technologies (ICECCT) 2017 Feb 22 (pp. 1-5). IEEE.
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## Appendix:

```
#include <Servo.h> //servo library
```

```
Servo servo;
```

```
int trigPin = 5;
```

```
int echoPin = 6;
```

```
int servoPin = 7;
```

```
int led= 10;
```

```
long duration, dist, average;
```

```
long aver[3]; //array for average
```

```
void setup() {
```

```
    Serial.begin(9600);
```

```
    servo.attach(servoPin);
```

```
    pinMode(trigPin, OUTPUT);
```

```
    pinMode(echoPin, INPUT);
```

```

servo.write(0);      //close cap on power on
delay(100);
servo.detach();
}

void measure() {
  digitalWrite(10,HIGH);
  digitalWrite(trigPin, LOW);
  delayMicroseconds(5);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(15);
  digitalWrite(trigPin, LOW);
  pinMode(echoPin, INPUT);
  duration = pulseIn(echoPin, HIGH);
  dist = (duration/2) / 29.1;  //obtain distance
}

void loop() {
  for (int i=0;i<=2;i++) {  //average distance
    measure();
    aver[i]=dist;
    delay(10);              //delay between measurements
  }
  dist=(aver[0]+aver[1]+aver[2])/3;

  if ( dist<50 ) {

```

```
//Change distance as per your need  
servo.attach(servoPin);  
  delay(1);  
servo.write(0);  
delay(3000);  
servo.write(150);  
delay(1000);  
servo.detach();  
}  
Serial.print(dist);  
}
```

### **Future Scope:**

- 1). These type of devices are more useful in public places like malls, Institutions, Companies, etc.  
To maintain hygienic Environment.
- 2). These can be located at any place easily (not restricted to a particular position).
- 3). Apart of ultrasonic sensor we can even also add object detection sensors so that when an object is detected nearby lid of dustbin will be opened (but there is a drawback in using this sensor).