

# Home based Intrusion Detection System using Balanced Magnetic Switch and Twilio Messaging Service

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**Abstract:** Security has become a major concern these days especially with the burgeoning rate of thefts and crimes. There are roughly 2.5 million burglaries a year all over the world, 66% of which are home break-ins. While majority of these burglaries result in only a small number of valuables being stolen, a sense of insecurity sets in, which can last for years. Installing an electronic security system is also a great way to deter would-be burglars who may decide to pass over a house for an easier target. It is significant to notice that if a few houses in a locality are equipped with security systems, the theft rates bound to decrease in the entire locale. Reports suggest that police are able to solve only 13% of the burglaries reported due to lack of witness or physical evidence. The objective of this paper is to collect such evidences in order to reduce the theft rates. This paper focuses on designing and developing a model of an IoT-Based security system for homes, banks and offices in need of security. The proposed IDS has provision for theft and sends alerts to the user through an Android application and Twilio Messaging Service. It also captures a number of snapshots of the intruder and mails it to the user. When compared to the other existing systems, the leverage obtained by preferring this IDS is that the user receives alerts irrespective of his location and whether or not he is connected to the internet or not. This system also consumes less power as the camera is activated and takes snapshots only in the presence of an intruder, unlike the CCTV system, where live feed is recorded round the clock.

**Keywords:** Intrusion Detection System (IDS), Internet of Things (IOT), Security.

## 1. Introduction

In today's world, security plays an important role to prevent intruders from entering into any confidential areas/Home and provide access to only legitimate person. Studies show that homes without security systems are more likely to be targeted by burglars than those with professionally monitored systems. Hence an "Intrusion Detection System" (IDS) is needed. Security systems are often the first line of defense against break-ins. Today, due to the advancements in technology and in the Internet of Things (IoT), it is possible to envision pervasive connectivity, storage and automation in systems.

The Proposed System, which is stand-alone and wirelessly connected, is modelled for intrusion. It uses mobile phones as a mode of interface to view the alerts, since they have become a

predominant part of our lives and are carried by users all the time. The system is equipped with a Balance Magnetic Switch sensor (BMS) and a Passive Infrared Sensor (PIR). A camera, is used to capture image of the intruder on detection of motion.

The break-in is first intimated to the user through an alert notification by the Android Application. The Twilio Messaging Service is used to send alert message to the user globally irrespective of the user's location and network connectivity. On the whole, the system is compact, low power, economical and intelligent as it is fully automated.

### A. Motivation

Internet of Things (IoT) is a developing technology that is gaining widespread acceptance and popularity in the commercial sector. For achieving a second line of defense against an Intrusion, Intrusion Detection System is required that can detect a third party that tries to exploit the security of the network, even if this attack has not been experienced before. If an intruder is detected soon enough, it can take appropriate measures before any damage is done. Thus, intrusion detection provides a second wall of defense.

### B. Methodology

1. Literature review of various projects/papers on related work Sub Subsection.
2. Study of PIR sensor, BMS sensor, Raspberry pi 3b+ and Android Studio.
3. Interfacing PIR, BMS sensor with Raspberry pi 3b+.
4. Application Design using Android studio.
5. Programing of PIR sensor and BMS sensor

## 2. System design

The smart home security system is made up of the following hardware and software elements.

- Passive Infrared (PIR) sensor
- Balance Magnetic Switch (BMS) sensor
- Raspberry pi 3b+
- Camera
- Piezo buzzer
- Servo motor
- Load cell

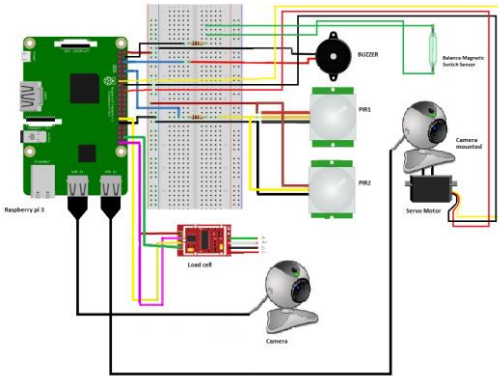


Fig. 1. System architecture

The schematic block diagram of the proposed security system is shown in the Fig. 1. The Raspberry pi 3b+, PIR sensor, BMS sensor, Buzzer, Camera Module, and the Power supply constitute the hardware of the system to be installed at the required place. The PIR, BMS sensors, Load cell and the Buzzer are connected to the GPIO pins of the Raspberry pi 3b+. The Camera Module is inserted in the camera slot and the images are stored in the Raspberry pi 3b+'s memory card.

### 3. Working and flow chart

The working of the entire system can be described by the following operations:

#### A. Motion detection

A motion sensor can be considered as a linchpin of an intrusion detection system as it detects any movement in space. A motion sensor uses one or multiple technologies to detect motion. In the proposed system, we are using BMS sensor and PIR sensor to detect motion. The BMS sensor is mounted on doors and windows and the PIR sensor is placed at the corner of each room. In the initial phase of motion detection, the BMS sensor will detect motion at doors and windows. BMS sensor is a two-part sensor that generates an alarm condition when a change in the magnetic field between the parts is detected. In the second phase, the PIR sensor will detect motion in each room. A PIR sensor detects motion by measuring changes in infrared levels emanated by the surrounding objects. A load sensor is placed at the front door. The load sensor is used for detecting activity at the front door.

#### B. Surveillance system

For monitoring and recording intrusion, a camera will be installed at the front door and the space connecting the room and the hall. The interior camera is mounted on a servo motor. The camera rotates in the direction of intruder and captures image of the intruder. The direction of camera is controlled using the PIR sensor. The front yard camera will turn on and capture image as soon as the load cell will detect a load.

#### C. Alert generation

The proposed system consists of an alert generation system

which is used to notify the occupant of the house/office about intrusion once detected. Twilio messaging service is used to generate text alerts and transmit them to a dedicated phone number once an intrusion is detected. Twilio offers a Messaging Service API for creating a Service and managing the phone numbers, short codes, alpha sender IDs associated with the Service. The android application provided to the user also notifies the user about the intrusion. The system also contains a buzzer for alarming nearby population.

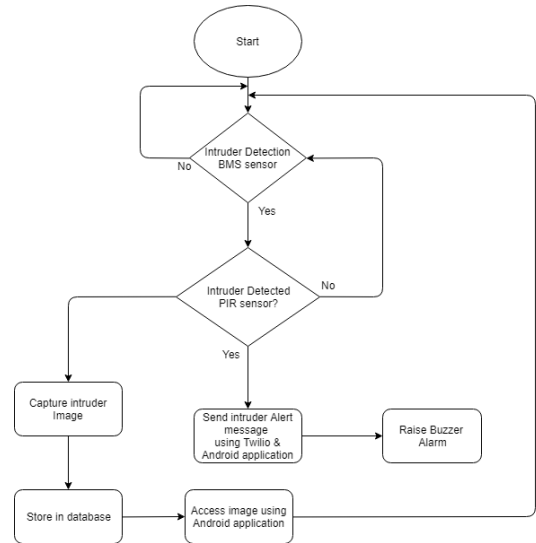


Fig. 2. Flow chart

#### D. Remote server

For monitoring and recording intrusion, an Android application is provided to the user. The data received can be accessed anytime, anywhere by logging into the account in the application. The Android application is provided to access images from database anytime, anywhere when connected to network.

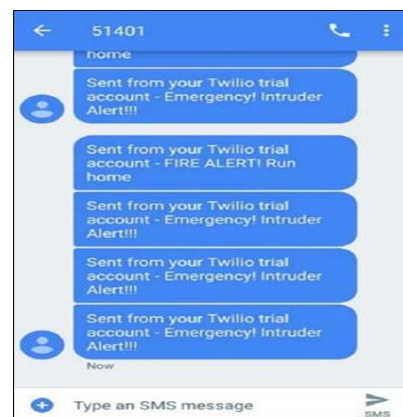


Fig. 3. Twilio message received by the user

### 4. Results

The proposed system implements detecting intruder with wireless sensors and provides automated environment over IoT.

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230
MOTION at WINDOW
1
Intruder at ROOM detected
CAPTURING IMAGE at ROOM...
--- Opening /dev/video1...
Trying source module v4l2...
/dev/video1 opened.
No input was specified, using the first.
--- Capturing Frame...
Skipping 10 frames...
Capturing 1 frames...
Captured 11 frames in 1.18 seconds. (9 fps)
--- Processing captured image...
Disabling banner.
Writing JPEG image to '/home/pi/shared/room.jpeg'.
241
Intruder detected at hall
CAPTURING IMAGE at HALL...
--- Opening /dev/video1...
Trying source module v4l2...
/dev/video1 opened.
No input was specified, using the first.
--- Capturing Frame...
Skipping 10 frames...
Capturing 1 frames...
Captured 11 frames in 1.16 seconds. (9 fps)
--- Processing captured image...
Disabling banner.
Writing JPEG image to '/home/pi/shared/hall.jpeg'.
241
Normal condition ..
11750
Visitor Detected..!!
Capturing image...
--- Opening /dev/video0...
Trying source module v4l2...
/dev/video0 opened.
No input was specified, using the first.
--- Capturing Frame...
Skipping 10 frames...
Capturing 1 frames...
Captured 11 frames in 1.04 seconds. (10 fps)
--- Processing captured image...
Disabling banner.
Writing JPEG image to '/home/pi/shared/visitor.jpeg'.
236
Normal condition ..
    
```

Fig. 4. Motion detected log

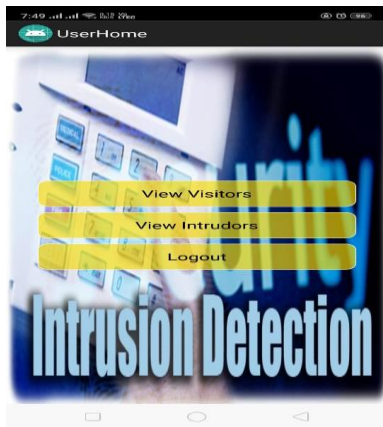


Fig. 5. Android Application interface

## 5. Conclusion

The system incorporates security along with automation using IoT. The proposed system enhances security by limiting user's interaction with outside world. The security module successfully sends alerts upon detecting intruder using wireless sensors, also owner can successfully automate environment through app thus enabling owner to simplify complex tasks, enhance convenience and comfort, save energy efficiently, access and use home systems anywhere and enjoy completely security.

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