THE NATIONAL INSTITUTE OF ENGINEERING

MYSURU-570008

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Internet of Things Project [EC6E104]-VI Semester

SYNOPSIS ON

Security Alarm System

Under the guidance of:

NANDINI SP

Assistance Professor, Dept. of Electronics and Communication, NIE

Submitted By:

ACHYUTH J SHANKAR	**(4NI18EC004)**
KARTHIK K M	**(4NI18EC034)**
PRAJWAL S D	**(4NI18EC052)**

2020-2021

ACKNOWLEDGMENT

We are thankful to the department of ECE for assigning us to work on Internet of things (IoT). It helped us to enhance our knowledge about it and the working about it. We also thank Smt. Nandini S P for her complete guidance to us.

ABSTRACT

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 setting off the alarm. The basic idea behind this project is that all the bodies generate some heat energy in the form of infrared which is invisible to human eyes. But, it can be detected by electronic motion sensor.

The project involves the use of Arduino, motion sensor, buzzer, LCD display and a simple program. The sensor detects any motion in its permissible range and triggers the alarm. It will also send the signal to Arduino which processes the signal and set off the alarm along with detection message on display. With this system we can easily set up a security alarm in our home for unwanted intruders.

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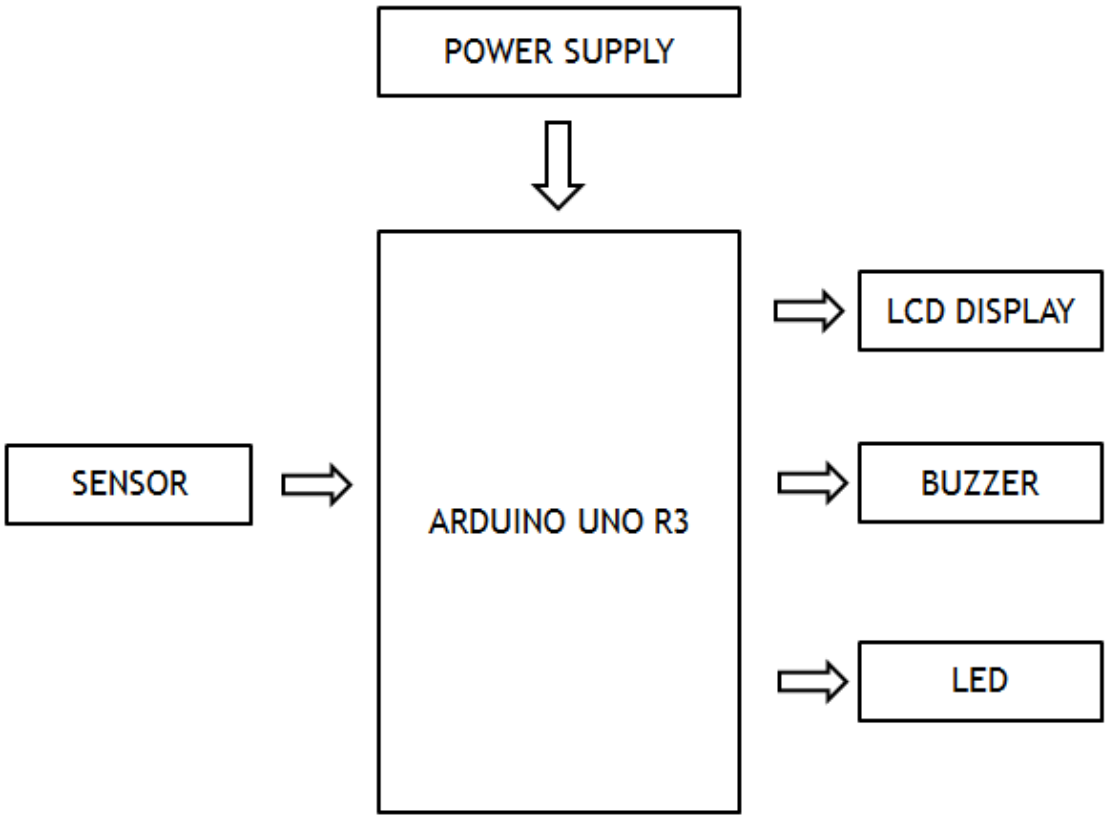
INTRODUCTION

Security and safety are one of the most talked of topics in almost every facet like surveillance, industrial applications, offices, and in general, in smart environments. To secure it against theft, crime, fire, etc. a powerful security system is required not only to detect but also pre-empt hazards. Conventional security systems use cameras and process large amounts of data to extract features with high cost and hence require significant infrastructures

This project is on development of an efficient and cheap security alarm system. This system helps you to protect your house from thieves. In this project we are going to use an Arduino Uno R3 Board, P.I.R Sensor module, LCD 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 siren. Our body generates heat energy in the form of infrared which is invisible to human eyes. But it can be detected by electronic sensor. This type of sensor is made up of crystalline material that is Pyroelectric. In this project, we are using P.I.R. Motion Sensor Module as an infrared sensor that generates electric charge when exposed in heat and sends a signal to Arduino. According to level of the infrared in front of sensor, Arduino displays the status on L.C.D and start buzzing speaker and glows the L.E.D. A simple program is running on Arduino which checks sensor if anything is moved or new object has been detected.

Block Diagram



Block Diagram Description:

The basic block diagram of the security alarm system is shown in the above figure mainly it consists of

- Power Supply
- P I R Sensor
- Arduino UNO R3 Microcontroller
- LCD Display
- Buzzer
- LED

Power supply: The power supply of the Arduino can be done with the help of an exterior power supply otherwise USB connection. The exterior power supply (5 to 20 volts) mainly includes a battery or an AC to DC adapter.

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.

PIR sensors detect general movement, but do not give information on who or what moved. For that purpose, an imaging IR sensor is required.

PIR sensors are commonly called simply "PIR", or sometimes "PID", for "passive infrared detector". The term passive refers to the fact that PIR devices do not radiate energy for detection purposes. They work entirely by detecting infrared radiation (radiant heat) emitted by or reflected from objects.

Fig. 1 PIR Sensor

Arduino UNO R3 Microcontroller: An Arduino is an open-source microcontroller development board. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on computer, used to write and upload computer code to the physical board. The board features an Atmel ATmega328 microcontroller operating at 5 V with2Kb of RAM, 32 Kb of flash memory for storing programs and 1 Kb of EEPROM for storing parameters. The clock speed is 16 MHz, which translates to about

executing about 300,000 lines of C source code per second. The board has 14 digital I/O pins and 6 analog input pins. The pin diagram is shown below.

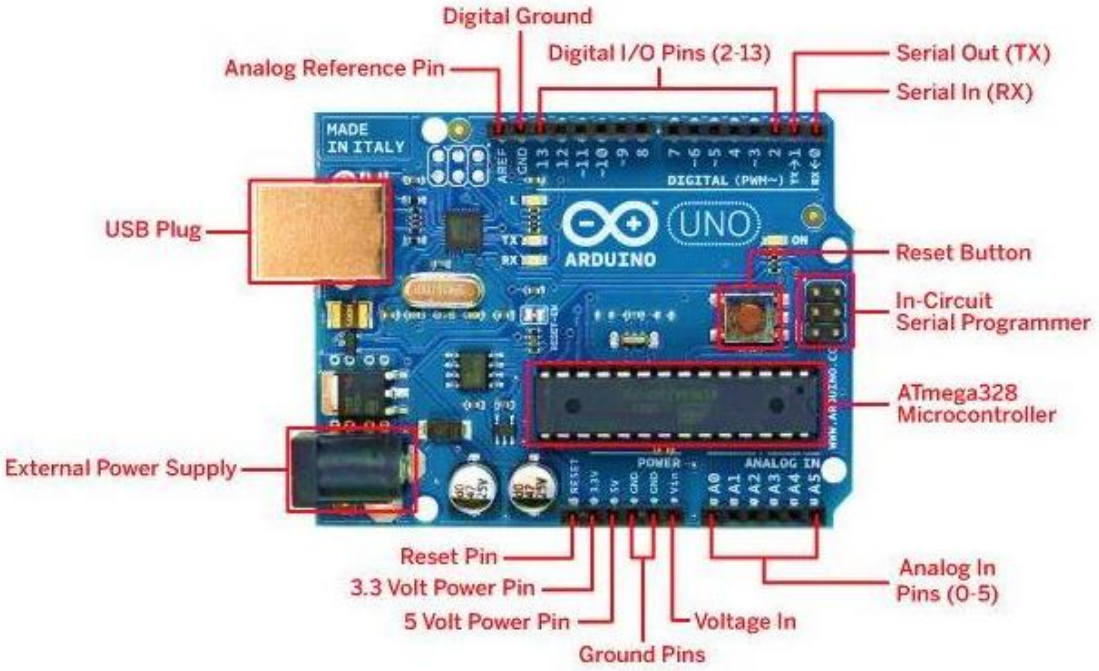


Fig. 2 Pin diagram of Arduino UNO R3

LCD Display:

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical, easily programmable.

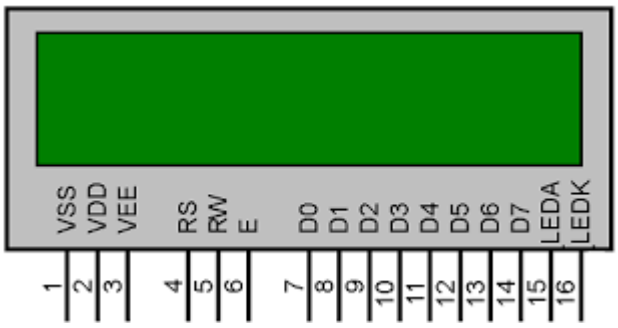


Fig. 3 LCD (16 X 2) pin diagram

Circuit Diagram

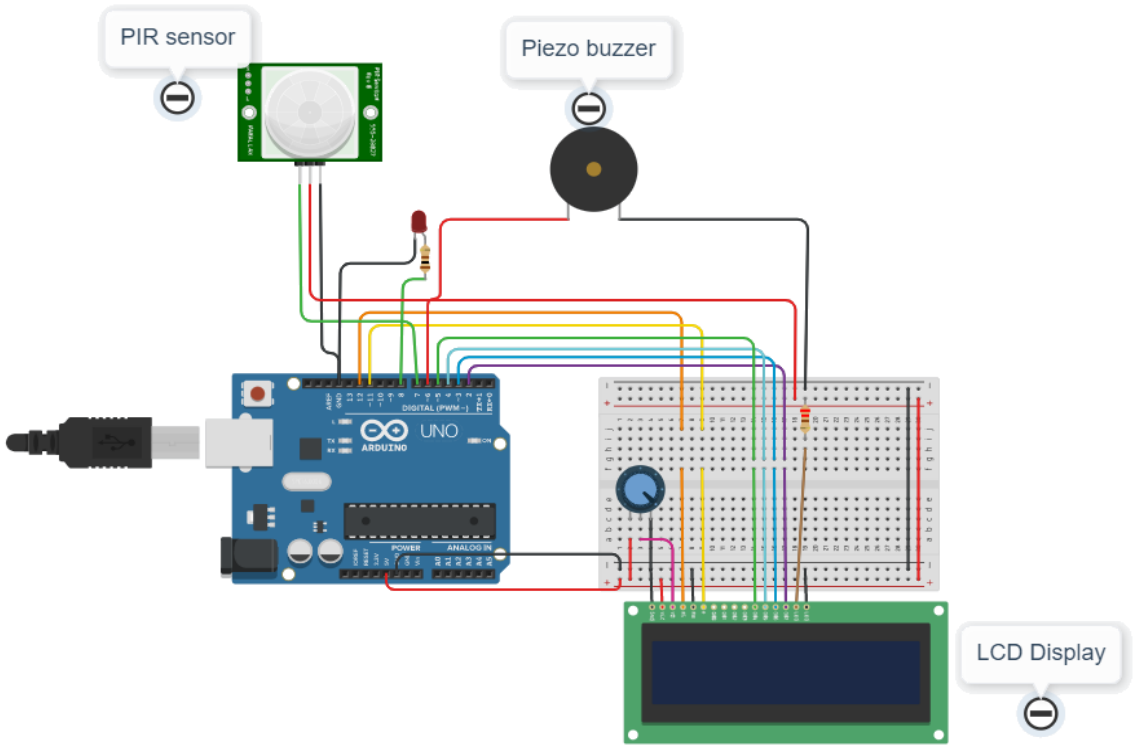


Fig. 4 Circuit Diagram of Security alarm system

WORKING OF CIRCUIT

PIR is basically made of Pyroelectric sensors to develop an electric signal in response to a change in the incident thermal radiation. Every living body emits some low-level radiations and the hotter the body, the more is emitted radiation. Commercial PIR sensors typically include two IR-sensitive elements with opposite polarization housed in a hermetically sealed metal with a window made of IR-trans missive material (typically coated silicon to protect the sensing element).

When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors. When a warm body like a human or an animal passes by, it first intercepts one half of the PIR sensor which causes a positive differential change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. These change pulses are what is detected. To shape the FOV, i.e. Field of View of the sensor, the detector is equipped with lenses in front of it. The lens used here is inexpensive and lightweight plastic materials with transmission characteristics suited for the desired wavelength range.

To cover much larger area, detection lens is split up into multiple sections, each section of which a Fresnel lens is. Fresnel lens condenses light. Providing a larger range of IR to the sensor it can span over several tens of degree width. Thus, total configuration improves immunity to changes in background temperature, noise or humidity and causes a shorter settling time of the output after a body moved in or out the FOV. Along with pyroelectric sensor, a chip named Micro Power PIR Motion Detector IC has been used.

This chip takes the output of the sensor and does some minor processing on it to emit a digital output pulse from the analog sensor. Based on the output Microcontroller further trigger the alarm

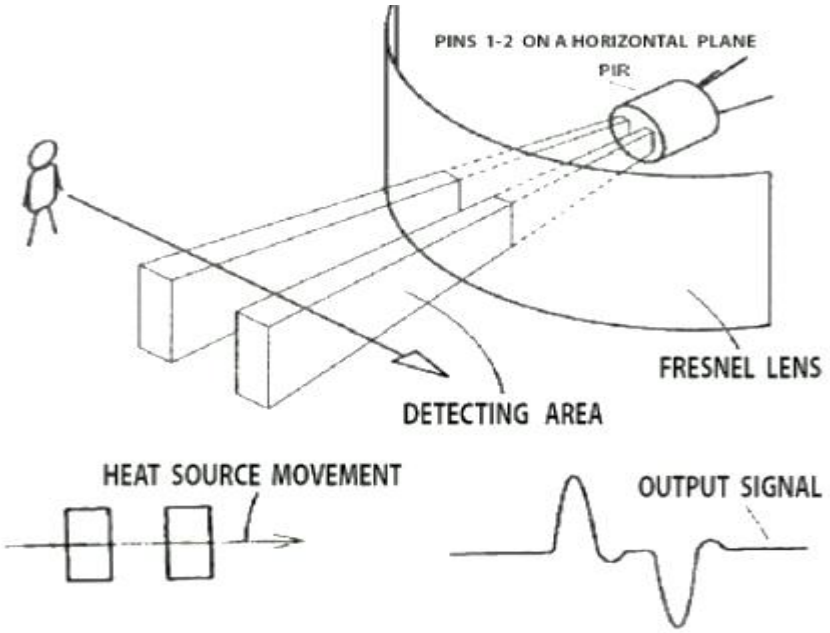


Fig. 5 Working of PIR Sensor

ADVANTAGES AND DISADVANTAGES

Advantages:

- The given system 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.
- The given system sets off a powerful buzzer, and it is effective as any other alarm system available in the market.

Disadvantages:

- The given 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 cuts through the line of the PIR sensor.

APPLICATIONS

This type of motion sensing alarm system can be easily employable for security purposes at banks, various offices and even for sensitive establishments such as for military. We can easily set up this system for household purposes.

It can also be used in motion activated night lights.

CONCLUSION

Thus, we have designed a security alarm system using Arduino and PIR motion sensor. This project 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.

FUTURE SCOPE

- Triggering the camera to capture the protected area.
- We can add a keypad to arm or disarm the alarm.
- We can determine the position of the intruder and then send a SMS to the concerned authorities.

REFERENCES

Research paper

Passive Infrared (PIR) Sensor Based Security System,

International Journal of Electrical, Electronics and Computer Systems. Vol: 14 Issue: 2, June 2013, *Pema Chodon, Devi Maya Adhikari, Gopal Chandra Nepal, Rajen Biswa, Sangay Gyeltshen, Chencho.*

Website

https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor/how-pirs-work

APPENDIX

Project Code:

```
#include<LiquidCrystal.h>

// Assigning PIN Numbers
const int led = 8;
const int sensor = 7;
const int buzzer = 6;
bool sensor_value ;
bool state = false ;

// initialize the library with the numbers of the interface pins
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

void setup()
{
        pinMode(led,OUTPUT);            //assigning led as output
        pinMode(buzzer,OUTPUT);         //assigning buzzer as output
        pinMode(sensor,INPUT);          //assigning sensor as input
}
void loop()
        {
                sensor_value = digitalRead(sensor);             //Reads sensor value
                 if(sensor_value == true)       //PIR sends a signal
                 {
                         state = true;
                 }
          if(state == true)// if Object detected
```

```
        {
                digitalWrite(led,HIGH);       //LED ON
                tone(buzzer,1000);       //BUZZER ON
                delay(500);
                digitalWrite(led,LOW);
                noTone(buzzer);
                delay(500);
                lcd.begin(16, 2);

                lcd.print(" Alarm Triggered");       //LCD display output
                lcd.setCursor(0, 2);
                lcd.print(millis() / 1000);
        }

         else                                  //object not detected
         {
                digitalWrite(led,LOW);       //LED OFF
                noTone(buzzer);       //BUZZER OFF
                lcd.print("  Secured");       // print statement in LCD
        }
        lcd.setCursor(0, 1);
}
```

Algorithm:

1. Start

2. Connect the Piezo buzzer to digital pin 6

3. Connect the PIR motion sensor to digital pin 7 as an input

4. LED is connected to digital pin 8

5. We start, assuming no motion detected

6. Create a variable for reading the pin status

7. Initialize the library with the numbers of the interface pins

8. Declare LED as output and sensor as input

9. Read input value

10. check if the input is HIGH, then turn LED ON

11. Put the buzzer ON

12. Set LCD cursor position

13. Print text to LCD as ‘Alarm Triggered’

14. Stop

PIR Motion Sensor:

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason, they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.

Basic Stats:

Size: Rectangular

Output: Digital pulse high (3V) when triggered (motion detected) digital low when idle (no motion detected). Pulse lengths are determined by resistors and capacitors on the PCB and differ from sensor to sensor.

Sensitivity range: up to 20 feet (6 meters) 110° x 70° detection range.

Power supply: 3V-9V input voltage, but 5V is ideal.