

Home Intrusion Detection using IoT

Deepthi Sunkara¹ Likhitha Sai Rajarajeswari Thulluri² Chandrika Talla³ Naga Bhavani Vinnakota⁴ Mr. Santhosh Kumar Peketi⁵

^{1,2,3,4}UG Student ⁵Assistant Professor

^{1,2,3,4,5}Department of Electronics & Communication Engineering

^{1,2,3,4,5}Vasireddy Venkatadri Institute of Technology, Nambur (V), Guntur (dist), Andhra Pradesh, India

Abstract— Internet of Things or IoT in short, is the idea of making devices and objects smarter by linking them to the internet. IoT has promising applications for smart home, wearable devices and more. The primary objective of this project is to reduce human work by designing and implementing a security system named as Intrusion Detection System (IDS) [1] that offers controllability through a hand held mobile phone and PC by means of IoT. Our project proposes security system using IoT environment which intimates intrusion in Home, Bank, Airports, Offices, University or any location and typically report to the administrator. The leverage obtained by preferring this system over similar kind of existing systems is that the alerts send by the Wi-Fi connected microcontroller managed system can be received by user at any distance.

Key words: IoT, Intrusion Detection System (IDS)

I. INTRODUCTION

As a part of today’s scenario, safety and security plays a crucial role. The purpose of home intrusion detection is to detect the intruders and provide security using sensors by programming an embedded chip namely, a microcontroller. An Embedded system is one of the biggest domains which control many of the common devices. These systems are designed to do a specific task, unlike general-purpose computers. Embedded systems are more preferred for real-time applications and have a specific operating system at times. These devices can communicate to internet or a cell-phone network, extending its applications in the domain of Internet of Things (IoT). IoT is a technology that transforms everyday physical objects into an eco-system that would enrich our lives and makes it simpler. The most popular platforms used for IoT applications are Raspberry Pi and Arduino. Raspberry Pi is a complete Linux computer that can provide all functionalities of a computer/laptop, at an even low consumption level. On comparison with Arduino board, Raspberry Pi is a fully functional Linux computer whereas Arduino is only a micro controller reducing the task of programming and improving efficiency by optimization. This work developed system, which is organised by integrating Raspberry Pi with a Picamera and a PIR sensor module establishing a wireless network by transmitting images of trespasser via email.

II. WORK FLOW

The purpose of this work flow is to know the outline of the ongoing process.

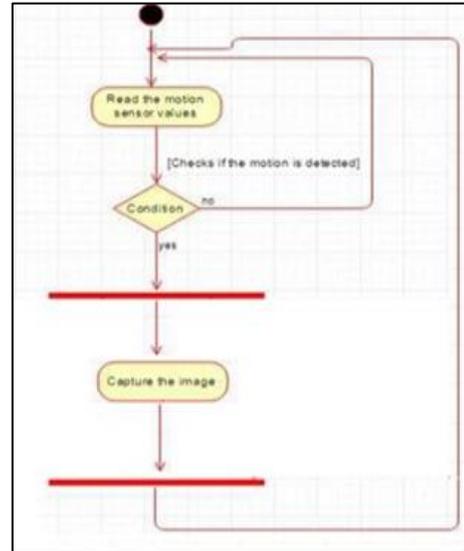


Fig. 2.1: Design Flow of Ongoing Process

In the above process is an infinite flow that starts from a circle. The PIR sensor shown in the rectangular box is used to detect motion. The condition in a diamond box checks the value obtained from the sensor and processes the flow. If no motion is detected the sensor starts detecting and if motion detected, an image is captured and the process is repeated.

III. BLOCK DIAGRAM

In support to the aim of the project in order to avoid malicious activities, a low cost system is implemented as shown below.

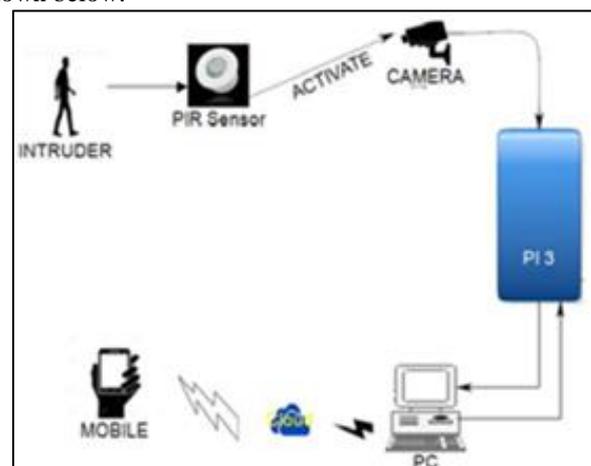


Fig. 3.1: Block Diagram of Home Intrusion Detection

When an intruder is detected by the motion sensor, it activates the camera module to capture the image of the intruder. As the camera module is interfaced to the RPi, the captured image is sent to the authorized user via email which can be accessed by the user through a mobile or a PC.

IV. COMPONENT SET

This includes RPi, PIR sensor, Picamera module.

A. Raspberry Pi

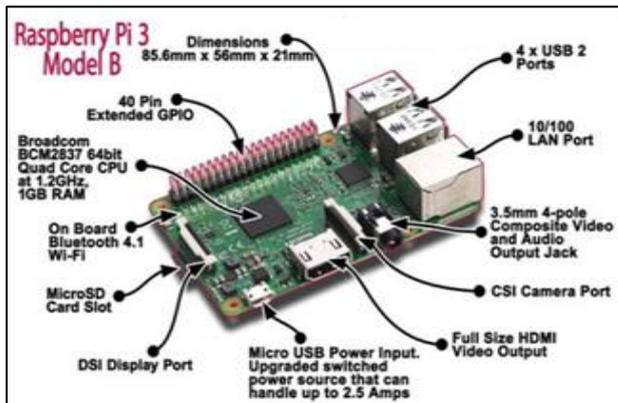


Fig. 4.1: Raspberry Pi 3 Model B along with its Specifications

Raspberry Pi is a series of small single-board computer of credit-card sized and represent the standard mainline form-factor [2]. There are different generations of RPi with its first generation released in February 2012. The above RPi3 model B was released in February 2016 with increased compatibility and features. A specific Raspbian OS was developed, a Debian-based Linux OS for its operation, as well as has capability of operating with third-party Ubuntu, Windows 10 IoT Core, RISC OS with main programming language as Python.

B. PIR Sensor

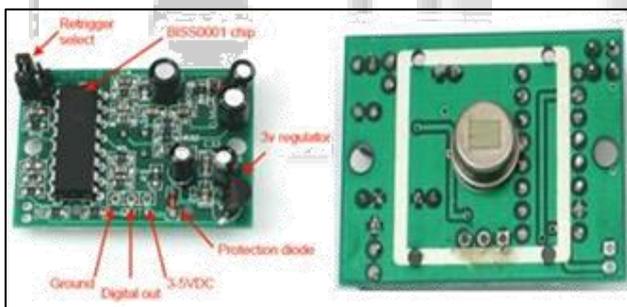


Fig. 4.2: External view of PIR Sensor

They are often referred to as PIR, “Passive Infrared”, “Pyroelectric”, or “IR motion” sensors. The PIR sensor works detecting the level of infrared rays. This has two slots; each slot is made of a special material that is sensitive to IR. In idle case, 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 passes by, it first intercept 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 resulting in generation of negative differential change[3]. This swinging from positive to negative change results in the detection of motion.

C. Picamera Module



Fig. 4.3: Picamera Module

The Raspberry Pi camera module can be used to take high-definition video, as well as stills photographs [4]. The camera consists of a small circuit board, which can be connected to the RPi camera serial interface bus connector via a flexible ribbon cable. This camera has a resolution of five megapixels with full resolution of 2592×1944 and a video resolution of 1080p30.

V. LANGUAGE USED

A. Python

Python is a powerful open source programming language developed by a Dutch programmer Guido Van Rossum in the year 1991, named as Python after watching Monty Python’s Flying circus. It is a high-level language, helping the programmer to concentrate on what to do rather than how to do. Python is an interpreted language [5] that compiles sequentially and generates a byte code which supports the code to run on any kind of computer.

VI. RESULTS

The PIR sensor and Picamera are interfaced to RPi board as shown below. PIR sensor is connected to the 40 pin GPIO connector and Picamera is interfaced to camera serial interface (CSI) bus connector.

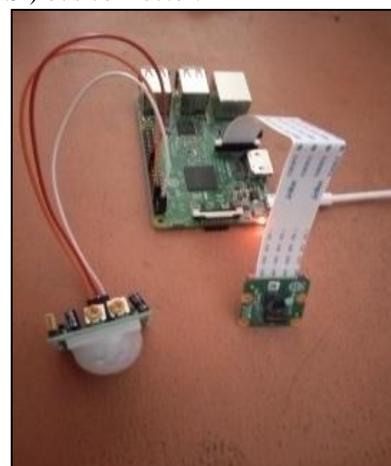


Fig. 5.1: Experimental Setup

When the intruder approaches the PIR sensor as shown in the below image.



Fig. 5.2: Image of Intruder near PIR Sensor

The PIR sensor detects an object moving in its field view, an image is captured by Picamera which is stored in RPi and mailed using SMTP [6] protocol with the help of Wi-Fi. The sent mail would appear as shown below.

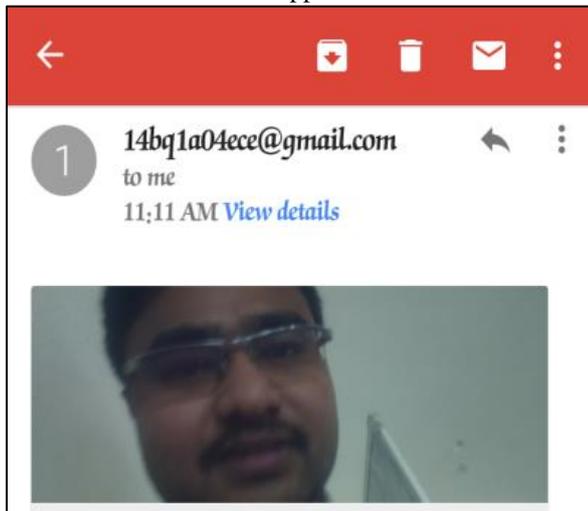


Fig. 5.3: Screenshot of Mail with Intruder Image

VII. CONCLUSION

The fast growing technological enhancement has pros and cons. Safety and security plays a key role to avoid any adverse effect caused by filching. Intrusion detection is implemented for surveillance and is of low cost, saves large amount of power. There are many applications of intrusion detection apart from home surveillance; it can replace CC surveillance where the cost of investment is low. A manager can employ it to identify invaders entering a private area such as near to his locker. Similarly this can also be used by cashiers in banks, shopping malls etc.

REFERENCES

- [1] <http://www.excite.com/content/home-security/intrusion-detection-systems>
- [2] <http://www.efxkits.com/blog/raspberry-pi-technology-with-applications/>

- [3] <https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor?view=all>
- [4] <https://projects.raspberrypi.org/en/projects/getting-started-with-picamera/3>
- [5] <https://docs.python.org/2/library/email-examples.html>
- [6] <https://www.geeksforgeeks.org/simple-mail-transfer-protocol-smtp/>