

IoT Based Home Security

Saurabh Manjarekar¹, Sumit Rathod², Rafiq Siddhiqi³, Israkkhan Pathan⁴, Milind Kale⁵

Student, Department of Computer Engineering, Sinhgad Institute of Technology, Lonavala, India^{1,2,3,4}

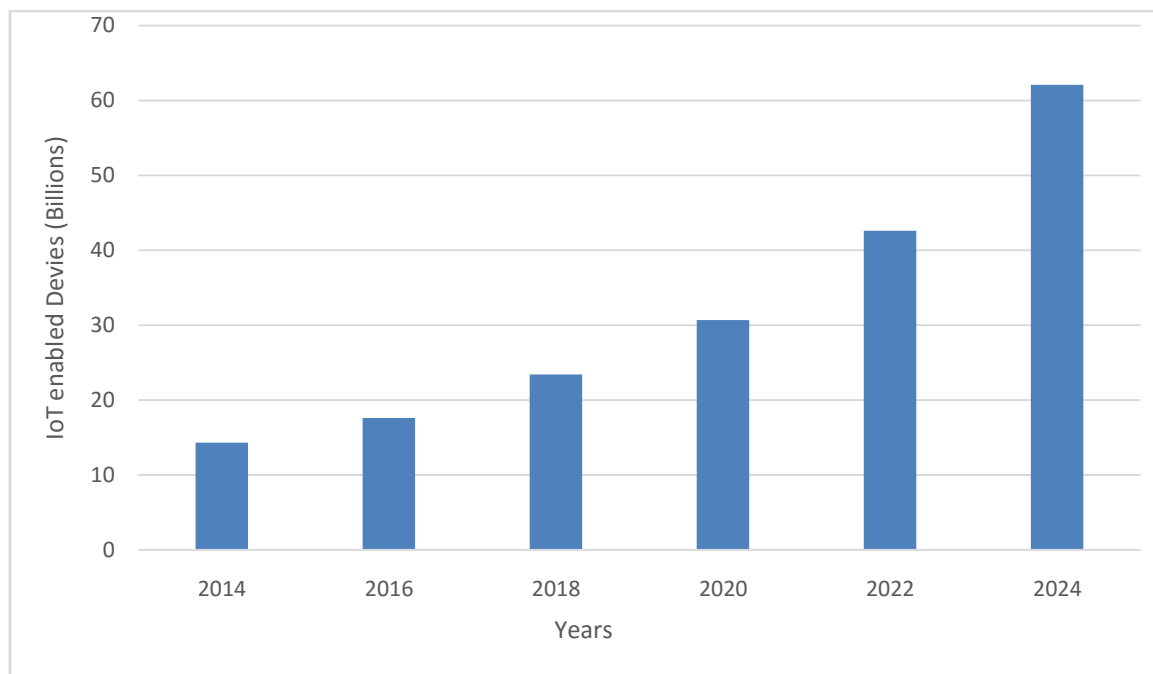
Professor, Department of Computer Engineering, Sinhgad Institute of Technology, Lonavala, India⁵

Abstract: Internet of Things (IoT) gives us the idea of remotely connecting and monitoring real world objects (things) through the Internet. This paper presents the design and implementation of an IoT-based Smart Home Security system for monitoring the surroundings based upon the real time tracking of Objects using OpenCV which is implemented on Raspberry Pi 3B development board, that can be used in homes and societies. Furthermore, this system can be used to report to the home security service provider immediately when a trespass occurs.

Keywords: Internet of Things(IoT), OpenCV, Raspberry Pi, Security.

I. INTRODUCTION

The Internet of Things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data. Each thing is uniquely identifiable through its embedded computing system but is able to inter-operate within the existing Internet infrastructure. The number of online capable devices increased 31% from 2016 to 8.4 billion in 2017. Experts estimate that the IoT will consist of about 30 billion objects by 2020. It is also estimated that the global market value of IoT will reach \$7.1 trillion by 2020.



The IoT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention. When IoT is implemented using sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also includes technologies such as smart homes, intelligent transportation and smart cities.

The Internet of Things is the network of smart objects which are connected to a common network path in order to communicate and exchange data. The network path can be interconnected or interconnected with the "smart objects" being either embedded software, hardware or any sensor. It refers to the state where the things will have more and more data and information associated with them and have a ability to communicate, produce new information and become the integral part of the free world wide web. Nowadays, there is a growing demand of security and intelligent systems

so that it leaves us with less human intervention and smart decision making devices. With the growing demand, comes the growing competition which has forced the competitors to come out with more intelligent, efficient as well as user friendly security solutions. This has made our lives easier and stress free.

II. ENVIRONMENT SETUP

A. Components required

- 1) Raspberry pi 3B
- 2) Raspberry pi camera
- 3) USB Cable
- 4) Memory card
- 5) Open CV(Software)
- 6) Raspbian OS (Software).

B. Raspberry Pi 3B

- SoC: Broadcom BCM2837.
- CPU: 4× ARM Cortex-A53, 1.2GHz.
- GPU: Broadcom VideoCore IV.
- RAM: 1GB LPDDR2 (900 MHz).
- Networking: 10/100 Ethernet, 2.4GHz 802.11n wireless.
- Bluetooth: Bluetooth 4.1 Classic, Bluetooth Low Energy.
- Storage: microSD.
- GPIO: 40-pin header, populated.
- Ports: HDMI, 3.5mm analogue audio-video jack, 4× USB 2.0, Ethernet, Camera Serial Interface (CSI), Display Serial Interface (DSI).

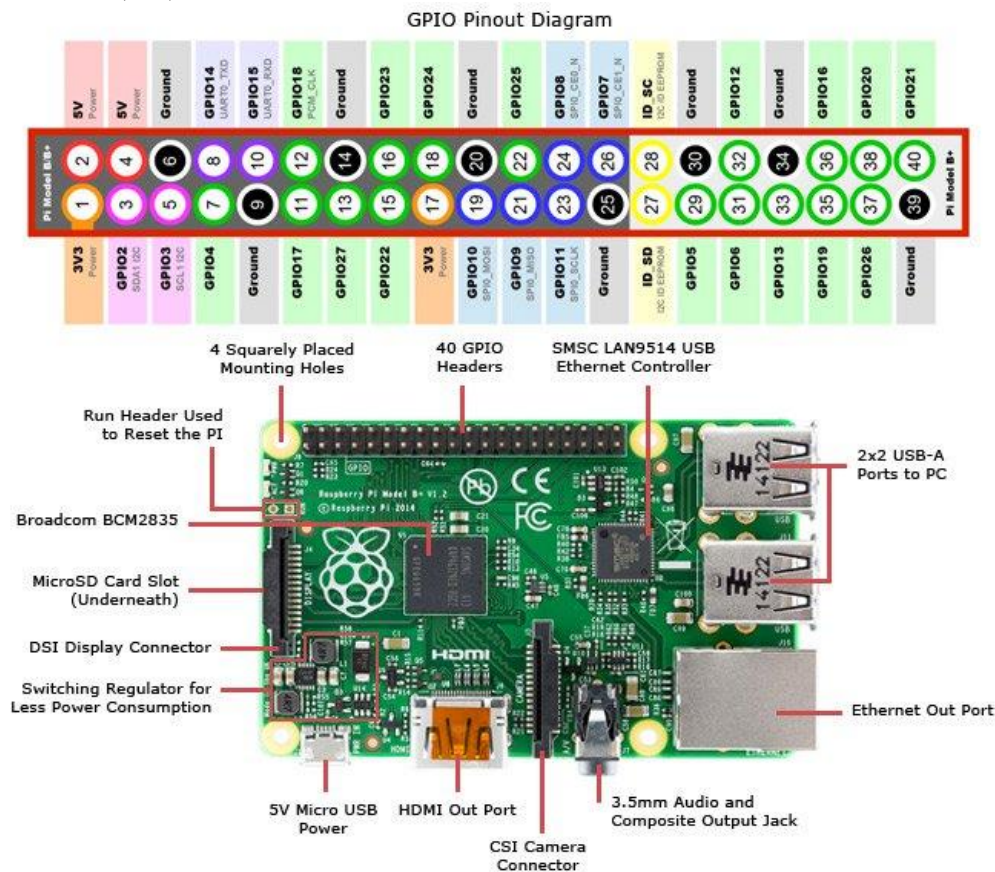


Fig. 1. Raspberry Pi 3B

C. Setup

The raspberry pi camera is connected on the raspberry pi 3B via a dedicated slot. The board is powered up by external 5V and 2.5A adapter. The raspberry pi is booted with Raspbian OS. Open CV is installed on Raspbian OS through commands on terminal. The board is programmed to have access to the local Wi-Fi.

III.IMPLEMENTATION DETAILS

Fig 2. Shows the Flow of the given security system. We interfaced the display of Raspberry pi to Computer system via VNC server. We firstly installed the raspbian OS into the raspberry Pi. Raspbian OS is based on Linux. Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run. However, Raspbian provides more than a pure OS: it comes with over 35,000 packages, pre-compiled software bundled in a nice format for easy installation on your Raspberry Pi. The initial build of over 35,000 Raspbian packages, optimized for best performance on the Raspberry Pi.

After the installation of Raspbian on raspberry pi we then installed OpenCV which was used to recognize the objects detected in camera feed. Object Detection using Haar feature-based cascade classifiers is an effective object detection method. It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images. Here we will work with object detection. Initially, the algorithm needs a lot of positive images (images of faces) and negative images (images without faces) to train the classifier. Then we need to extract features from it. We had three types of classifiers for face, half body and full body detection using xml classifiers.

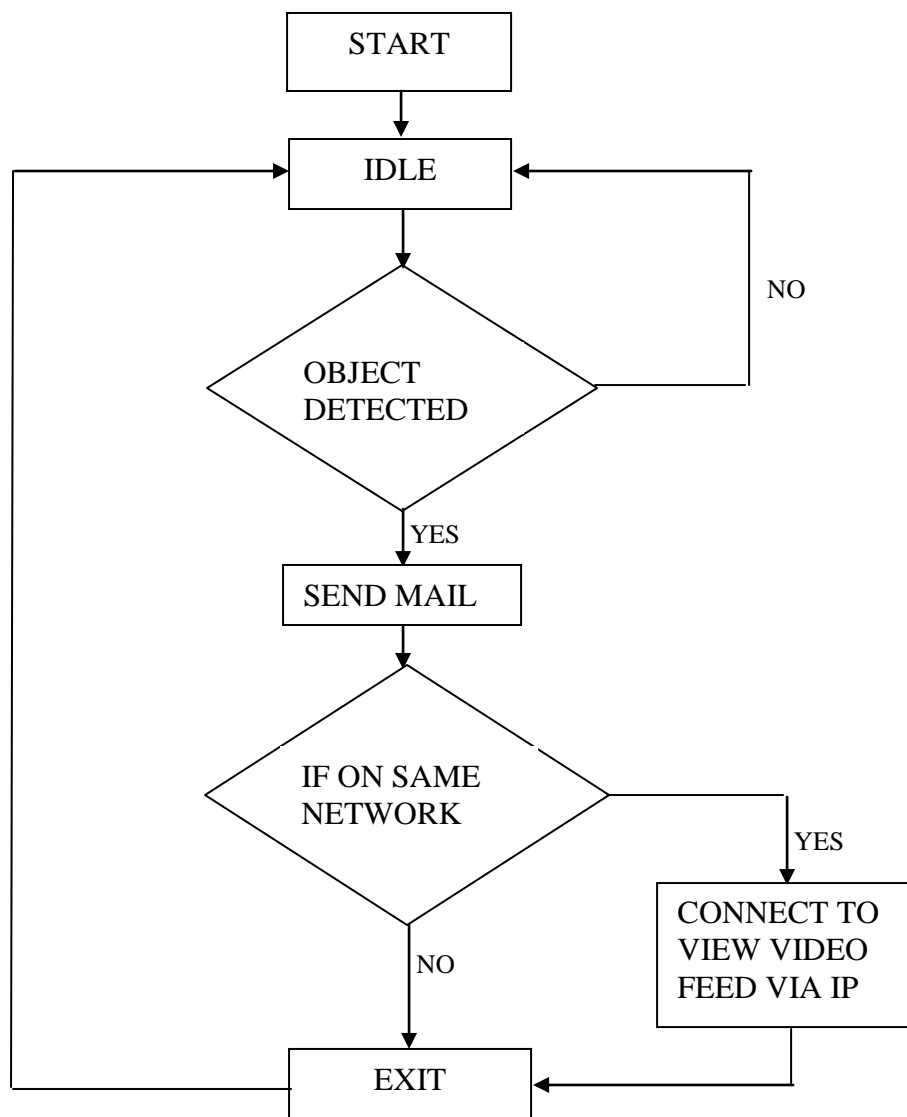


Fig. 2. Flow Chart of Security System.



IV. CONCLUSION

In this paper, we discuss the functions of Smart security system and home network system. We implemented the notification system utilizing the object recognition functions. There are several advantages. For example, it allows the user to operate system conveniently. Currently, the system is limited in that only one camera device can be usable. In the future, voice recognition and face recognition functionalities can be augmented to strengthen the security system more. We expect that smart bell systems can be spread to each household and it is expected to be developed to enable control using smart wear.

REFERENCES

- [1] Woo-Hyun Park, Yun-Gyung Cheong, "IoT Smart Bell Notification System : Design and Implementation", 2017.
- [2] Jasmeet Chhabra, Punit Gupta "IoT based Smart Home Design using Power and Security Management" 2016.
- [3] Ravi Kishore Kodali, Vishal Jain, Suvadeep Bose and Lakshmi Boppana, "IoT Based Smart Security and Home Automation System" 2016.
- [4] <https://en.wikipedia.org/wiki/OpenCV>
- [5] https://docs.opencv.org/3.0-beta/doc/py_tutorials/py_tutorials.html
- [6] https://en.wikipedia.org/wiki/Internet_of_things