HOME SECURITY SYSTEM

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1. Introduction

IoE is the intelligent connection of people, process, data and things. The Internet of Everything (**IoE**) describes a world where billions of objects have sensors to detect measure and assess their status; all connected over public or private networks using standard and proprietary protocols. Home Security Systems are an important feature of modern residential and office setups. Home security systems must be affordable, reliable and effective.

Concerns about security, in general, grow continually, as well as the study to address these concerns. Several intrusion detections prototypes have been developed. While some aim at preventing intrusions such as systems used in classified facilities or banks, others are just built for detection. Although some techniques are more reliable than others, it is always at the expense of cost.

Modern complex home security systems include several security features like fire, intruders, electronic door lock, heat, smoke, temperature, etc. Some security systems may be a combination of all the security measures. Home Security Alarm Systems are very important in present day society, where crime is increasing. With the technological advancements we have achieved in the recent years, a homeowner doesn't have to worry about home security while getting off his/her home. Modern home security systems provide enough security from burglars, fire, smoke, etc. They also provide immediate notification to the homeowner.

Modern security detection and monitoring systems can be synchronized and designed to alert owners of threats. This complete monitoring and detection is achieved by fusing the compact system to prevent a diversity of operation and high cost of purchasing individual systems

The aim of this project is to implement a simple and affordable, but efficient home security alarm system. The project is designed for detecting intruders and informing the owner with the use of alarms and glowing LEDs.

2. Requirements

2.1. Hardware Requirements

2.1.1. Arduino Uno R3

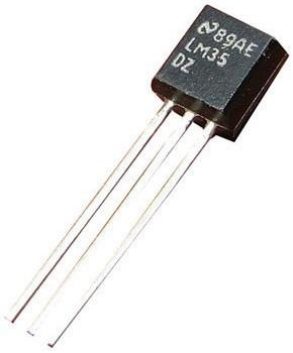
The Arduino Uno R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs). Programs can be loaded on to it from the easy-to-use Arduino computer program. The Arduino has an extensive support community, which makes it a very easy way to get started working with embedded electronics. The R3 is the third, and latest, revision of the Arduino Uno.

2.1.2. PIR Sensor

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications. The sensor converts the resulting change in the incoming infrared radiation into a change in the output voltage, and this triggers the detection. Objects of similar temperature but different surface characteristics may also have a different infrared emission pattern, and thus moving them with respect to the background may trigger the detector.

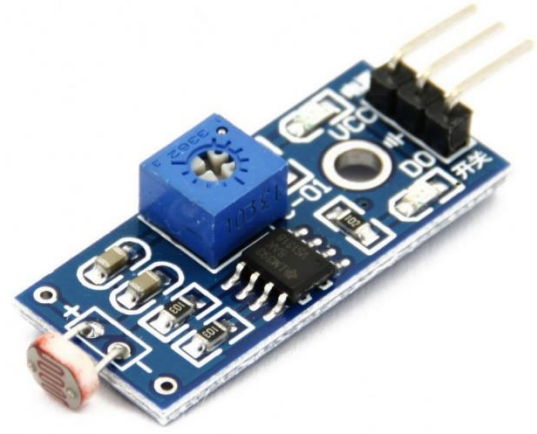
2.1.3. Temperature sensor

A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. They are devices to measure temperature readings through electrical signals. The sensor is made up of two metals, which generate electrical voltage or resistance once it notices a change in temperature.



2.1.4. LDR Sensor

Photo resistors, also known as light dependent resistors (LDR), are light sensitive devices most often used to indicate the presence or absence of light, or to measure the light intensity. LDRs have a sensitivity that varies with the wavelength of the light applied and are nonlinear devices. They are used in many applications but are sometimes made obsolete by other devices such as photodiodes and phototransistors.



2.1.5. Other Requirements

Potentiometer, Resistor, LEDs, LCD Displays, Breadboard

2.2. Software Requirement

2.2.1. Arduino IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them. Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information.

2.2.2. Tinkercad

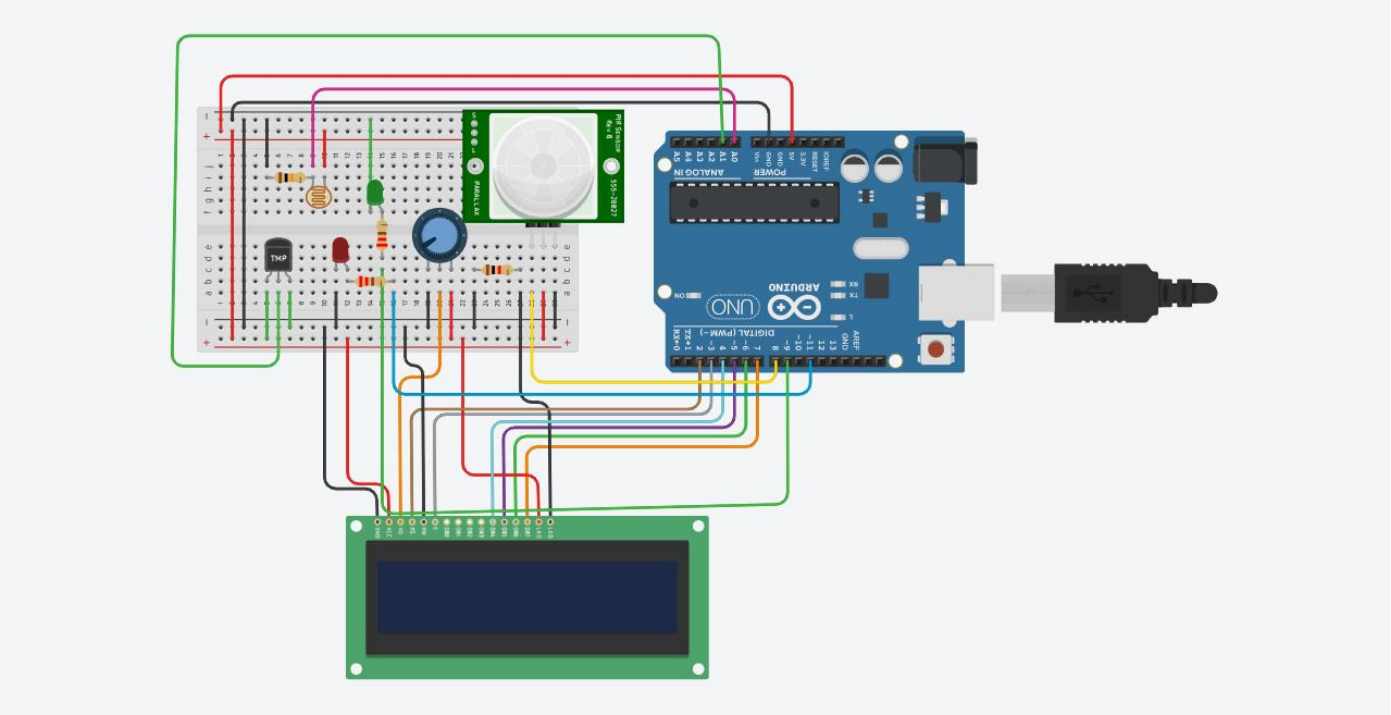
Tinkercad is a free, online 3D modeling program that runs in a web browser, known for its simplicity and ease of use. Tinkercad is an **online** collection of software tools from Autodesk that enable complete beginners to create 3D models. This CAD software is based on constructive solid geometry (CSG), which allows users to create complex models by combining simpler objects together. Since we don't have the hardware components physically, Tinkercad serves as a prompt platform to demonstrate the simulation of the working model.

2.3. Hardware and Software Requirements with Costs

Components	Price in Rs.
1. Arduino Uno R3	1000
2. PIR sensor	60
3. LDR sensor	40
4. Potentiometer	150
5. Temperature TM36 sensor	250
6. Resistor 220 ohm, 2x1000 ohm	40
7. LEDs	10
8. LCD Display	100
9. Breadboard	100
10. Tinkercad	0
Total	**1700**

3. Design & Code

3.1. Design



The design is user-friendly & easy to understand. It is cost efficient. The use of various LEDs, LCD Displays & Buzzer is very essential in alerting the user in case of an intrusion or any other malevolent activities.

3.2. Code

```
// library for the LCD display:
#include <LiquidCrystal.h>

int hot=9;
float sensor=0;
float celsius=0;
float voltage=0;
//The above is for temperature sensor
int ledPin = 11;
int PIRpin = 8;
int pirState = LOW;
int val = 0;
// photocell circuit
int photocellPin = 0;     // the cell and 10K pulldown are connected to a0
int photocellReading;     // the analog reading from the sensor divider

LiquidCrystal lcd(2, 3, 4, 5, 6, 7);


void setup() {

  pinMode(ledPin, OUTPUT);
  pinMode(PIRpin, INPUT);
  pinMode(photocellPin, INPUT);
  pinMode(hot,OUTPUT);

  Serial.begin(9600);
  lcd.begin(16, 2);
  lcd.setCursor(2, 0);                    // Set LCD cursor position (column, row)
  lcd.print("P.I.R Motion ");             // Print text to LCD
  lcd.setCursor(0, 1);                    // Set LCD cursor position (column,row)
  lcd.print("and Light Sensors");         // Print text to LCD
  delay(2000); // wait 2s                 // Delay to read text

   delay(2000);                           // Delay to read text
   lcd.clear();                           // Clear LCD
   lcd.setCursor(0, 0);
    lcd.print("Processing Data.");
    delay(3000);
    lcd.clear();
   lcd.setCursor(3, 0);               // Set LCD cursor position (column 0, row 0)
   lcd.print("No Motion Detected");
   lcd.setCursor(3, 1);
   lcd.print("Waiting !");

}

void loop(){

  sensor=analogRead(A1);
  voltage=sensor*5000/1024;
  voltage=voltage-500;
  celsius=voltage/10;
```

```
  if(celsius>= 26)
 {
  digitalWrite(hot,HIGH);
  delay(1000);
  digitalWrite(hot,LOW);
 }

  val = digitalRead(PIRpin);
  photocellReading = analogRead(photocellPin);

  if (val == HIGH) {                    // check if the input is HIGH
    digitalWrite(ledPin, HIGH);         // turn LED ON
    delay(150);

      if (pirState == LOW) {
        Serial.println("Motion detected!");
        lcd.clear() ;
        lcd.setCursor(0, 0);          // Set LCD cursor position (column 0, row 0)
        lcd.print("Motion Detected!");
        lcd.setCursor(0, 1);          // Set LCD cursor position (column 0, row 1)
        lcd.print(photocellReading);
        // We only want to print on the output change, not state
        pirState = HIGH;
          delay(5000) ;
      }
  } else {
      digitalWrite(ledPin, LOW); // turn LED OFF

     // display no motion screen saver
     scrollScreenSaver() ;
      if (pirState == HIGH){
        // There's no motion !

        // change to no motion detected
        pirState = LOW;
      }
  }
}

void scrollScreenSaver() {

   // autoscroll https://www.arduino.cc/en/Tutorial/LiquidCrystalAutoscroll
   lcd.clear() ;
   lcd.setCursor(15, 0);              // Set LCD cursor position (column 0, row 0)
   lcd.print("No Motion ");
   lcd.setCursor(15, 1);
   lcd.print("Waiting !");
   // scroll 7 positions (display length - string length) to the left
   // to move it back to center:

    for (int positionCounter = 0; positionCounter < 22; positionCounter++) {
      // scroll one position left:
      lcd.scrollDisplayLeft();
      // wait a bit:
      delay(150);
```

4. Working

The project basically is used for make our houses more secure, and for such a good security we have used 3 sensors which are:

Temperature sensor: Used to detect the temperature of the human body when the intruded touched the door knob which would result in switching on of the green LED.

PIR sensor: This sensor is used to detect any motion in the near proximity, which when detected would result in switching on of the red LED.

Light Dependent Resistor: This is used to detect the presence and absence of the light which is used in our project as a way to detect if the intruder is using a torch or any other light emitting device to do the mischief. Adjusting the sensitivity of this sensor the LCD can be seen showing different values of the detection.

We have used different resistors in order to adjust the flow of current to prevent burning out of any component. The potentiometer is used to switch on the LCD.

When nothing is detected the LCD would show "No motion, Waiting!" and once detected the value of proximity of the intruder is shown.

5. Advantages & Applications

5.1. Advantages

- The circuitry is not that complicated and thus can be easily troubleshot.
- The given system sets off a powerful buzzer, and it is effective as any other alarm system available in the market.
- The operation of the system is very simple and can be used by anyone with a basic knowledge of Arduino.
- Easy to upgrade as per the user requirement.
- Most cost effective and efficient home security system that is available in the market.
- Convenient & easy to maintain

5.2. Applications

- This Project can be deployed on any house where the proximity distance can be set along with the temperature and the amount of light to be adjusted in order to trigger the sensor.
- When the sensor detects the motion, it would be displayed in the LCD used to alert the owner of the house.
- It can be used in factories, bungalows, building gates or wherever a need of physical intrusion checking is required.

6. Future Scope & Conclusion

6.1. Future Scope

- Currently, we are using LEDs and Buzzers in order to alert the user. But as an extension, we could use Global System for Mobile Communication (GSM) so that the users can be given an update based on categorically segregating the trigger points using the various sensors.
- This project typically caters to households but in future, it can be used in any commercial sectors as well. Egs: Banks, Shopping Malls, Offices, etc.
- Provision to store several mobile numbers once the GSM model is also executed (Local police or medical facilities or fire station numbers)
- Video recording once alarm gets triggered

6.2. Conclusion

Thus, we have designed a home security alarm system using Arduino and PIR motion sensor, Temperature sensor, LDR 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 efficient in view of the above features.