

Program No:	14
Roll No :	1554
Title of Program :	Smart dustbin with ultrasonic sensor and servo motor
Objective :	The code controls a servo motor based on distance measurements from an ultrasonic sensor, where the servo moves to 90 degrees if the distance is less than 30 cm, otherwise moves to 0 degrees.

Theory: -

How Ultrasonic Sensors Work

Ultrasonic sensing is one of the best ways to sense proximity and detect levels with high reliability. Our technical support often receives emails about how our sensors work and what environments our sensors can (or cannot) function in.

This guide was created as an introduction to ultrasonic sensing, its principles, and how ultrasonic sensors work in your applications.

What is an Ultrasonic Sensor?

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. It operates by sending and receiving ultrasonic pulses using a transducer. These pulses relay back information about the object's proximity.

High-frequency sound waves reflect across boundaries and produce distinct echo patterns. These reflections are then analyzed to determine the distance to the object. This process allows ultrasonic sensors to provide accurate proximity readings in various applications, such as object detection, level measurement, and distance gauging.

Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The sensor's **transducer** acts as both a microphone and a speaker, allowing it to send and receive ultrasonic sound waves.

Many ultrasonic sensors, including ours, use a single transducer to both emit a pulse and receive the returning echo. The sensor determines the distance to a target by measuring the time lapse between the sending and receiving of the ultrasonic pulse. This time delay, also known as the **time-of-flight**, is a key aspect of how ultrasonic sensors work.



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What is an Ultrasonic Sensor?

An **ultrasonic sensor** is an instrument that measures the distance to an object using ultrasonic sound waves. It works by using a **transducer** to send and receive ultrasonic pulses, which relay back information about an object's proximity.

High-frequency sound waves reflect across boundaries and produce distinct **echo patterns**. The sensor analyzes these echoes to determine the distance to the object, providing accurate proximity measurements.

Source Codes:

```
#include <Servo.h>
```

```
Servo servoMain; // Define our servo
```

```
int trigpin = 10;  
int echopin = 11;  
int distance;  
float duration;  
float cm;
```

```
void setup() {  
  servoMain.attach(9); // servo on digital pin 9  
  pinMode(trigpin, OUTPUT);  
  pinMode(echopin, INPUT);  
}
```

```
void loop() {  
  digitalWrite(trigpin, LOW);  
  delay(2); // Wait for 2ms  
  digitalWrite(trigpin, HIGH);  
  delayMicroseconds(10); // Send a 10us pulse  
  digitalWrite(trigpin, LOW);
```

```
  duration = pulseIn(echopin, HIGH); // Measure the duration of the pulse  
  cm = (duration / 56.82); // Convert duration to distance in cm
```

```
distance = cm; // Store distance
```

```
if (distance < 30) { // If distance is less than 30 cm  
  servoMain.write(90); // Move servo to 90 degrees  
  delay(1000); // Wait for 1 second  
} else {  
  servoMain.write(0); // Move servo to 0 degrees  
  delay(50); // Short delay before next measurement  
}  
}
```

OutPut:





