Anti-Theft System Using Raspberry Pi and Raspberry Pi Camera Module

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1.Introduction

Anti-Theft System Using Raspberry Pi and Raspberry Pi Camera:

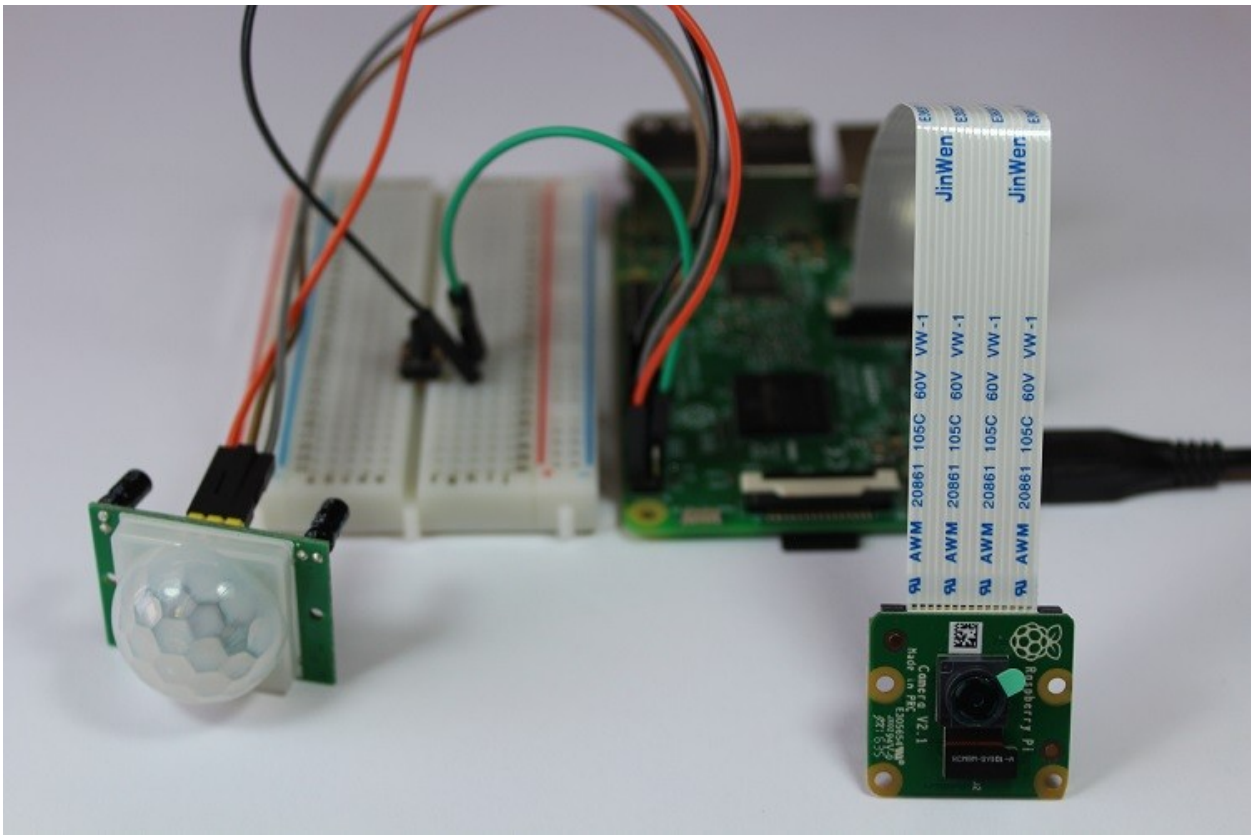
This project shows how to take photos with a Raspberry Pi when motion is detected. It can be used as a anti-theft system, to capture a picture of the theif . We'll be using a Raspberry Pi V2 camera, and the code will be written in Python programming language.

Raspberry Pi has always been fun and easy to build projects. Its powerful ARM architecture and open-source Linux based Operating System has helped us a lot in getting our projects online in no time. In this tutorial we will learn another interesting way to **share data (files/photos/videos/audios/text) between Raspberry Pi and our Mobile phone through a popular chat application called Telegram**. By this we can send the captured picture of thief to the users mobile phone

For those who are new to Telegram, it is a chat based application available in play store for Android (also available for Iphone and windows) that is very similar to Whatsapp. It has over 100 million downloads (as on 5-10-2017) on play store and people claim it to be faster and more functional than Whatsapp (fingers crossed). One special features of this application is that they support bots. Meaning this smart phone application can not only be used by Humans but also by machine. In our case the machine will be Raspberry Pi. Once you train Raspberry Pi on how to act as a bot, anyone (if you make it public) can chat with your Raspberry Pi like chatting to any normal person and even share Photos Pictures Documents and Audio files. You can even train it to be your own Personal assistant, sounds cool right? Lets learn how to build a **Raspberry pi telegram bot**.

2.Project Overview

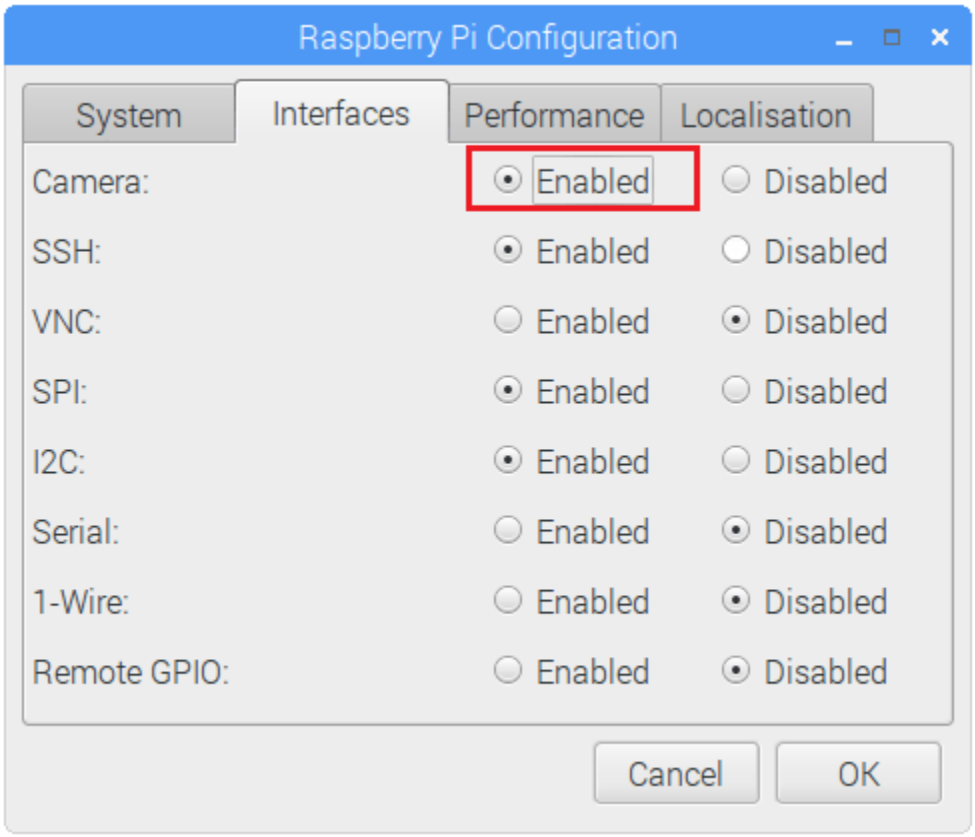
The circuit for this project consists of a PIR motion sensor, a pushbutton, and a camera module you'll connect to your Pi. The pushbutton is an extra component that allows you to stop the Python script.



To program the Raspberry Pi we'll be using a Python script and the built-in picamera library, which makes it very simple to control the camera. To control the GPIOs we'll be using the gpiozero library that contains classes for most popular components like pushbuttons, LEDs, motion sensor, etc.

Enable the Camera:

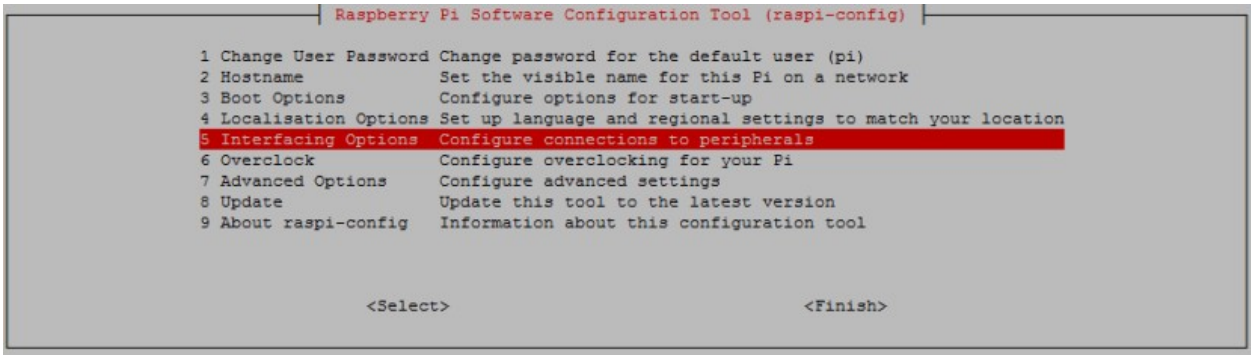
You need to enable your Raspberry Pi's camera software before you can use the camera module. In the desktop environment, go to the main menu and select **Preferences** > **Raspberry Pi Configuration**. Select the **Interfaces** tab and a window as shown below should open.



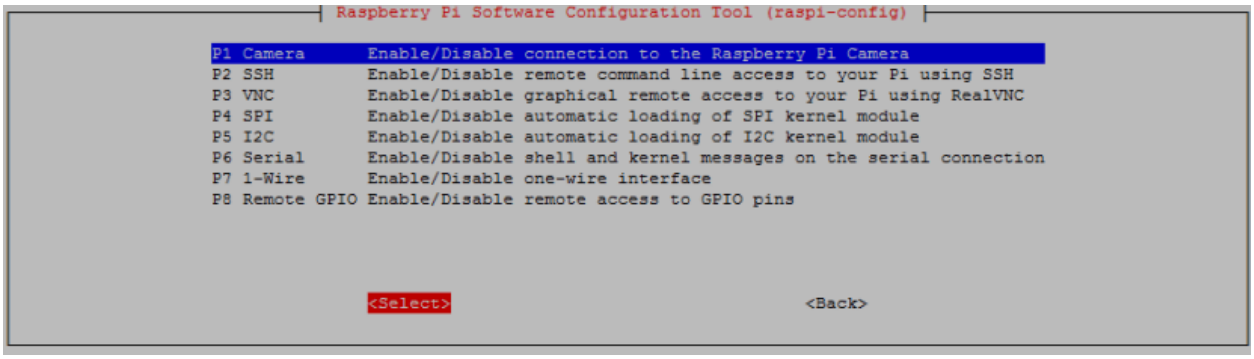
Alternatively, in the Terminal window, type the following command:

pi@raspberry:~ $ **sudo raspi-config**

You should see the Raspberry Pi software configuration tool. Select the **Interfacing Options**:

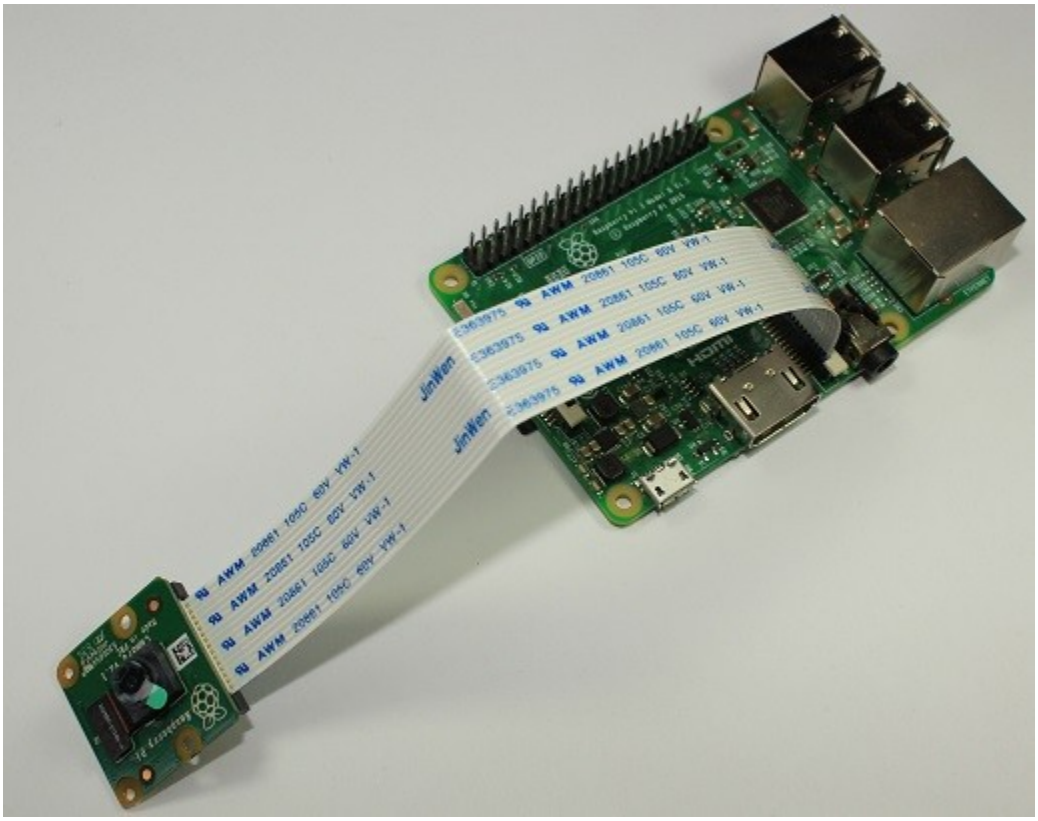


Enable the camera and reboot your Pi:



Connect the Camera:

With the camera software enabled, shut down your Pi and then connect the camera to the CSI port. Make sure the camera is connected with the blue letters facing up and oriented as shown in the following figure. Then start up your Pi again.



3.Components Used

3.1 Raspberry Pi

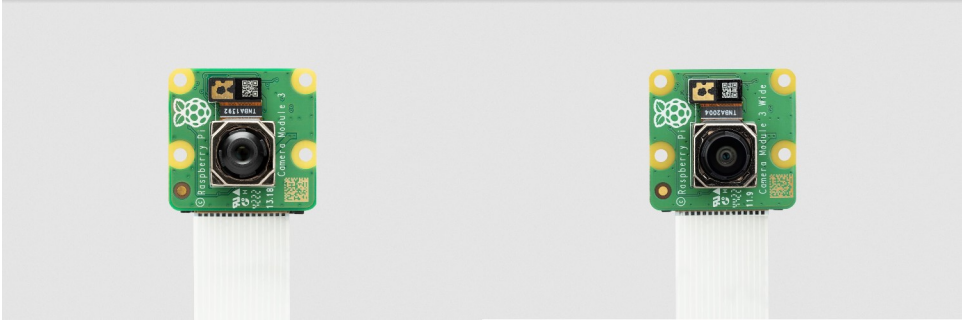
The Raspberry Pi is a low cost, **credit-card sized computer** that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games.

What's more, the Raspberry Pi has the ability to interact with the outside world, and has been used in a wide array of digital maker projects, from music machines and parent detectors to weather stations and tweeting birdhouses with infra-red cameras. We want to see the Raspberry Pi being used by kids all over the world to learn to program and understand how computers work.

3.2 Raspberry Pi Camera

There are now several official Raspberry Pi camera modules. The original 5-megapixel model was released in 2013, it was followed by an 8-megapixel Camera Module 2 which was released in 2016. The latest camera model is the 12-megapixel Camera Module 3 which was released in 2023. The original 5MP device is no longer available from Raspberry Pi.

All of these cameras come in visible light and infrared versions, while the Camera Module 3 also comes as a standard or wide FoV model for a total of four different variants.



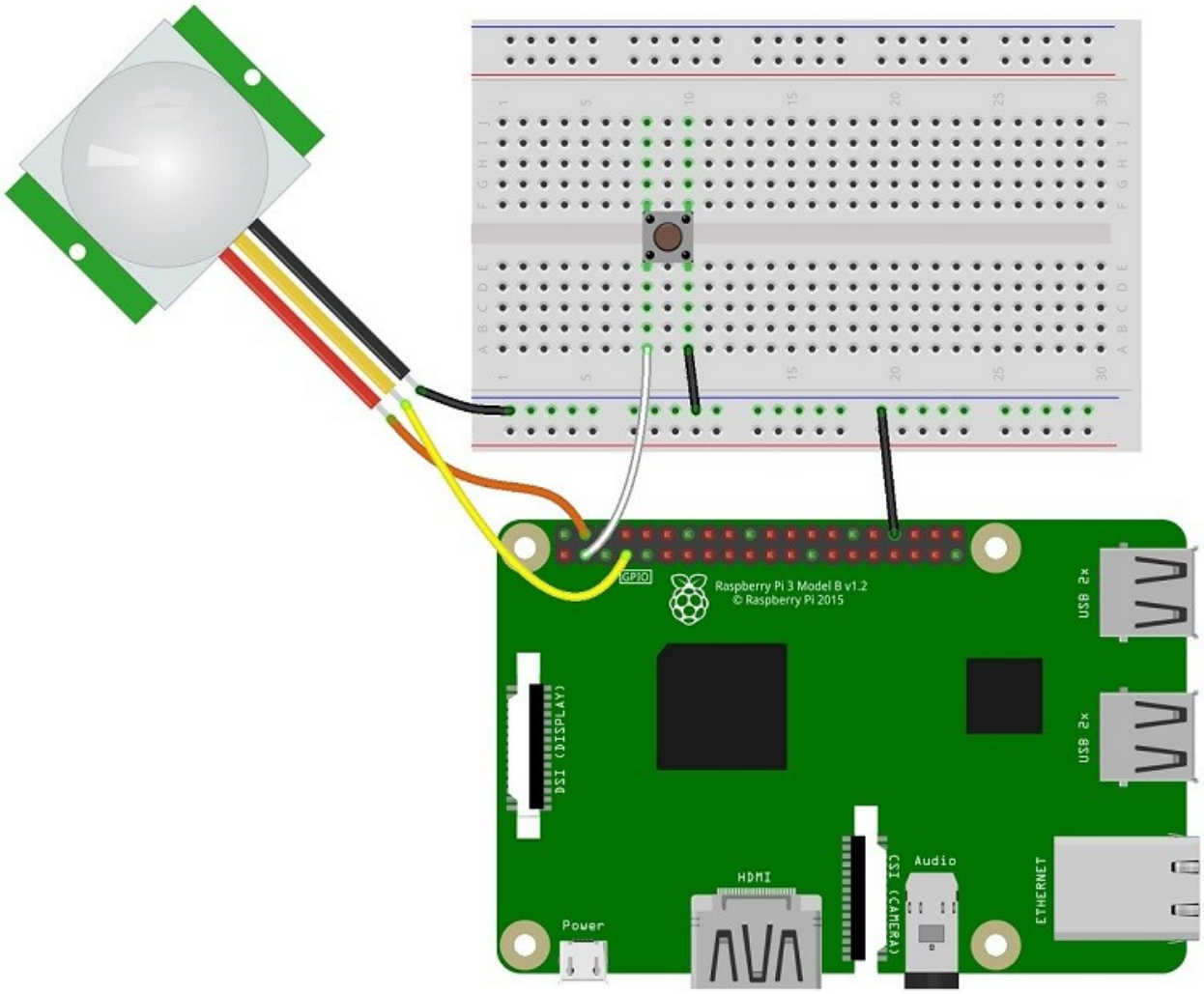
3.3 PIR Sensor

sensor is an electronic sensor that measures infrared light radiating from objects. PIR sensors mostly used in PIR-based motion detectors. Also, it used in security alarms and automatic lighting applications. The below image shows a typical pin configuration of the PIR sensor, which is quite simple to understand the pinouts. The PIR sensor consist of 3 pins,

- Pin1 corresponds to the drain terminal of the device, which connected to the positive supply 5V DC.
- Pin2 corresponds to the source terminal of the device, which connects to the ground terminal via a 100K or 47K resistor. The Pin2 is the output pin of the sensor. The pin 2 of the sensor carries the detected IR signal to an amplifier from the
- Pin3 of the sensor connected to the ground.

4.Circuit Diagram and Connections

With the camera connected, follow the next schematic diagram to wire the rest of the circuit.



- **Pushbutton**: GPIO 2
- **PIR motion sensor**: GPIO 4

Note: the PIR motion sensor we're using in this project should be powered using the 5V pin. Other sensors required 3.3V to operate. Read your sensor's specifications before wiring the circuit.

5.Source Code

import telepot

from picamera import PiCamera

```
import RPi.GPIO as GPIO
import time
from time import sleep
import datetime
from telepot.loop import MessageLoop
from subprocess import call
PIR = 4
camera = PiCamera()
camera.resolution = (640, 480)
camera.framerate = 25
GPIO.setwarnings(False)
GPIO.setmode(GPIO.BCM)
GPIO.setup(PIR, GPIO.IN)
motion = 0
motionNew = 0

def handle(msg):
    global telegramText
    global chat_id

    chat_id = msg['chat']['id']
    telegramText = msg['text']

    print('Message received from ' + str(chat_id))

    if telegramText == '/start':
    bot.sendMessage(chat_id, 'Security camera is activated.')#Put your welcome note here
```

```
    while True:
    main()


bot = telepot.Bot('6192391146:AAHYn7znPSjTrXP1RTWTNlQwNXOghqj622E')
bot.message_loop(handle)

def main():
    global chat_id
    global motion
    global motionNew

    if GPIO.input(PIR) == 1:
    print("Motion detected")
    motion = 1
    if motionNew != motion:
    motionNew = motion
    sendNotification(motion)


    elif GPIO.input(PIR) == 0:
    print("No motion detected")
    motion = 0
    if motionNew != motion:
    motionNew = motion

def sendNotification(motion):
```

```
    global chat_id


    if motion == 1:
    filename = "./video_" + (time.strftime("%y%b%d_%H%M%S"))
    camera.start_recording(filename + ".h264")
    sleep(5)
    camera.stop_recording()
    command = "MP4Box -add " + filename + '.h264' + " " + filename + '.mp4'
    print(command)
    call([command], shell=True)
    bot.sendVideo(chat_id, video = open(filename + '.mp4', 'rb'))
    bot.sendMessage(chat_id, 'The motion sensor is triggered!')


while 1:
    time.sleep(10)
```

6.Connecting With Telegram bot

Material Required:

1. Any Raspberry Pi connected to Internet
2. A mobile running Telegram Application.

There is not much hardware involved in this project so relax on your chair with your Pi and **follow the steps below**. If you are new to Raspberry Pi then follow our Raspberry Pi Introduction article and other Raspberry Pi Tutorials.

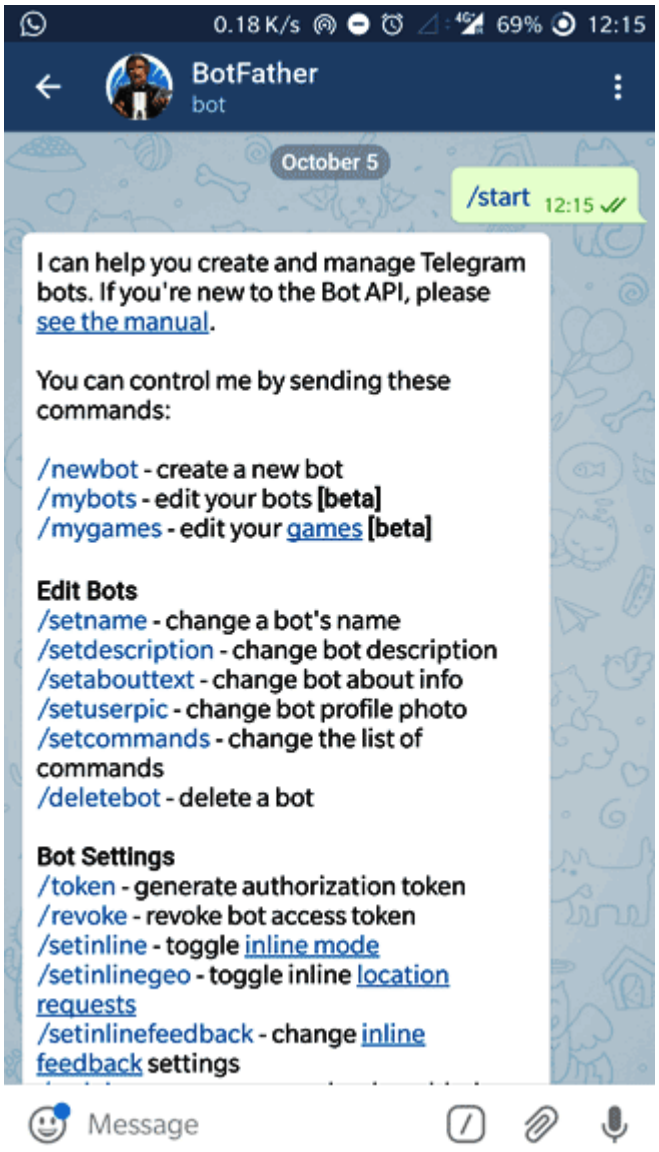
Note: This tutorial assumes that your Pi is already connected to internet and you know how to use the Lx terminal on you Pi. So connect your Pi to internet before proceeding.

Step 1: Installing Telegram on your Mobile

The first step would be to install Telegram on your Mobile. Telegram is available for Android, IOS and even for Windows platform so just go ahead and download your Telegram application. Just like all application there will be a small Sign Up procedure to start using Telegram, continue with it until you reach your home screen.

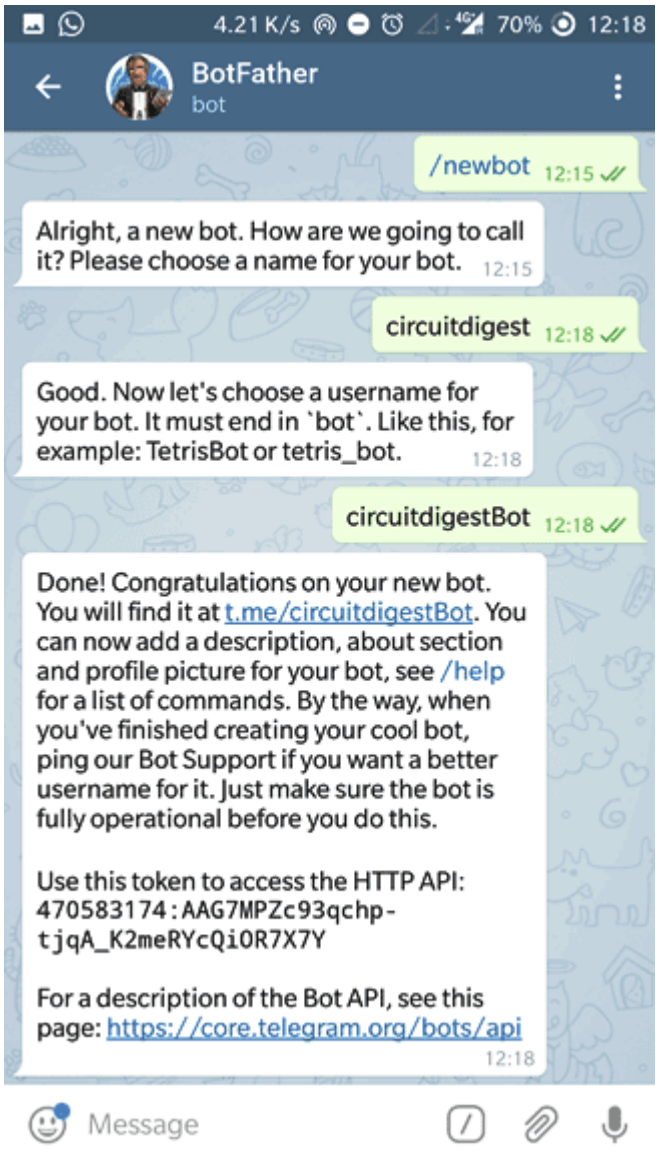
Step2: Talk to Bot Father

The next step would be to request the Bot Father to create us a new Bot. On the top right corner of the Home screen there will be a search icon, click on it to search for the name “botfather”. Botfather is a Bot by itself, it will guide you to create a new bot for you. Click on **start** and select **/newbot** as shown in the picture below. Now, the bot will ask for few details like name of your Bot and the user name of the bot. Fill those details and remember the username for we will needing it in future.



Step3: Getting your token for access

I have named bot as circuitdigest and the username as circuitdigestBot. After this process the botfather will give you a Token for access. This is like the password for your bot, people can control program your bot using this token key. So keep it safe and do not share it with anyone. Once you have received this token key it is time to move on to Raspberry Pi.



Step4: Telepot for installing Telegram on Raspberry Pi

Using Telegram Bot in Raspberry Pi is made possible by the python package called Telepot. We need to install this package on Raspberry Pi by using the following commands on Lx terminal

```
sudo apt-get install python-pip
sudo pip install telepot
```

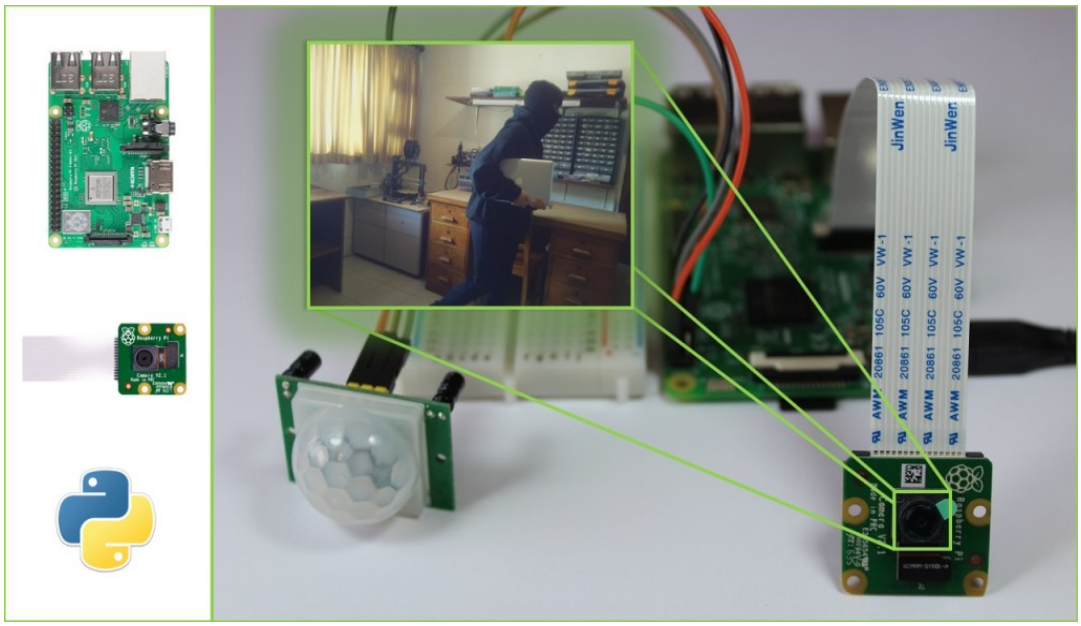
Once Telepot is imported into Raspberry we can use this package in our python program to communicate with our Telegram Bot.

Step 5: Programming your Raspberry Pi

The bot that we just created on Telegram is just like a baby, it cannot do anything on its own unless we teach it what and how to do things. This teaching can be done through Raspberry Pi and Python script. In this tutorial I have programmed the bot to perform some basic actions like sending a message, Photo, Audio and Document. So when you say a particular command it will respond with a particular action the command and action is listed in the table below

7.Result

You can place this project in a strategic place and come back later to check any saved photos. The following figure shows a photo taken by this project.



By this the smart Anit-Theft system was successfully implemented.

8.Future work

Abstract International border security has become a very challenging task for any country. It is not always possible for border security forces to monitor long borders round the clock and in all seasons. Deployment of technology in the form a robot for intruder detection at the border and transmission of information to the control center is imperative in the geo- political situation of the world. Many of the high risk jobs in a hostile environment are best performed by a robot while it can be dangerous for soldiers. The proposed work aims to develop an automatic solution to detect the presence of an enemy or any hostile events such as fire/gas leakage in targeted places without loss of human life. It consists of a robotic vehicle for spying the pre-allocated area by continuously monitoring it. Whenever a sensor gets activated, the surveillance system checks for the presence of humans and then runs a face recognition algorithm. If the facial data of the person detected does not match with the pre-stored personal data of soldiers, the system recognizes him as an intruder and activates the laser gun to target him. In case of detection of unusual/dangerous events such as someone carrying a knife or a gun in high security zone, an alert message is sent to the operator. The system also provides the live streaming of surveillance data to the operator using Raspberry Pi and VNC Viewer.

The proposed surveillance robot system with face recognition is continuously surveying the surrounding area. When the objects get detected, the robot overcomes them and moves forward. The robot is able to sense carbon monoxide and fire in the surrounding area. The system continuously monitors the given area and is able to recognize whether the detected person is known or unknown. If the detected person is unknown, then the system activates

laser gun and shoots him down. The system is capable of providing live streaming of images and alert messages. Hence, it is suitable for surveillance application in war field or borders. The proposed work also detects unusual objects carried by the humans in high security zones.

The present work can be extended by adding unusual event detection in order to recognize the activities of unknown or known person. As algorithms used in image processing are illumination affected, advanced algorithm can be deployed to insulate the robot from light effects.