WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Design and Implementation of Unauthorized Object Based on Proposed Motion Detection Technology and IOT

Jaswinder Kaur[1], Dr. Gurpreet Singh[2]

[1]M. Tech CSE, [2]Professor in CSE
St. Soldier Institute of Engg. & Technology, Near NIT, Jalandhar

ABSTRACT:

A security system using an ultrasonic sensor is a device designed to detect and respond to unauthorized access or movement in a specific area. It utilizes an ultrasonic sensor to measure distance and detect objects within its range. When an object or person enters the monitored area, the system detects the change in distance and triggers a response, such as sounding an alarm, activating lights, or sending a notification. In this research we enable real-time monitoring of a specific area or premises using ultrasonic sensors. By integrating the system with IoT, it becomes possible to receive immediate notifications and alerts on connected devices or through a central monitoring system

Keywords: Arduino, Motion, Ultrasonic Sensors, Automation.

I. Introduction

A security system using an ultrasonic sensor offers several benefits for enhancing security in various environments. Here are some key advantages:

Accurate and Reliable Detection: Ultrasonic sensors provide accurate and reliable distance measurements, allowing for precise detection of objects or people within their range. They are effective at detecting both stationary and moving targets, making them suitable for different security applications.

Wide Coverage Area: Ultrasonic sensors can cover a wide area, depending on their range and installation position. This enables the security system to monitor larger spaces with a single sensor, reducing the need for multiple sensors or devices.

Non-Contact Sensing: Ultrasonic sensors operate on the principle of sound wave reflections and do not require physical contact with the objects they detect. This non-contact sensing capability minimizes wear and tear on the sensor, ensuring long-term reliability and reducing maintenance requirements.

Fast Response Time: Ultrasonic sensors can quickly detect changes in distance, providing a fast response time when an object or person enters the monitored area. This rapid response allows for timely security alerts and actions to be initiated.

II. Build a security system with an ultrasonic sensor and Arduino in IoT:

Arduino Uno: The central processing unit that controls the system and interacts with the ultrasonic sensor and other components. Arduino UNO is widely used in various research projects, including robotics, home automation, sensor monitoring systems, and interactive art installations. Its ease of use, extensive community support, and large collection of libraries and examples make it a popular choice for beginners and experienced makers alike.

Fig. 1: Arduino UNO

Ultrasonic sensor: Measures distance by emitting ultrasonic waves and detecting their reflections. Common ultrasonic sensors used in Arduino projects include HC-SR04 or JSN-SR04T.

Fig. 2: Ultrasonic Sensor

Buzzer or alarm: Produces an audible alert when a breach is detected.

LED or display: Provides visual indication of the system's status or alerts.

Internet connectivity module: Enables the Arduino board to connect to the Internet and communicate with other devices or services in the IoT ecosystem. Options include Wi-Fi modules like ESP8266 or ESP32, Ethernet shields, or other IoT-specific boards like Arduino MKR series.

Power supply: Provides power to the Arduino board and other components. This can be a USB cable connected to a computer or a dedicated power source like a battery or AC adapter.

Jumper wires: Used to connect the components together, establishing electrical connections between the Arduino board, ultrasonic sensor, buzzer, LED, and other modules.

Resistors and capacitors (if required): Depending on the specific circuit and components used, you may need resistors or capacitors to stabilize the signals, protect the components, or adjust voltage levels.

Optional: Breadboard or PCB (Printed Circuit Board) for prototyping and connecting the components in a tidy and organized Manner.

III. Objectives of the study

1. To enhance security by developing a system that can detect and alert against unauthorized access or intrusions. The ultrasonic sensor, coupled with Arduino and IoT capabilities, can provide a robust and reliable security solution.

2. To enable real-time monitoring of a specific area or premises using ultrasonic sensors. By integrating the system with IoT, it becomes possible to receive immediate notifications and alerts on connected devices or through a central monitoring system.

3. To explore the cost-effectiveness of implementing an ultrasonic sensor security system using Arduino in comparison to traditional security systems. This study can evaluate the affordability and scalability of the proposed solution.

4. To design and optimize an energy-efficient ultrasonic sensor security system using Arduino and IoT. This includes exploring power-saving techniques, such as sleep modes or intelligent sensor activation based on specific events or patterns.

5. To analyze the collected sensor data for pattern recognition, anomaly detection, or predictive analytics.

IV. Circuit of Proposed Work

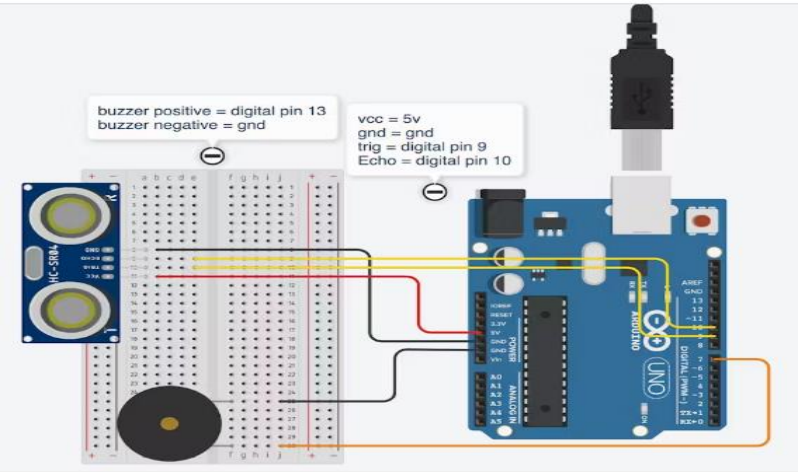

Fig. 3: Circuit Diagram of Proposed System

V. Step-by-step process to build the proposed security system:

Step 1: Connect the ultrasonic sensor to the Arduino UNO:

- Connect the VCC pin of the sensor to the 5V pin on the Arduino.
- Connect the GND pin of the sensor to the GND pin on the Arduino.
- Connect the TRIG pin of the sensor to pin 2 on the Arduino.
- Connect the ECHO pin of the sensor to pin 3 on the Arduino.

Step 2: Connect the buzzer or LED (optional):

- If you want to use a buzzer, connect the positive terminal of the buzzer to pin 4 on the Arduino and the negative terminal to GND.
- If you prefer to use an LED, connect the positive terminal of the LED to a current-limiting resistor (220-470 ohms), and connect the other end of the resistor to pin 4 on the Arduino. Then, connect the negative terminal of the LED to GND.

Step 3: Write the Arduino code:

Open the Arduino IDE on your computer.

Write the following code:

```
const int trigPin = 2;

const int echoPin = 3;

const int alarmPin = 4;

long duration;

int distance;

void setup() {

  pinMode(trigPin, OUTPUT);

  pinMode(echoPin, INPUT);

  pinMode(alarmPin, OUTPUT);
```

```
  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 < 50) {  // Adjust this threshold according to your needs
    digitalWrite(alarmPin, HIGH);
    delay(1000);  // Adjust the delay time for the alarm
    digitalWrite(alarmPin, LOW);
  }
  delay(500);  // Adjust the delay between measurements
}
```

Step 4: Upload the code to the Arduino:

- Connect the Arduino UNO to your computer using a USB cable.
- Select the correct board and port from the Arduino IDE.
- Click on the "Upload" button to upload the code to the Arduino.

Step 5: Test the security system:

- Open the Serial Monitor in the Arduino IDE (Ctrl+Shift+M).
- Ensure that the baud rate is set to 9600.
- Move an object closer to the ultrasonic sensor and observe the distance readings in the Serial Monitor.
- If the distance is less than the threshold (50 cm in the example code), the alarm (buzzer or LED) will be triggered.

Fig. 4. Installed devices to implement security system using ultrasonic sensor and Arduino UNO.

Table 1: Analysis Between Distance Measured using Manual & Ultrasonic Sensor

TEST RANGE	MEASURED DISTANCE (cm)	ACTUAL DISTANCE (cm)
1	20.2	20
2	30	29.5
3	40.2	40.1
4	36	35.3
5	29.8	29.2
6	32.1	32
7	28.4	28.1
8	32.5	32.1
9	26..3	26.1
10	27.5	27
11	40.1	40
12	35.3	34.2
13	29.2	29
14	32	34.5

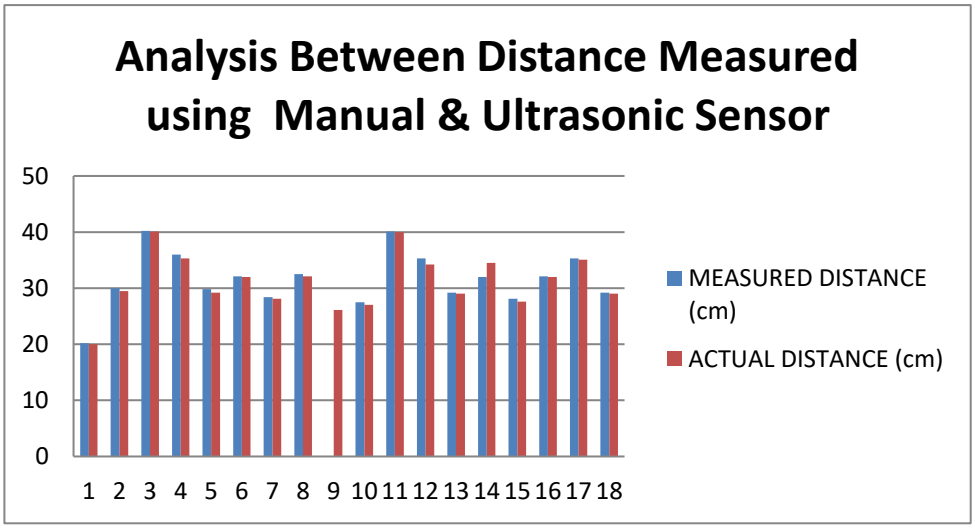

Fig. 5: Analysis Between Distance Measured using Manual & Ultrasonic Sensor

V. CONCLUSION AND FUTURE SCOPE

A security system using ultrasonic sensors has a promising future scope due to advancements in technology and increasing demand for smart and automated security solutions. Here are some potential future developments and applications for security systems based on ultrasonic sensors:

Enhanced Object Detection: As technology progresses, ultrasonic sensors can be further improved to provide even more precise object detection capabilities. This could involve advancements in signal processing algorithms, higher resolution sensors, and increased sensitivity. These enhancements would enable the system to detect and differentiate between various objects more accurately, including human presence, vehicles, and specific types of threats.

REFERENCES

[1] Suresh.S, J.Bhavya, S.Sakshi, K.Varun and G.Debarshi, "Home Monitoring and Security System", IEEE, 2016.

[2] 1neha Roze, Preeti Malik, Rekha Rani, Monika Tomar, Mallika Verma, Pratibha Jolly, "Home Security and Automation Using Arduino And Sensors", International Journal of Advances in Electronics and Computer Science, Volume-6, Issue-9, Sep.-2019.

[3] Amit Kumar, Anchal Baranwal, Arun Kumar, Brijesh Kumar Kushwaha, Dhanajay Mishra, Deepu Kumar, Varun Singhal, " Border Security System using Arduino & Ultrasonic Sensors", International Journal of Scientific Engineering and Technology Research.

[4] Mrs.W.Nancy, R.Ananthi Reeta, "Security system to adopt in railway tracks for additional safety", Indian Journal of Applied Research, Volume - 7 | Issue - 4 | April-2017,

[5] Mutinda Mutava Gabriel, Kamweru Paul Kuria, "Arduino Uno, Ultrasonic Sensor HC-SR04 Motion Detector with Display of Distance in the LCD", International Journal of Engineering Research & Technology (IJERT), 2020.

[6] Adamu Abdulkarim, M. S. Anas and A. S. Adamu, "Design, construction and testing of security based sonar radar system using MCU and controlling software for application in nuclear industries", Journal of Research in Environmental and Earth Sciences, Volume 6 ~ Issue 6 (2020) pp: 22-34.

[7] Marwa M. Eid and M. I. Fath Allah, "Automated Railway Security System", IEEE, 2019.