



# Smart Dustbin with Arduino

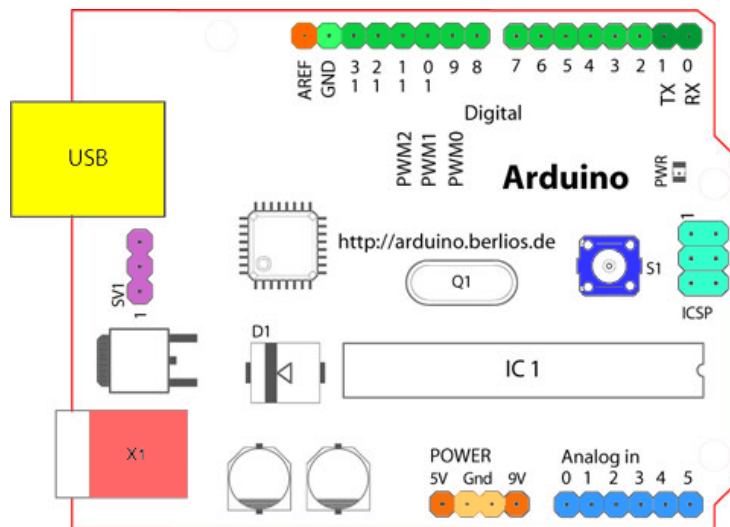
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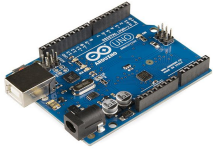


## Introduction




In this project, I have made a smart dustbin that automatically detects when a user holds garbage in front of it and opens and closes the lid automatically.

As a reference, this is the representation of a general arduino uno board:



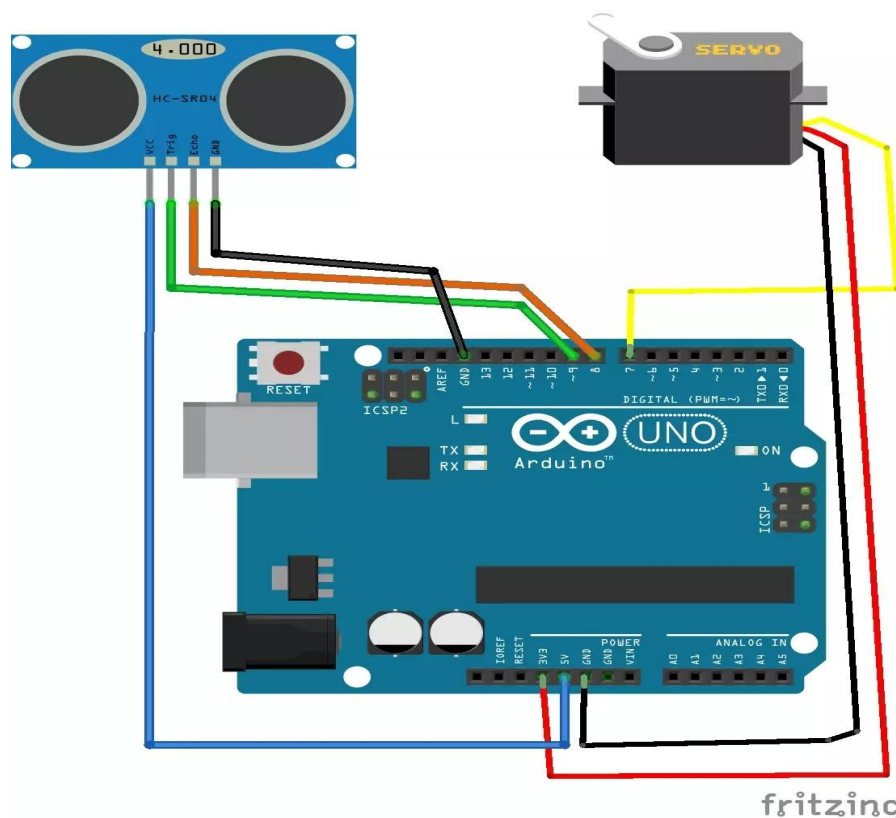
## Components

Name	Use	Image
Arduino Uno (Microcontroller Unit)	To program the electric parts to implement required behaviour	
HC SR04 (Ultrasonic sensor)	To detect the distance of the user from the dustbin	
SG 90 (Servo motor)	To open the dustbin lid and close it	

Jumper Wires	To form connections	
Cardboard	To make the dustbin lid	
Bucket	To use as body of the dustbin	

Apart from the above I have also used Fevi-qwik and tape to attach and glue components as required.

## Circuit Diagram



Credit : (<https://myelectricspark.com/2020/05/smart-dustbin-using-arduino.html>)

## Working

The HC-SR04 ultrasonic sensors detect the distance of the nearest object in front of it every 0.5 seconds. The arduino is programmed such that whenever the distance is less than 15cm it causes the servo motor arm to rotate by 150 degrees which is connected to the lid of the dustbin. Thus the dustbin gets opened and stays open for 3 seconds. Then servo motor rotates to close the lid and the smart dustbin comes back to its initial state.

## Experimental Set-Up

- 1) Connect the Vcc, Trig, Echo and Gnd pin of the HC SR04 to the Power 5V pin , Digital 5 pin, Digital 6 pin and Digital GND pin respectively.
- 2) Connect the Signal (orange wire) ,Vcc (red wire), Gnd pin (brown wire) of the SG 90 to the Digital 7 pin, Power 3.3V pin and Power Gnd pin respectively.
- 3) Connect the arduino USB cable to the USB port on the board.

## Use Cases

Public dustbins are often dirty. This is why people might not prefer to touch it while using. Also if the dustbins don't have lids then the odour will come out from them. This creates a need for mechanisms to open and close dustbins automatically. The prototype described in this project serves this purpose.

## Experiments

After trial and error I fixed the following parameters as convenient.

Parameter	Value
Threshold distance for object detection	15 cm
Time for which lid stays open	3 seconds
Time for which lid stays closed after use	1 second
Delay between loop() executions	0.5 second

## Simulation Data

This has been taken from the serial communication monitor. It is used to display the distance of the nearest object in front of the sensor. Also the message "Object!" is displayed whenever an object is detected within 15cm from the sensor.

```

37
37
37
37
16
40
object!
10
23
19
1201
255
20
1201
24
object!
3
262
1201
object!
6
38
39
39
37

```

## Arduino Code

The source for the code is :

<https://drive.google.com/drive/folders/1xb4cyyzlHGZZU1tExqBZXpE0gnLfE72N>

However to suit my needs I had to make the following changes :

- 1) Reduce the overall computations per loop to improve the responsiveness of the item.
- 2) Adjust the threshold distance and time parameters to suit my small dustbin.
- 3) Modify the serial communication to display a message whenever an object is detected.

Here is my version of the code :

```

#include <Servo.h> //servo library
Servo servo;
int trigPin = 5;
int echoPin = 6;
int servoPin = 7;
int led= 10;
long duration,dist,average;

void setup()
{

```

```
    Serial.begin(9600);
    servo.attach(servoPin);
    pinMode(trigPin, OUTPUT);
    pinMode(echoPin, INPUT);
    servo.write(0);
    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; //formula to get distance in cm knowing the time between
    //sending out and receiving ultrasonic signals
}

void loop()
{
    measure();
    if ( dist<15 ) //if any object is closer than 15cm then it is detected as object
    {
        Serial.println("object!");
        servo.attach(servoPin);
        delay(1);
        servo.write(0); //this opens the lid
        delay(3000); //keeps the lid open for 3 seconds
        servo.write(150); //closes the lid
        delay(1000);
        servo.detach();
    }
    Serial.println(dist);
    delay(500);
}
```

## Conclusion

The prototype was successfully built and its behaviour is as expected.

## Reference

- 1) <https://www.arduino.cc/en/reference/board>
- 2) <https://drive.google.com/drive/folders/1xb4cyyzlHGZZU1tExqBZXpE0gnLfE72N>
- 3) <https://myelectricsparks.com/2020/05/smart-dustbin-using-arduino.html>