# Theft Prevention System using Raspberry Pi & PIR Sensor

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## Abstract

Theft Prevention system is entirely controlled by Raspberry Pi, which is the heart of this system. PIR has the duty of motion sensing. After motion sensing relays are triggered by Raspberry Pi. Relays are responsible for turning lights ON/OFF. Buzzer will ring simultaneously. System provides a facility of notification to the user through GSM.
**Keywords: Raspbian-Wheezy OS, PHP web page, PIR Sensors, Raspberry Pi**

## I. INTRODUCTION

The proposed system is based on concept of IoT "Everything that is connected to the internet is alive", is going to be the new rule for future. Future is Internet of Things (IoT), world is moving towards it with rapid pace[7]. According to Amol Dhumane [7] objectives of IoT are:

− To build highly interconnected system where devices will be the users of the internet.
− This system should work 'smartly' for the betterment of human beings.
− The system should improve the relationship between the humans and the environment in which they live.

The Internet of Things (IoT) is a novel networking paradigm which allows the communication among all sorts of physical system with the plethora of applications in the fields of applications in the field of domotics, e-health, goods monitoring and logistics, among others [10].

Theft prevention has become very important as there are so many intrusion activities going on worldwide. Recently intruders have become technically advanced creating a fear in peoples 'minds concerning their valuables. This gives arise to continuously monitor one's valuables. Many of the theft detection systems are available to catch the thief, which can be further improved. By using these technologies, in some scenarios, the thief cannot be caught. Even if the thief is caught, victim cannot get back his/her valuable belongings. "Prevention is better than cure". If the theft is being prevented from happening, the person will be at no loss [9].

Most of the home monitoring system has CCTV as its main component and massive computers too. To overcome difficulty of surveillance through CCTV footages, Raspberry Pi a single chip mini-computer this is intelligent enough to capture the footages reducing the size and price.

## II. HARDWARE SPECIFICATIONS

### A. PIR Sensors:

PIR sensors are used to detect any motion. They are able to sense the Infrared radiations. Whenever it detects any motion a binary value '1' is sent to Raspberry Pi, else binary value '0' is sent. PIR works on 5 Volts and 50 mA current. Ideally, it senses the motion up to 12ft, i.e. 4 meters in semispherical angle.
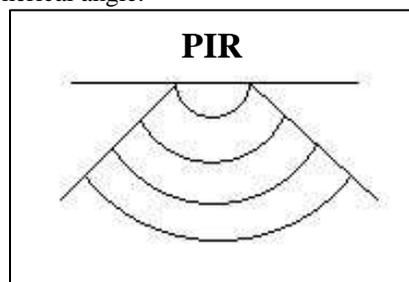


Fig. 2.1: Range of PIR

### B. Relay:

An electromechanical switch called relay which operates as a switch consuming low current and can trigger relatively devices with high current. Relay used in the implemented system is a 5V relay and 5 mA.

### C. Camera:

RPi camera is used to capture the images. Camera used in system is 2MP. RPi camera can be connected to the Raspberry pi board through serial/flex cable. Captured image can be stored in the form of JPEG, PNG, BMP etc. Camera operates on 3.3V.

### D. Buzzer:

Buzzer is used to alert the surrounding. This system uses DC buzzer which operates on 5V and 30mA. It has sound pressure level of 85dB. This DC buzzer has 2.3 kHz frequency. It operates in continuous mode.

### E. GSM SIM 900A:

GSM SIM is used for communication purpose. GSM SIM works on 850/900/1900/1800MHZ frequency. The communication is controlled via AT i.e. attention command. It contains internal TCP/IP protocol stack. It uses MAP protocol to send the SMS. It has voltage range from 3.2-4.8V and it operates on 1.5mA.

## III. SOFTWARE SPECIFICATIONS

### A. PHP (Personal Home Page):

PHP is used for web page development purpose.
    PHP is also used for server side scripting as well as for general purpose programming. HTML and HTML 5 codes can be used in PHP. The codes which is enclosed in delimiters, only that code can executed by PHP interpreter. The code is processed which is outside the delimiter. <?  ?> these are most common delimiter used to open and close PHP sections. Variables in PHP code are followed by '$' symbol.

### B. Python:

Python is open source, high level programming language which is used for general purpose programming. It is also known as most widely used interpreting language. It has great feature of code readability. White spaces are used to delimit the blocks instead of using curly braces. In python syntax is designed in such a way that only fewer lines of code is enough to explain the concept. It supports late binding by binding variable and method name at runtime.

### C. Raspbian Wheezy OS:

Raspberry Pi uses an operating system which is based on Debian Operating System known as Raspbian Operating System. It is the interface which has set of basic programs and utilities which enables Raspberry Pi hardware to run. Raspbian Operating System uses optimized Debian OS which is recommended by Raspberry Pi foundation over other operating system. Raspbian OS has following versions:
1) Raspbian Noobian
2) Raspbian Wheezy
3) Raspbian Jessie
    Raspbian Wheezy supports Command line interface as well as graphical user interface. It supports Debian multimedia which deals with audios, midi and graphics, video. It also provides own cloud interface for storage purpose, it can be accessed through web.  It uses Linux Kernel version 3.16 and GCC 4.9.

## IV. SYSTEM IMPLEMENTATION

The user will activates this proposed system when he will not be present at his home for longer duration. After activation of system, PIR sensor is the only component which is active all the time. It senses radiations continuously and sends signal to Raspberry Pi. Signal is in binary format, i.e. 0 and 1 for motion detection it will send binary value 1; else it will keep on sending value 0 to Raspberry Pi.
    After receiving value 1 from PIR sensor, Raspberry Pi triggers the further functioning. Raspberry Pi is responsible for activating relay module. Relay module is used to turn high voltage devices ON or OFF. Raspberry Pi allows user to turn ON/OFF these devices from remote location through web page. At the same time, Raspberry Pi also activates buzzer to start ringing.
    When lights are turned ON by relay, PiCam captures image of intruder. Captured image is stored on SD card. This image is uploaded on web page GSM module sends a message of intruder alert to user with link of web page in that message.
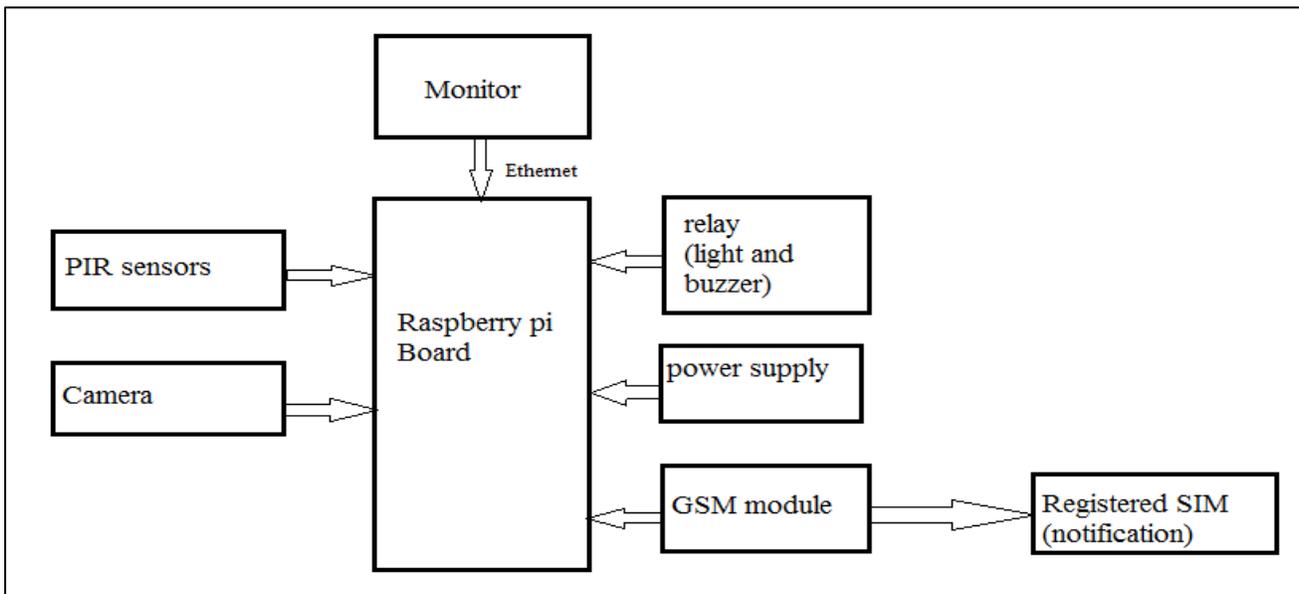System overview is shown in the following figure.

Fig. 4.1: System Architecture

## V. EXPERIMENTAL RESULT
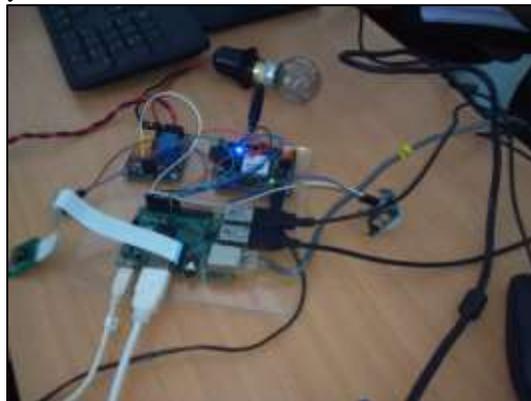
The following image shows Proposed System:



Fig. 5.1: Working System

### A. Scenario 1:



Fig. 5.2: PIR Motion Detection

The above image shows presence of ant intruder. PIR sensors detects the motion done by hand, and the further system functioning is carried out. After motion sensing, relay triggers the bulb to turn ON and buzzers starts ringing as shown in image.
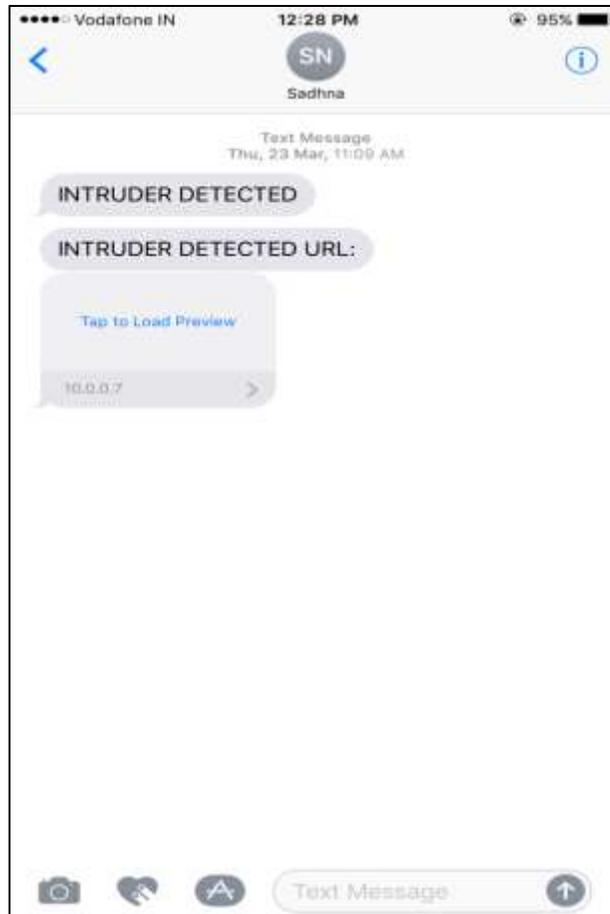
*B. Scenario 2:*



Fig. 5.3: Notification to user

The above image shows screenshot of notification sent on user's mobile phone. This SMS contains link of the webpage containing image of intruder.
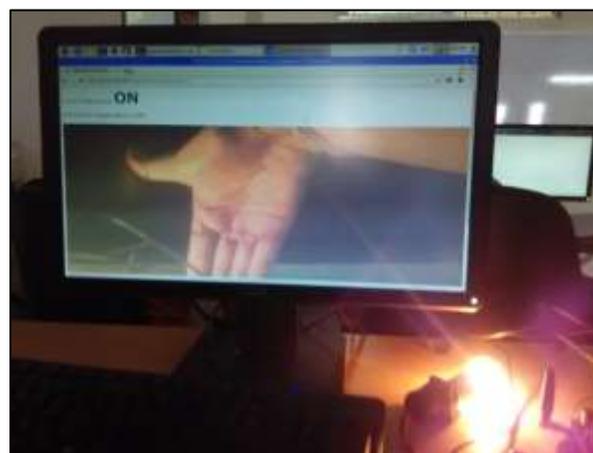
*C. Scenario 3:*



Fig. 5.4: Remote ON/OFF Operation (ON)

The above image shows webpage which is accessed through the browser. Through this webpage user can turn lights ON from any remote location.
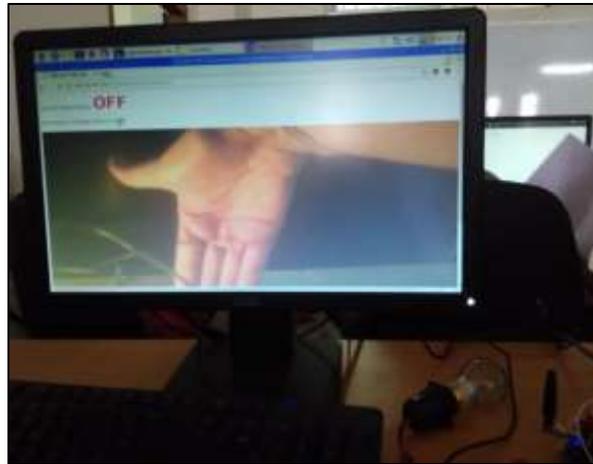
### D. Scenario 4:



Fig. 5.4: Remote ON/OFF Operation (OFF)

The above image shows webpage which is accessed through the browser. Through this webpage user can turn lights OFF from any remote location.

## VI. CONCLUSION

This proposed system serves the solution for theft prevention. It gives us cost effective solution as we can deploy n number of PIR sensors. System is also reliable as we provided battery backup in case of power cut. Captured image can be used as strong evidence for further investigation. Also this system is scalable and flexible. By covering all these objectives we can conclude that system is successfully implemented.

## VII. FUTURE SCOPE

From improvement  point of view we can add new features to existing system such as, providing delay timer to the system so that owner can switch off the system and by using framing techniques video can also be captured as an evidence. We can also notify the nearest police station with location of intruder detection through GSM module. If we want to cover large area through the system we can deploy multiple sensors using multiplexer

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