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# Smart House for Intruder Detection System

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***Abstract:***
Enhancing home security is a major issue in society. Nowadays safety and security has always become a necessity for metropolitan cities. The primary concept of our project is to reduce theft by designing and implementing a security system. Some traditional system like surveillance camera or GSM band system provides some kind of warning in the form of alarm format. When compared to that we developed a newly improved intelligent mechanism to detect malicious activity. We use intruder detection system, which detect any intrusion or violation and typically report to the house owner. If any unauthorized intrusion is detected then the images are sent to the registered mail id. The door can only be opened with a correct password. Here risk of sending false alerts/alarms has reduced.

***Keywords***: Intruder, security system, surveillance.

## I. INTRODUCTION

Nowadays, the society is facing many insecure problems. Insecurity is everywhere and the most vulnerable targets are houses. And the number of intrusion cases is constantly increasing. It is very difficult to prevent intrusion when no one in home. The currently available commercial home security systems are very expensive and unaffordable by many people. Also these commercial home security systems consume more amount of power consumption. Simultaneously it consumes more amounts of data. To overcome these drawbacks we develop the system called smart home security system. The main goal of creating this system is to make cheap alternative [1]. It reduces the power and data consumption. Our proposed system takes images instead of recording videos this improves the quality of images and memory requirement is reduced. By taking images instead of videos we can process and transmit the captured image fast. The suspect can be found easily with images which have good clarity when compared with images. We use array of PIR sensors to detect human activities and send signal if any activities are found to the Raspberry

Pi. The Raspberry Pi captures the image with the help of camera unit. Then the person must enter the password to open the door. The door is unlocked with the help of a servo motor if the password is correct. If the password is wrong then it will not unlock and the images are sent to the authenticated owner of the house. These images can be used to identify the intruder.

## II. PROPOSED SYSTEM

Instead of using a wireless connection we use wired data transfer technique between microcontroller and Raspberry Pi, this reduces a cost. We can use an array (more than 3) PIR sensor to reduce false alarms (like pet animals) [2]. Here the PIR sensors are lined up in both vertical and horizontal positions [5], [6]. We use Web hooker which is used to send the captured image to the user.

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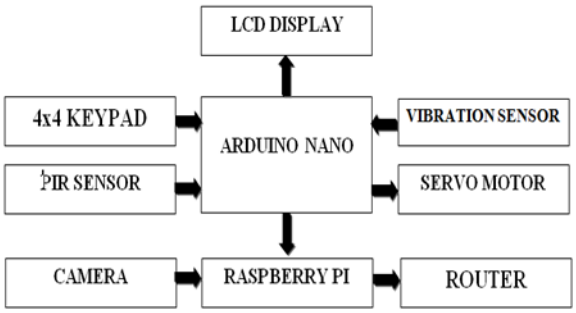
## III. BLOCKDIAGRAM




MODULES:

PIR SENSOR

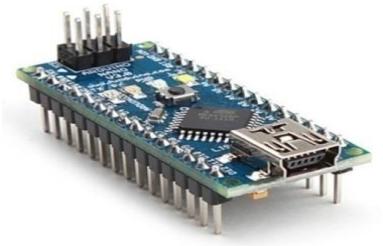
A PIR sensor called as passive infrared sensor is used to find any movements or motion in its range [3]. They do not radiate any energy instead they detect the IR radiation. They can only detect the general movements and they cannot find any nonmoving targets. All objects with a temperature above absolute zero emit heat energy in the form of radiation. The infrared radiations are not visible to the naked eye. A Pyroelectric Sensor and A special lens called Fresnel lens which focuses the infrared signals onto the pyroelectric sensor. HC-SR 501 is the sensor number and it has three pins. VCC, GND and the OUTPUT pins. VCC - is the power supply for HC-SR501 PIR sensor which we connect the 5V. GND - should be connected to the ground of Arduino. OUTPUT - pin is a 3.3V output. LOW indicates no motion is detected, HIGH means some motion has been detected.

In our project the PIR sensor is used to detect the intruders who try to enter the house [4]. The movement of the intruder triggers the PIR sensor and a HIGH output signal of 3.3V is produced. In order to reduce the false alarm we use an array of PIR sensors and this increases the chances of detecting the intruder every time.

ARDUINO NANO

The Arduino Nano is a small, complete board based on the ATmega328P [9]. It has 36 pins in total out of which 14 are digital pins and 9 analog pins. It has 7 power pins and 3 reset pins. It can works on 7-12V DC. It usually works on 5V DC. Digital pins can act as both input and output pins, when used as input they can sense 3.3-5v and can produce an output of 5V. The analog pins can be used as input and output and work on analog voltages. It can accept analog and digital inputs. It has an onboard flash chip memory to store the program. The codes are written on Arduino IDE and are dumped to the board using a Universal Serial Bus.

In our project the Arduino Nano is used to sense the signals from the individual PIR sensor and find the target. The data from the array of sensors allow us to detect the target entering or leaving the house. This signal is sent to the Raspberry Pi.



SERVO MOTOR

A Servomotor is a high torque DC motor used for applications that need high torque applications. It has three wires in RED, ORANGE and BROWN colors. The operating voltage is 5V DC. PWM signals are sent to the servo from the

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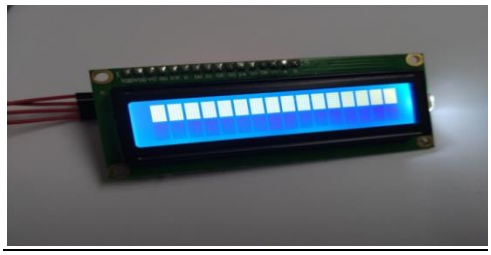
Arduino nano to control the motor. +5 V is applied to the RED wire, BROWN wire is connected to GND and the PWM signals from the Arduino Nano are sent to the ORANGE pin of the servomotor.

In our project the servomotor (SG 90) is used to lock and unlock the door [10]. Because of its high torque it can open the lock.

LCD DISPLAY

A flat panel display that does not emit light directly instead uses a backlight. These types of displays are widely used in low power application. A 16x2 (16 columns and 2 rows) LCD display is the basic display module used in many circuits. It has two 16 character lines and has an LED for backlight. Each character is made up of 5x8 pixel dots. It has 16 pins and out of which 4 pins (1, 2, 15, and 16) are power pins and 8pins are used as data pins (7-14). The operating voltage is 5V DC. The backlight LED illuminates the display in dark places.

In our project the LCD Display (16x2 LCD display) is used to display three states. Ideal state which displays SMART HOUSE, detected state which displays INTRUDER DETECTED and the welcome state which displays WELCOMEOWNER. It is powered by the 5V power pins of the Arduino Nano.



KEYPAD

A keypad is a simple peripheral that is used to get input from the user. The most common type of Keypad is a 4x4 Matrix keypad. It has 4 rows and 4 columns. There are 8 pins 4 for the 4 rows and 4 for the 4 columns. There are 16 individual keys which are numbers from 0-9 and alphabets A, B, C, D and two symbols * and #. When a key is pressed it makes contact with the row and column wires that are places under each key. The keys are parallel and short a row and column wire when clicked.

In our project we use the keypad to get the password from the person who tries to enter the house.


VIBRATION SENSOR

It is a non-directional vibration sensor that detects small vibrations. The device measures the vibrations using the piezoelectric effect. A comparator produces a high output voltage when there are no vibrations. When a vibration is detected then the output voltage of sensor gores low. The sensor output changes based on threshold value set. Threshold value is set using the potentiometer. Minute vibrations can be detected using the vibration sensor.

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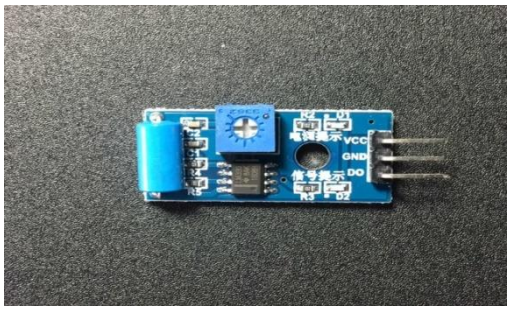
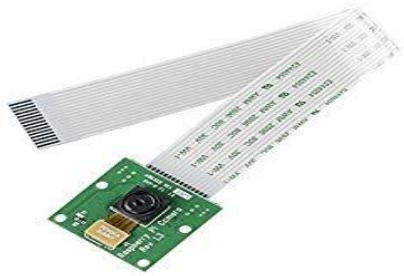
In our project the vibration sensor (SW 420) is used to detect any person who tries to break open the door




CAMERA

The camera module is a light weight portable camera that supports the Raspberry Pi without any additional circuit components. It directly communicates to the Raspberry Pi using MIPI camera serial interface protocol. It is widely used for its low payload compared with that of the USB camera. It is a 5MPcolour camera module without microphone and is an Omni vision 5647camera module. It has a resolution of 2592x1944 and supports 1080p, 720p and 480p. It connects directly to the camera port of the Raspberry Pi through the ribbon cable.

In our project we use the camera module to capture images of the intruder [8].



ROUTER

A router is used in a network that forwards data between computers or devices. The data is usually sent in the form of packets and the routers forward these packets to their destination. Router is connected to data lines and when packets arrive it reads the packet header to find out the destination. Then using the information from routing table then sends the packet to the destination node or to another network.

In our project the router is used to connect the Raspberry Pi to the internet. The images captured by the Raspberry Pi using the camera module are sent to the owner of the house.

RASPBERRY PI

The Raspberry PI is a low cost computer that fits in our pocket. It can be connected directly to computer monitor and can use a keyboard and mouse. It resembles a computer and can run most of the applications that run on a normal computer. It uses an SD card as its hard drive and can be connected to a TV or a monitor through the HDMI port. The Raspberry Pi 3 comes in two modules Module A and the Module B. The Raspberry Pi Module B has on board Wi-Fi and Bluetooth 4.0. It has a Quad-core 64-bit ARM Cortex A53 processor running at 1.2 GHz. So C Broadcom BCM2837. GPU: Broadcom Video Core IV @ 400 M Hz. Has four USB ports a Ethernet port and a HDMI port. It has a 1GB SDRAM.

In our project when the Arduino Nano detects a person it send signal to the Raspberry Pi [7]. The Raspberry Pi then captures the image of

the person and waits for the password. If the password is wrong then the image is sent to the owner of the house. For the correct password the Pi send signal to the controller to open the lock.

SAMPLE OPERATION


SYSTEM MONITORING FOR INTRUDER


AN INTRUDER


SYSTEM DETECTS THE INTRUDER

PERSON ENTERS THE PASSWORD


PASSWORD CORRECT


PIR SENSOR PLACEMENT.

## IV. CONCLUSION

Three PIR sensors are placed inside the room on the door and outside the room. The IR energy emitted by the human being is detected by the two PIR sensors placed outside the room. After detecting human, PIR sensor produces a high voltage (3.3V) detected by the microcontroller. Then the microcontroller sends the signal to the Raspberry pi to capture image using the camera. If person tries to open the door or try to break door without using password then the vibration sensor senses the vibration created by intruder. Then buzzer starts buzzing and the

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images are sent to the house owner. Lock is opened when the person enters correct password. For wrong password the images are sent to owner and lock will not open, buzzer is turned on. The owner receives the images through E-mail.

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