

Automatic Door Opening System Using an Ultrasonic Sensor

An **Automatic Door Opening System Using an Ultrasonic Sensor** detects a person approaching the door and opens it automatically using a motor or servo. It is a common electronics and embedded systems project.

Components Required

- Ultrasonic sensor (e.g., HC-SR04)
- Arduino Uno (or another compatible microcontroller)
- Servo motor (e.g., SG90 or MG996R) or DC motor with motor driver
- Jumper wires
- Breadboard
- 5 V power supply

Working Principle

1. The ultrasonic sensor continuously measures the distance to objects in front of the door.
2. When a person comes within a preset distance (for example, 20 cm), the Arduino detects the change.
3. The Arduino sends a signal to the servo motor.
4. The servo rotates to open the door.
5. After a short delay, if no object is detected, the servo returns to its original position, closing the door.

Ultrasonic Sensor (HC-SR04)

- VCC → 5V
- GND → GND
- TRIG → Arduino Pin 9
- ECHO → Arduino Pin 10

Servo Motor

- VCC → 5V
- GND → GND
- Signal → Arduino Pin 6

Arduino Code

```
#include <Servo.h>

Servo door;

const int trigPin = 9;
const int echoPin = 10;

long duration;
```

```

int distance;

void setup() {
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);

  door.attach(6);
  door.write(0);    // Door closed

  Serial.begin(9600);
}

void loop() {
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);

  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

  duration = pulseIn(echoPin, HIGH);
  distance = duration * 0.034 / 2;

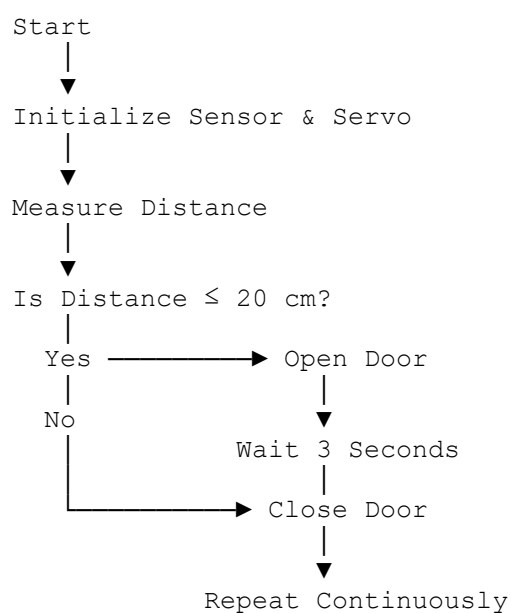
  Serial.print("Distance: ");
  Serial.println(distance);

  if (distance > 0 && distance <= 20) {
    door.write(90);    // Open door
    delay(3000);      // Keep open for 3 seconds
  } else {
    door.write(0);    // Close door
  }

  delay(200);
}

```

Flowchart



Applications

- Shopping malls
- Hospitals
- Hotels
- Offices
- Smart homes
- Industrial entrances

Advantages

- Contactless operation
- Improves hygiene
- Saves energy by opening only when needed
- Easy to build and inexpensive
- Suitable for smart automation projects

Disadvantages

- Limited sensing range
- Performance can be affected by obstacles or environmental conditions
- Requires a reliable power supply
- May trigger unintentionally if objects pass within the detection zone

This project is suitable for engineering diploma and undergraduate students as a basic embedded systems or IoT automation project.