UNIVERSITY OF MUMBAI

A PROJECT REPORT ON

Home Security Alarm System Using Arduino

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YEAR 2015-16

YouTube video link - https://youtu.be/Enm1J0D1lAo

ACKNOWLEDGEMENT

It is our privilege to express our sincerest regards to our project coordinator, Dr Prof Saurav Mitra and Prof Mugdha Joshi for their valuable inputs, guidance, encouragement, whole-hearted cooperation and constructive criticism throughout the duration of our project. Their useful suggestions for this whole work and co-operative behavior are sincerely acknowledged.

We deeply express our sincere thanks to our Head of Department Dr Prof. Anjali Deshpande for encouraging and allowing us to present the project on the topic “Home security alarm system using Arduino” at our department premises for the partial fulfillment of the requirements.

We take this opportunity to thank all our lecturers who have directly or indirectly helped our project. We pay our respects and love to our parents and all other family members and friends for their love and encouragement throughout our career. Last but not the least we express our thanks to our friends for their cooperation and support.

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ABSTRACT

The need for home security alarm systems nowadays is a serious demand. As the number of crimes are increasing every day, there has to 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 detect 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.

YouTube video link - https://youtu.be/Enm1J0D1lAo

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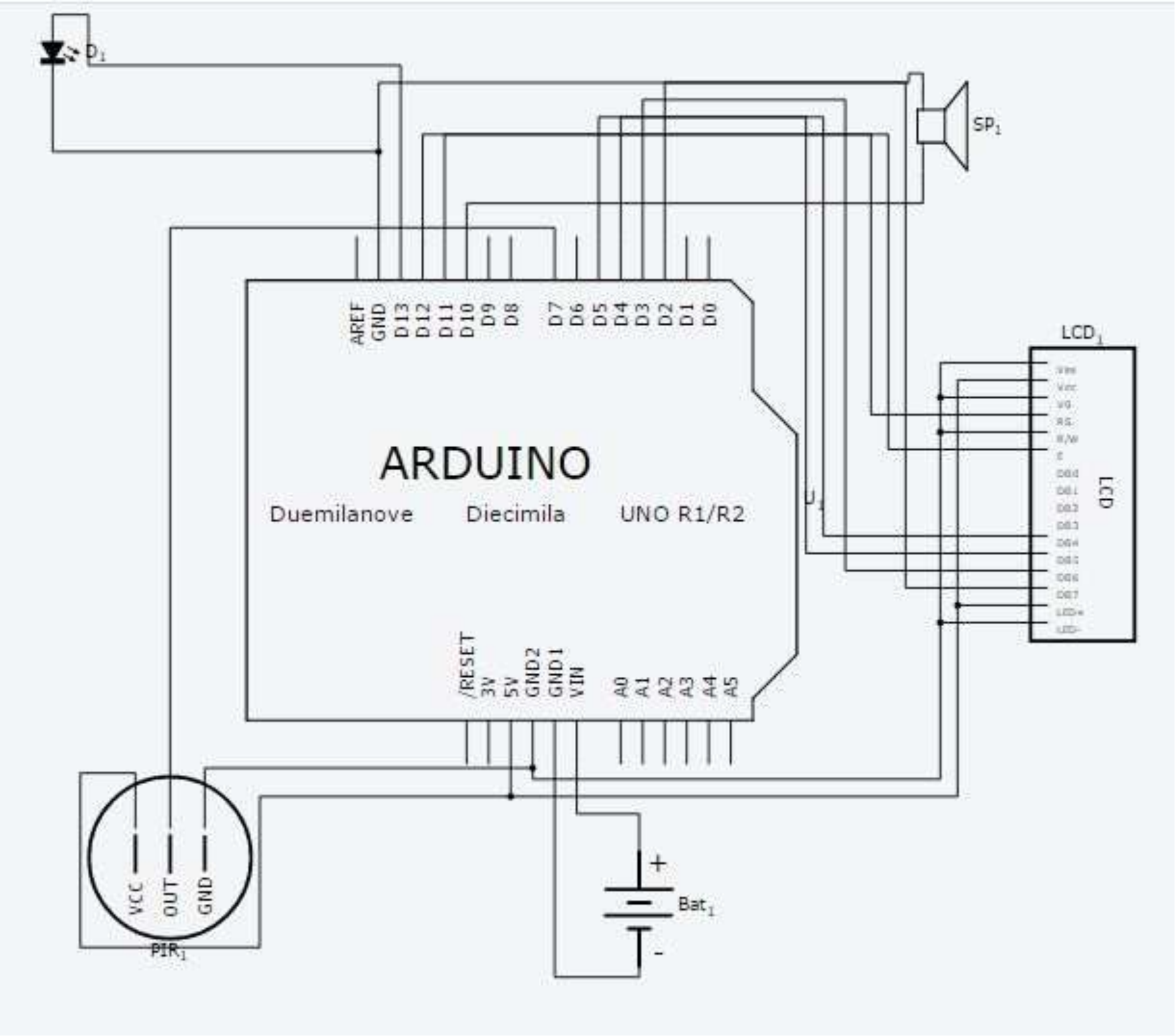
INTRODUCTION

We have designed an interesting and cheap home security alarm. This Gadget 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.

CIRCUIT DIAGRAM



COMPONENTS REQUIRED

- Arduino Uno
- P.I.R Sensor Module
- L.C.D(16 X 2)
- 9V Battery
- 9V Battery Clip
- L.E.D
- Piezo Buzzer
- Breadboard
- Some Jumper Wires
- An USB Cable
- A Computer

Cost incurred:

Component	Cost
Arduino Uno	550
P.I.R Sensor Module	150
L.C.D(16 X 2)	135
9V Battery	15
9V Battery Clip	5
L.E.D	1
Piezo Buzzer	20
Breadboard	50
Some Jumper Wires	60
Total	**986**

WORKING

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

Step 1: Connecting the P.I.R sensor to Arduino:

1. Connect Vcc pin of P.I.R sensor to positive terminal of Arduino (5V).
2. Connect Gnd pin of P.I.R sensor to any ground pin of Arduino.
3. Connect out pin of P.I.R sensor to Pin no. -7 of Arduino.

Step 2: Connecting L.E.D and Piezo Buzzer To Arduino

Connecting L.E.D

Connect Positive terminal (Longer Lead) Of L.E.D To Arduino Pin no. 13.

Connect Negative terminal (Shorter Lead) Of L.E.D To Any Ground Pin.

Connecting Piezo Buzzer

Connect Positive terminal (Red Wire) Of Buzzer to Arduino Pin no. 10.

Connect Negative terminal (Black Wire) Of Buzzer to Any Ground Pin.

Step 3: Connecting L.C.D to Arduino:

To wire your LCD screen to your Arduino, connect the following pins:

LCD RS pin to digital pin 12

LCD Enable pin to digital pin 11

LCD D4 pin to digital pin 5

LCD D5 pin to digital pin 4

LCD D6 pin to digital pin 3

LCD D7 pin to digital pin 2

Additionally, wire a 10K pot to +5V and GND, with its wiper (output) to LCD screens VO pin (pin3).

Step 4: Programming Arduino:

1. Download Arduino IDE 1.0.6 from https://www.arduino.cc/en/main/software.
2. Connect Your Arduino to your computer using USB Cable.
3. Open Arduino IDE, choose your correct board from Tools--Boards
4.Choose Your Correct Port from Tools--Serial Port

6. Copy the following sketch which appears in your Web Browser to your Arduino Sketch Page.
7. Click on Upload Icon or go to File—Upload

Step 5: Drill Holes in the Housing:

Next we need to drill a few holes in the housing so that we can mount all the parts. Start by using a ¼" hole in one end of the housing. This will be where we mount the buzzer. Then use a ¾" hole saw to drill a hole in the other side of the housing. This will be where we mount the motion sensor

Step 6: Glue the Motion Sensor and the Buzzer in Place

Apply a small amount of hot glue around the motion sensor where it lines up with the hole in the housing. Then press the motion sensor into the hole. Apply more hot glue around the outside and hold it in place until the glue cools. Then apply a small amount of hot glue to the face of the buzzer. Align the hole in the buzzer with the hole in the housing and press it in place. Hold the buzzer in this position until the glue dries.

Step 7: Close Up the Housing:

The last thing that you need to do is connect the battery and close up the housing.

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.

APLLICATIONS

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.

CONCLUSION

Thus, we have designed a home security alarm system using Arduino and PIR motion 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.

FUTURE SCOPE

- 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

Books

[1] Michael Mcroberts, *Beginning Arduino.*

Software

[2] Arduino IDE 1.0.6 from https://www.arduino.cc/en/main/software.

World Wide Web

[3] www.circuitstoday.com

[4] www.engineersgarage.com

[5] www.learn.adafruit.com

[6] www.instructables.com

APPENDIX

Project code:

```
//This Type of Sensor Detects Motion and lows L.E.D and Start Buzzing, It Also Displays that the
"Motion is Detected" On An  Lcd Screen
#include <LiquidCrystal.h>
int ledPin = 13;                // choose the pin for the LED
int inputPin = 7;               // choose the input pin (for PIR sensor)
int pirState = LOW;             // we start, assuming no motion detected
int val = 0;                    // variable for reading the pin status
int pinSpeaker = 10;            //Set up a speaker on a PWM pin (digital 9, 10, or 11)
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);          // initialize the library with the numbers of the interface pins

void setup() {  pinMode(ledPin, OUTPUT); // declare LED as output  pinMode(inputPin, INPUT); //
declare sensor as input
  pinMode(pinSpeaker, 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(5, 1);                          // Set LCD cursor position (column,row)
  lcd.print("Sensor");                          // Print text to LCD
  delay(4000); // wait 4s                      // Delay to read text
  lcd.clear(); // clear LCD display                  // Clear the display
  lcd.setCursor(2, 0);                          // Set LCD cursor position (column, row)
  lcd.print("Developed By");                      // Print text to LCD
  lcd.setCursor(2, 1);                          // Set LCD cursor position (column, row)
  lcd.print("Suman Ssk Vinit");                          // Print text to LCD
delay(5000);                                  // Delay to read text
lcd.clear();                               // Clear LCD
lcd.setCursor(0, 0);
      lcd.print("Processing Data.");
      delay(3000);
      lcd.clear();
      lcd.setCursor(3, 0);
      lcd.print("Waiting For");
      lcd.setCursor(3, 1);
      lcd.print("Motion....");
}
void loop(){
  val = digitalRead(inputPin);  // read input value
  if (val == HIGH) {            // check if the input is HIGH
    digitalWrite(ledPin, HIGH);  // turn LED ON
    playTone(300, 300);
    delay(150);


    if (pirState == LOW) {
      // we have just turned on
      Serial.println("Motion detected!");
      lcd.clear() ;
      lcd.setCursor(0, 0);                                    // Set LCD cursor position (column 0, row 0)
      lcd.print("Motion Detected!");

      // We only want to print on the output change, not state
      pirState = HIGH;
    }
  } else {
      digitalWrite(ledPin, LOW); // turn LED OFF
      playTone(0, 0);
      delay(300);
      if (pirState == HIGH){
      // we have just turned of
      Serial.println("Motion ended!");
      lcd.clear() ;
      lcd.setCursor(3, 0);
      lcd.print("Waiting For");
      lcd.setCursor(3, 1);
      lcd.print("Motion....");      // We only want to print on the output change, not state
      pirState = LOW; } } }  // duration in mSecs, frequency in hertz
void playTone(long duration, int freq) {
    duration *= 1000;
    int period = (1.0 / freq) * 100000;
    long elapsed_time = 0;
    while (elapsed_time < duration) {
        digitalWrite(pinSpeaker,HIGH);
        delayMicroseconds(period / 2);
        digitalWrite(pinSpeaker, LOW);
        delayMicroseconds(period / 2);
        elapsed_time += (period);
    }
}
```

Algorithm:

1. Start
2. Connect the Piezo buzzer to digital pin 10
3. Connect the PIR motion sensor to digital pin 7 as an input
4. LED is connected to digital pin 13
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 ‘ MOTION DETECTED’
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.