



## **Mini Project Report On**

**“Theft Detection System for overnight vehicle parking”**

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**CERTIFICATE**

This is to certify that

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of T. Y. B. Tech. successfully completed Mini Project Report in

**“Surveillance System for Overnight Two Wheeler parking”**  
to my satisfaction and submitted the same during academic year 2019-20  
Trimester VII as part of Embedded and Internet of Things Laboratory  
subject.

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Date: \_\_\_\_\_

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# 1. INTRODUCTION

Every year, nearly 36,000 vehicles, which amount to Rs. 115 crore, are stolen in India out of these, only about 14,500 are traced, often in un-roadworthy conditions, with many components missing. These vehicles are stolen only because thieves are provided with the opportunity to steal them.

Here we are proposing a theft detection system for vehicles using Raspberry Pi in the domain on IoT(Internet of Things). This system secures two-wheelers/automobiles from theft by instantly detecting theft as well as allowing the user to view the theft details thereby highlighting the theft details and saving the video on a usb drive.

In this system, we use a camera along with raspberry pi along with an ultrasonic sensor for proximity detection and USB drive for storage. The system is powered by a 12V power supply. As soon as the ultrasonic sensor detects the change in proximity of the vehicle the system uses a buzzer to alert a caretaker of the vehicle and uses telegram api to send an alert message to the owner of the vehicle. The system records video footage of theft in progress as soon as the theft is detected.

We here use pi-camera to record video footage. Also, it stores the footage in a USB drive for further reference. Thus, the system provides an innovative approach to theft detection using IOT.

## **2. RELATED WORK**

### **2.1 Literature Survey**

With embedded systems fast expanding its reach, subject matter related to this field is available in abundance. While working on this project we have studied matter from various sources such as books, online articles, and reference manuals.

The knowledge gained from this activity has been of great help to us in understanding the basic concepts related to our project and has ignited further interest in this topic.

“Linux for Embedded and Real Time Applications”, by Doug Abbott has been of great help in providing an introduction to the process of building embedded systems in Linux. It has helped us understand the process of configuring and building the Linux kernel and installing tool chains. We understood the preponderance of the ARM processors in the field of embedded systems and the features of ARM processors from the document “The ARM Architecture” by Leonid Ryzhyk. The ARM architecture is a confluence of many useful features that make it better than other peer processors. Being small in size and requiring less power, they prove useful in providing an efficient performance in embedded applications.

### **2.2 Analysis of existing methods**

Mostly used systems are beepers, alarms, and biometrics. But, all these commercially available products are very high-priced. Car alarm techniques are used to prevent

car theft with the help of different types of sensors like pressure, tilt and shock & door sensors. These systems however bear some limitations such as high cost, high false alarm rate, and easy to be disabled.

In order to solve these problems recent advancements in computer hardware and software have enabled the automobile industry to develop affordable automated biometrics based identification and verification systems. Many biometrics, including face detection, facial features, hand geometry, handwriting and voice have been used for the identification and verification of individuals. But biometric has its own disadvantages such as the systems are not 100% accurate, they require integration and/or additional hardware and cannot be reset once compromised.

## 3. Proposed Work

### 3.1 Problem Statement

- To create an overnight two wheeler surveillance system, using Raspberry Pi.
- To make use of Ultrasonic sensor to record distance changes.
- To save the reading of ultrasonic sensor into a file.
- To make use of a 5 MP 'Pi Cam' camera to record a video of the theft when triggered.
- To use a Buzzer as an alarm to alert the owner.
- To use an SMS API to send an SMS to the vehicle owner, notifying him of the theft.

### 3.2 Social Relevance

Property crimes are said to hover around 10 million annually. Of this, vehicle theft tops the list and often occurs in all parts of the world. In recent years vehicle theft has become a major issue which should be traced and detected. The safety and security of the vehicle is essential. Even though there are many existing mechanisms they have some limitations and high cost. So, an efficient security mechanism is needed. The social impact of vehicle theft varies and correlates with the way vehicles are stolen or damaged.

We distinguish four types of vehicle theft:

**Vehicle theft after burglary:** before the car itself is stolen, the thieves first break into the house of the owner to get the key.

In the Netherlands more than 7 percent of stolen vehicles are stolen after breaking into the house of the owner. The burglary in the home is a huge invasion of privacy and often has much more impact than a theft at a business place. It is, after all, and in the private domain.

**Car theft in public space:** each year, the majority of vehicles are stolen on the road ( 65 % ) or from the house of the owner ( 15 % ). This category of vehicle theft we call 'clean' car thefts.

**Home Jacking:** we talk about home jacking when, in a home, office or other building the owner or occupant is instructed to handover the vehicle keys or the vehicle itself by use of violence or under threat of violence. In home jacking the occupant gets physically involved because of direct confrontation with the car thief (0,2 percent of the cases).

**Carjacking** is a form of vehicle theft involving violence or threat against the owner of the vehicle in public, in order to take the car keys and the vehicle. This type of theft may be facilitated by the fact that the cars are getting more secure , whereby car thieves aim directly at the owner. Carjacking is a group activity, in most cases, the victim is overpowered by multiple perpetrators and forced to issue car keys and car. The violence used in car jacking ranges from threat with firearms and knives to physical violence, such as beating and punches in the face, kicking or pushing with force from the car.

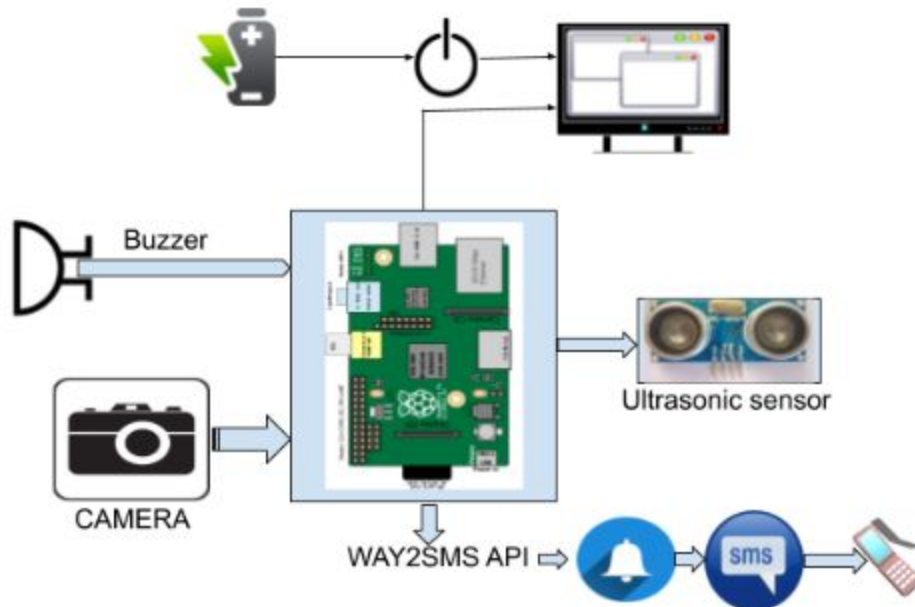
The social impact of these more violent types of vehicle theft may be compared with the impact of raid and robbery, hence, it can lead to psychological distress, including fear, anger and depression. The likelihood of psychological distress and their social



consequences increases with the level of violence encountered by the victims.

### 3.3 Architecture

**Block diagram**



#### THE ARCHITECTURAL FLOW OF SYSTEM

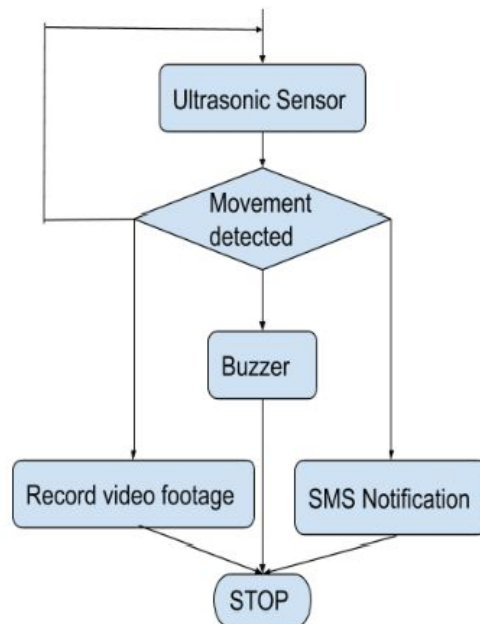


fig. Proposed system working

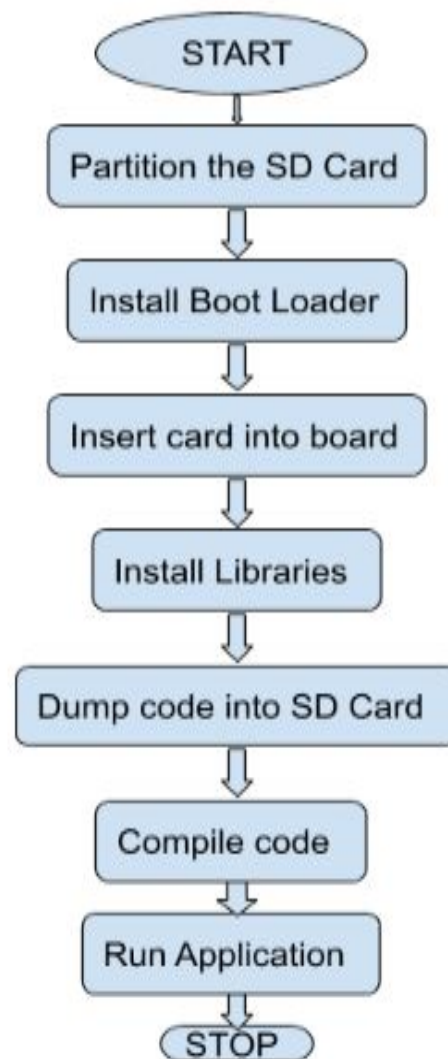


fig. Installation Process

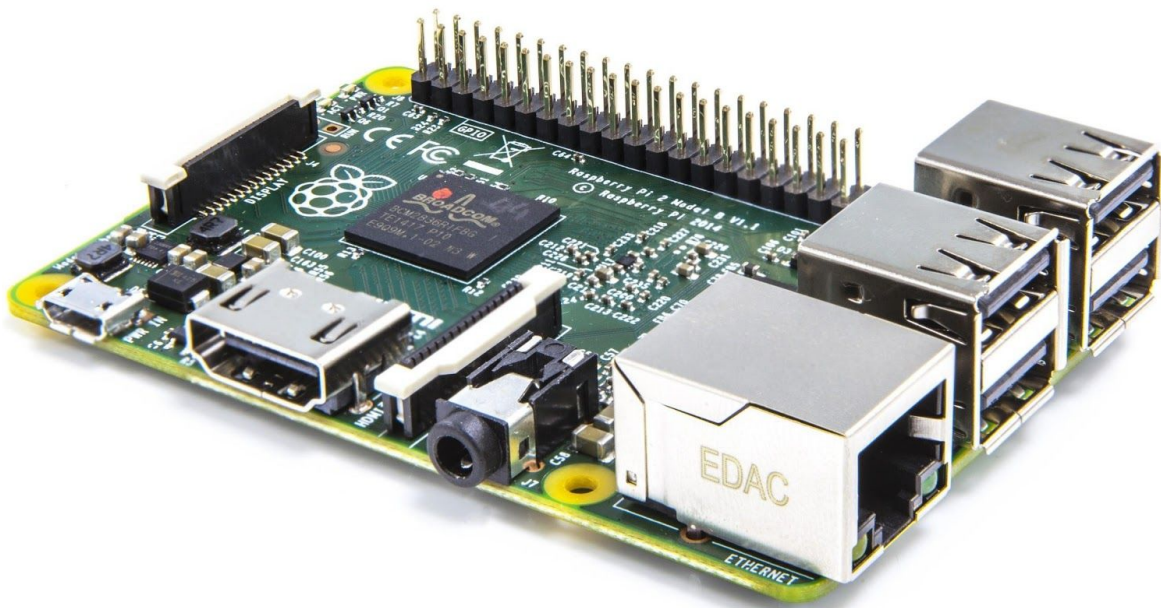
### 3.4 Hardware requirements

For implementing this project, we are using the following

1. Raspberry Pi 3.0
2. Ultrasonic Sensor HC-SR04
3. Buzzer
4. PiCamera

#### 1. Raspberry Pi 3.0

The Raspberry Pi Foundation is registered as an Educational Charity based in the UK. The foundation was set-up to foster education in the field of computer science. The aim of the foundation was to provide low cost, high-performance computer into the hands of people all over the world, so they are capable of



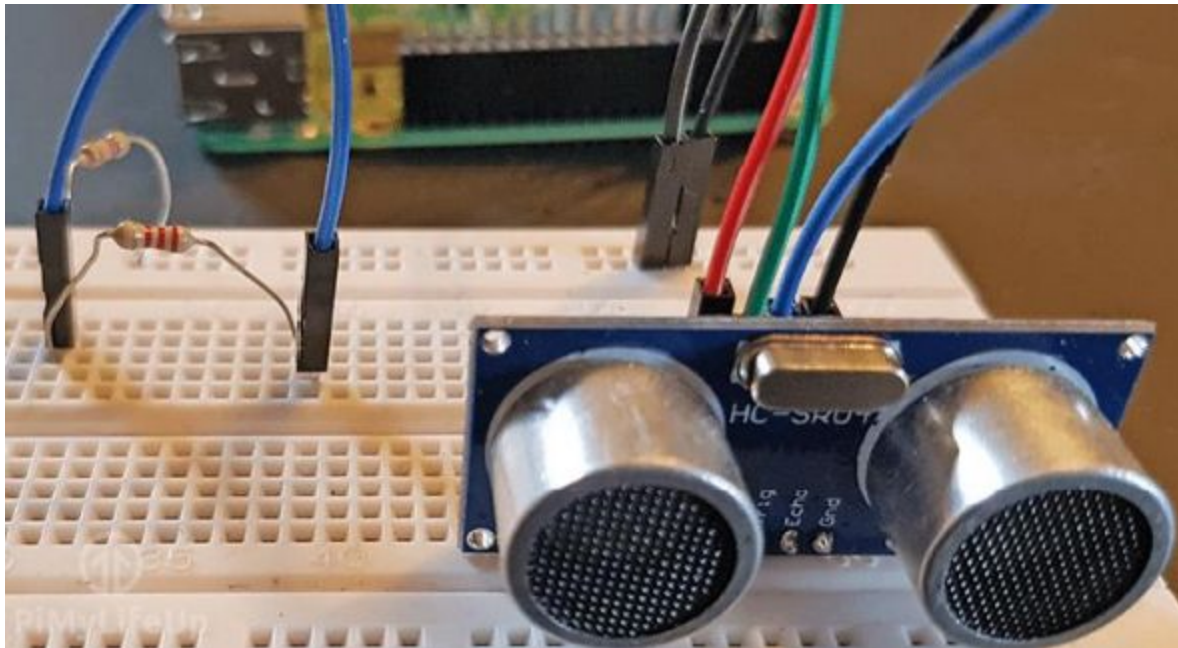
understanding, creating & modelling our progressive digital World.

It's a fully functional credit-card sized computer which can be plugged into a monitor. The Raspberry pi 3 is based on Broad-com System on Chip with an ARM processor of around 1.2GHz, a GPU

and 1 GB SDRAM. Since Raspberry Pi is a fully functional computer, we can perform tasks such as browsing the internet, word-processing, playing games and obviously developing IoT based applications.

## 2.Ultrasonic Sensor HC-SR04

In air, sound travels at a speed of 343 metres per second. An ultrasonic distance sensor sends out pulses of ultrasound which are inaudible to humans, and detects the echo that is sent back when the sound bounces off a nearby object. It then uses the speed of sound to calculate the distance from the object.



This is HCSR04 we used with Raspberry Pi. Including showing how to wire up the sensor to the Raspberry Pi, we implemented a Python script that will utilize the HC-SR04 Ultrasonic sensor to calculate distance. We achieve this by measuring the time it takes the ultrasonic pulse being sent out to it being received back by the sensor.

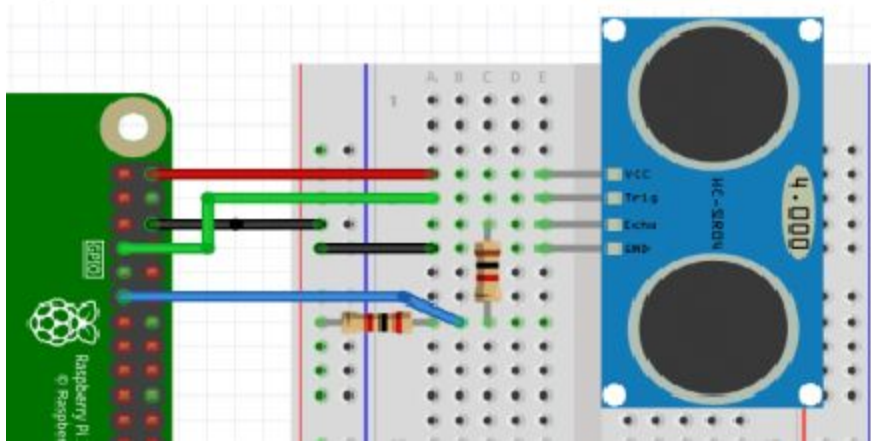


Fig. pinout interface of Rpi3.0 with HC-SR04(Vcc, Trigg, Echo, Grd)

### 3.Buzzer

We use a buzzer to alarm the owner about possible theft. As soon as ultrasonic detects unusual movement of vehicles, buzzer alerts the owner of the vehicle.

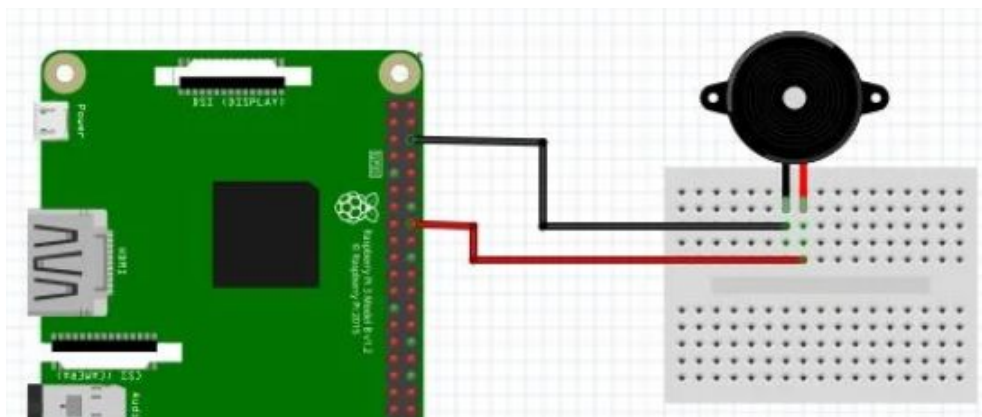
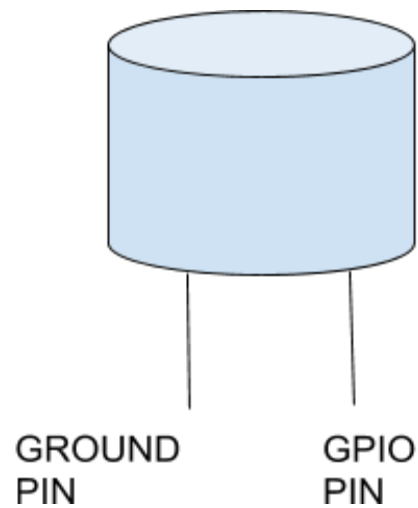


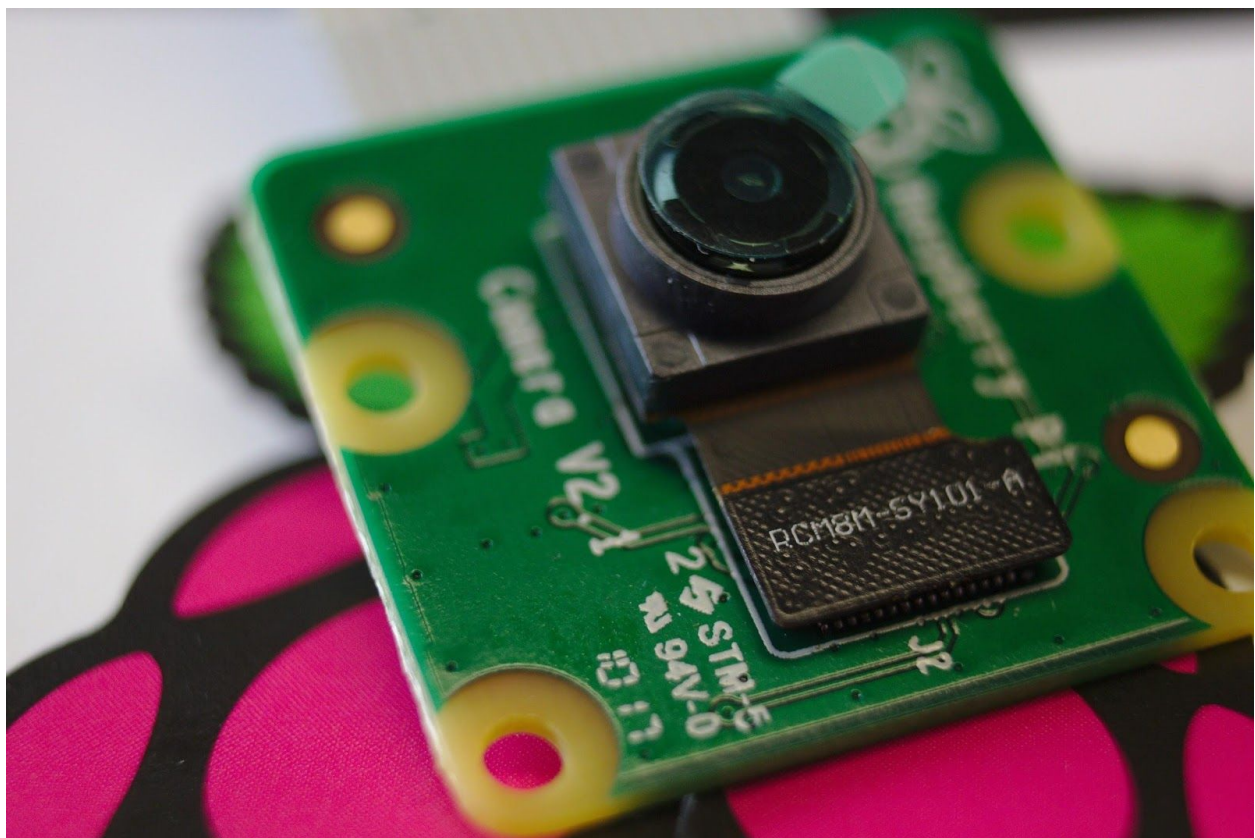
Fig. buzzer pinout interface with raspberry pi pinout





#### 4. Pi Camera

The Raspberry Pi Camera v2 is the new official camera board released by the Raspberry Pi Foundation. The Raspberry Pi Camera Module v2 is a high quality 8 megapixel Sony IMX219 image sensor custom designed add-on board for Raspberry Pi, featuring a fixed focus lens.



## Recording video with Python code

```
camera.start_preview()  
camera.start_recording('/home/pi/Desktop/video.h264')  
sleep(15)  
camera.stop_recording()  
camera.stop_preview()
```

Your Raspberry Pi should open a preview, record 15 seconds of video, and then close the preview.

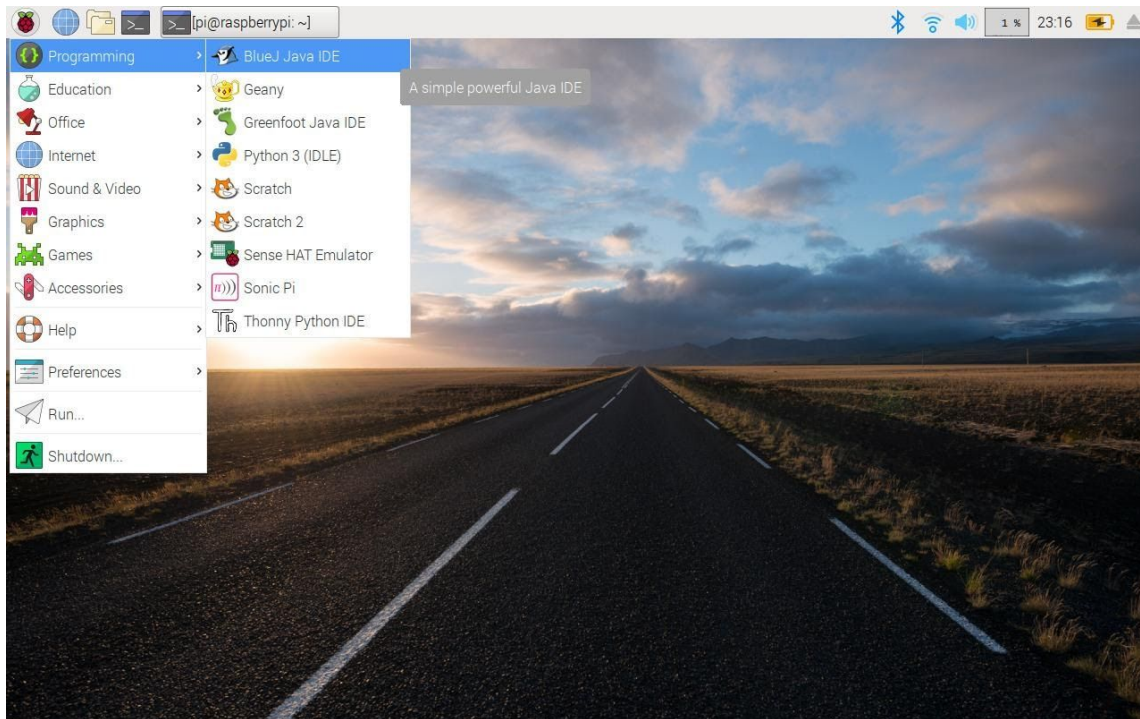
### 3.4 Software requirements

1. Raspbian OS
2. Way2SMS API integration
3. Pi camera module

#### 1.Raspbian OS

Raspbian is the Raspberry Pi Foundation's official supported operating system. You can install it with NOOBS. Raspbian comes pre-installed with plenty of software for education, programming and general use. It has Python, Scratch, Sonic Pi, Java and more.

Raspbian is a Debian-based computer operating system for Raspberry Pi. There are several versions of Raspbian including Raspbian Buster and Raspbian Stretch. Since 2015 it has been officially provided by the Raspberry Pi Foundation as the primary operating system for the family of Raspberry Pi single-board computers. Raspbian was created by Mike Thompson and Peter Green as an independent project. The initial build was completed in June 2012. The operating system is still under active development. Raspbian is highly optimized for the Raspberry Pi line's low-performance ARM CPUs.



Raspbian uses PIXEL, Pi Improved X-Window Environment, Lightweight as its main desktop environment as of the latest update. It is composed of a modified LXDE desktop environment and the Openbox stacking window manager with a new theme and few other changes. The distribution is shipped with a copy of computer algebra program Mathematica and a version of Minecraft called Minecraft Pi as well as a lightweight version of Chromium as of the latest version.

## 2.Way2SMS API integration

Way2SMS is an online Application Programming Interface provider service that lets you use their API to send SMS to cell phones via the internet.

In our project we used Way2SMS API to send alert messages to the cell phone of the owner of a vehicle.

## 3. Pi camera module

Connect the Camera Module. Ensure your Raspberry Pi is turned off. Locate the Camera Module port. Gently pull up on the edges of



the port's plastic clip. Insert the Camera Module ribbon cable; make sure the cable is the right way round, Push the plastic clip back into place. Start up your Raspberry Pi. Go to the main menu and open the Raspberry Pi Configuration tool. Select the Interfaces tab and ensure that the camera is enabled. Reboot your Raspberry Pi.

Now control the Camera Module via the command line. Now your Camera Module is connected and the software is enabled, try out the command line tools *raspistill* and *raspivid*.

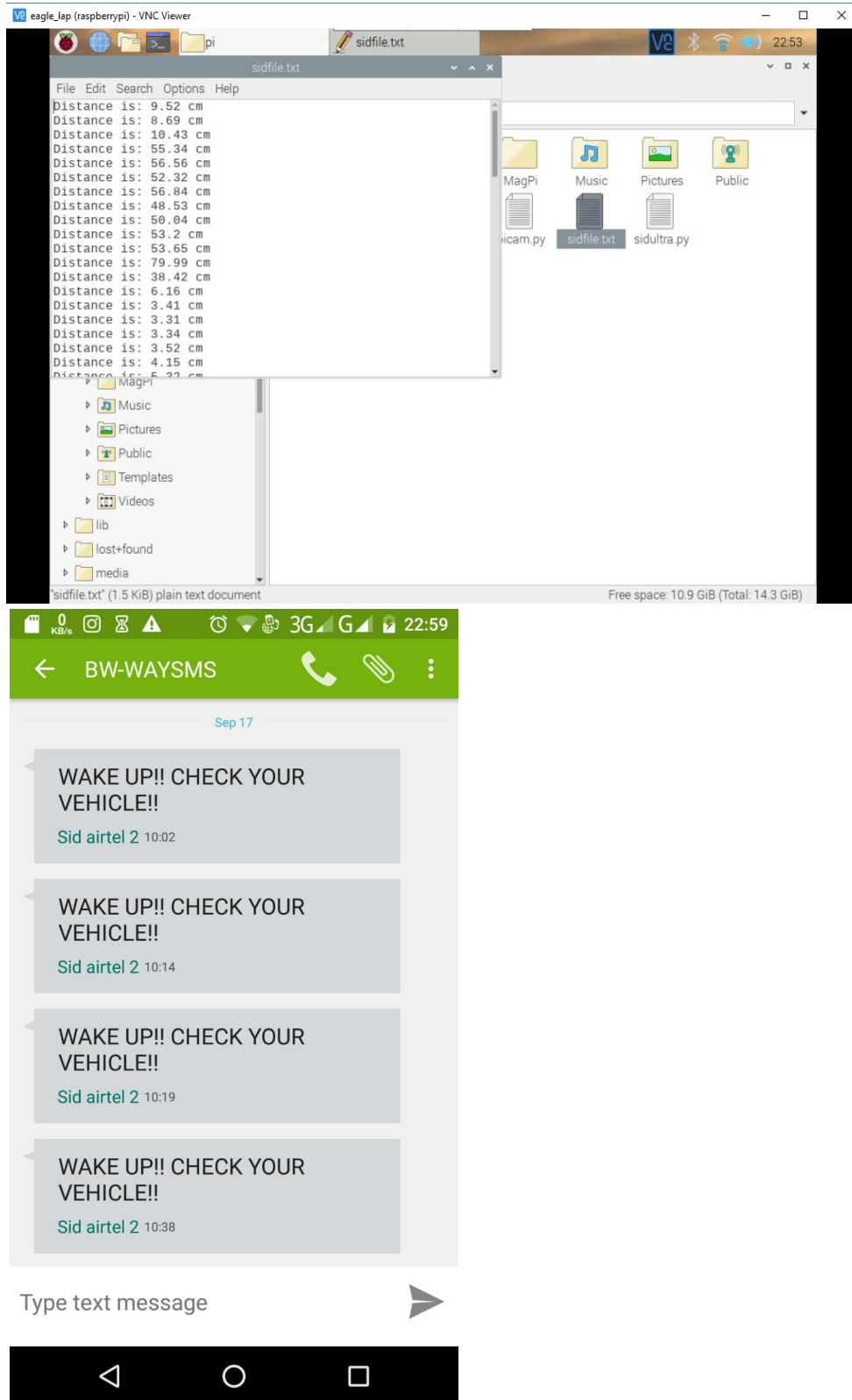
Record video with python code

```
camera.start_preview()  
camera.start_recording('/home/pi/Desktop/video.h264')  
sleep(15)  
camera.stop_recording()  
camera.stop_preview()
```

-Run the code

-Your Raspberry Pi should open a preview, record 15 seconds of video, and then close the preview.

### 3.5 Results obtained (with Screen shots of Results)



## 4.CONCLUSION

Thus implemented an overnight two wheeler surveillance system using:

- Raspberry Pi,
- Pi camera,
- Ultrasonic sensor,
- Buzzer,
- Way2SMS API

The sensor will be installed in front of the vehicle to monitor its movement.

The camera will be attached at some height above the device, and will be triggered along with the buzzer, when target activity is noticed.

An SMS will be sent using the way2sms API.

Thus, we will have an immediate response system in place.

*Future Scope:*

We can also send a signal to the gate to shut automatically.

If no one is at home, an SMS notification can be sent along with the video of the robbery to local guards or traffic police authorities, for immediate action.

## REFERENCES

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