



# Alarm System Using Arduino

Project Report

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## Abstract

Currently the use of IoT devices has grown in number and in popularity. People are using IoT devices by adding a touch of automation in their lives. The internet of things (IoT) helps people live and work smarter, as well as gain complete control over their lives. In addition to offering smart devices to automate homes an automated alarm system is an IoT device that keeps our homes safe and secure.

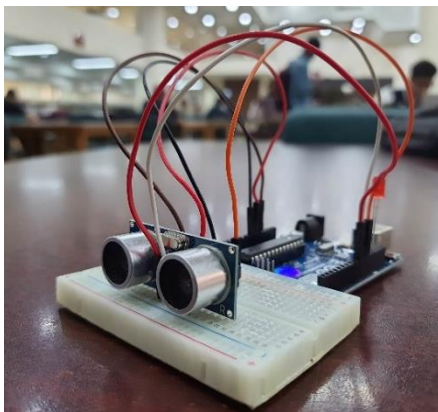
As the need for home security alarm systems nowadays is a serious demand as the number of crimes are increasing every day, there must be something that will keep us safe. We are all aware of the high-end security systems present in the market, but they are not easily available to everyone. We therefore intend to provide a solution by constructing a cost-efficient electronic system that has the capability of sensing the motion of the intruders and turn on the alarm. The project involves the use of Arduino, ultrasonic sensor, buzzer, led light and a simple program. The sensor detects any motion in its permissible range and triggers the alarm. With this system we can easily set up a security alarm in our home for unwanted intruders.

## Introduction

Smart Retail, Smart Banking, Smart Agriculture, Smart Home, Smart City - wherever there's a "Smart", you'll find IoT applications. Use of IoT is also exploding in the consumer sector. Smart TVs, smart watches, cars and trucks, heating and cooling systems and security systems are examples of IoT-enabled products.

Arduino is also in the family of IoT devices. Arduino IoT Cloud is an application that helps makers build connected objects in a quick, easy and secure way. It's cheap, easy to program and easy to use. With Arduino boards we can control the home activities with the control systems such as motion sensors, outlet control, temperature sensors, blower control etc.

Our main goal was to create an alarm system using Arduino which is very easy to build, and it can also be used in our home or in our room. This system helps us to protect our house from thieves. In this project we are going to use an Arduino, Ultrasonic Sensor and some other components. This Project can either powered with 9V Battery or with U.S.B of your computer. This is a basic motion-sensing alarm that detects when someone enters the area. When an intruder is detected, it activates a buzzer.



The alarm system is small compared to the ones used in industries and those which are used in homes too as it is just a prototype. The ultrasonic sensor we use is HC-SR04 and the controlling modules is Arduino UNO board.

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## Arduino UNO

Arduino is the physical programmable board. It is a computer hardware and software tool that designs and



manufactures microcontroller kits & modules for building digital devices, control systems and interactive objects that can sense and control objects in the physical world. Arduino hardware components are cheaper in relation with other controller architecture and programming language is easy.

It contains everything that is needed for a microcontroller; to simply connect to a computer with a USB cable or to power it with a AC-to-DC converter adapter or battery to get started.

## Ultrasonic sensor (HC-SR04)

The HC-SR04 sensor module is an ultrasonic sensor module. The module is a distance calculating



module. That same property is made it suitable to use it as detection sensor like PIR or motion sensor. The module has one transmitter and one receiver which transmit ultrasonic wave pulses and receives the reflected wave as the receiver receive the wave it shows that there is something in front of it because of the reflectivity of ultrasonic wave or echolocation.

## Materials and Circuit Diagram

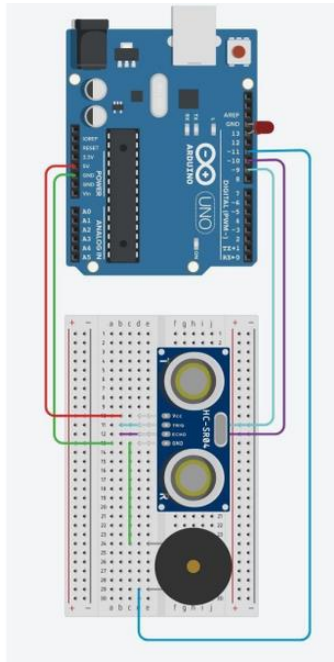
The components needed to build the system:

1. Arduino Uno
2. Ultrasonic Sensor HC-SR04

3. Buzzer
4. Red led
5. Breadboard
6. Jumper Wire

### Procedure

As this system is a basic motion activated alarm. It is built around an Arduino Microcontroller. It is connected to an ultrasonic motion sensor, a buzzer and a red led light. The whole system is battery powered so that it is easily portable. Once we have the code, we can connect all the external parts. The easiest way to do this is with a breadboard. This will make temporary connections to test everything out.



**Hardware Part-** Firstly, the Ultrasonic sensor and buzzer is placed on the breadboard. Vcc (5v) and GND (ground) is connected from the Arduino to the ultrasonic sensor. TRIG is the pin used to send a sonar signal, put this on pin 9 and ECHO is used to read the signal back and therefore calculate the distance which is put on pin 10. In the same way one pin of the buzzer is connected to GND and other is connected to pin 11 so that it can be turned when an intruder crosses a certain distance which is set to the Arduino. Lastly, the red led is placed directly in the Arduino board in pin 13 and GND, which is shown in the circuit diagram above. Now the necessary code needs to be uploaded to the board for it to work properly, which is also given below.

**Software Part-** Connect Your Arduino to your computer using USB Cable and then open Arduino IDE, we need to choose the correct board and ports from Tools. Then copy the following sketch which appears in our Web

Browser to our Arduino Sketch. Lastly, click on Upload Icon to upload the code to the board.

### Code

//Alarm System Using Arduino

```
const int trigPin = 9;
const int echoPin = 10;
const int buzzer = 11;
const int ledPin = 13;

// defines variables
long duration;
int distance;
int safetyDistance;

void setup() {
  pinMode(trigPin, OUTPUT); // Sets the trigPin
  as an Output

  pinMode(echoPin, INPUT); // Sets the echoPin
  as an Input

  pinMode(buzzer, OUTPUT);
  pinMode(ledPin, OUTPUT);

  Serial.begin(9600); // Starts the serial
  communication}

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

  // Sets the trigPin on HIGH state for 10 micro
  seconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

  // Reads the echoPin, returns the sound wave
  travel time in microseconds
  duration = pulseIn(echoPin, HIGH);
```

```
// Calculating the distance
distance= duration*0.034/2;
safetyDistance = distance;
if (safetyDistance <= 8){ //Enter the Distance
  digitalWrite(buzzer, HIGH);
  digitalWrite(ledPin, HIGH);}
else{
  digitalWrite(buzzer, LOW);
  digitalWrite(ledPin, LOW);}
// Prints the distance on the Serial Monitor
Serial.print("Distance: ");
Serial.println(distance);
}
```

## Result & Discussion

After setting up the circuits and uploading the code and power the Arduino, the system will start detecting. If someone crosses the safety distance it will turn on the alarm and the red led will indicate there is an intruder. We can also program the Arduino to do a lot of things, This is a good example that with a few components, we can build a full-fledged working system in a low cost and there is an endless possibility to modify and make the system better with adding few more components.

The advantage of using this system is that is handy and portable, and thus can be easily carried from one place to another. The circuitry is not that complicated and thus can be easily troubleshooted. Apart from the advantages this system has few drawbacks as this alarm system determines the presence of the intruder only and does not determine how many persons are in there actually. The alarm activates only when the person is inside the range of the sensor.

There are some applications where this system can be useful like this type of alarm system can be easily employable for security purposes at

banks, various offices and, we can easily set up this system for household purposes.

## Conclusion

As we have designed a home security alarm system using Arduino and Ultrasonic sensor, which is handy, portable, cost-effective and highly effective as well. Such alarm systems are hugely in demand for security purposes, and thus the given system can be proved useful and effective in view of the above features. And this system also has future scope to turn into a more advanced security alarm system by adding few more components like we can add a keypad to arm or disarm the alarm and, we can determine the position of the intruder and then send a SMS to the concerned authorities.

## References

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