

# Vehicle Speed Detection using Raspberry Pi

D.Dharini and R.Srividhya



**Abstract**—Due to the increasing accidents in the road, we are proposing a system to reduce it. Mainly the occurrence of accidents is due to the vehicle speed, so by figuring the over speed vehicle actions can be easily taken. Using this system the speed of moving vehicles can be determined with raspberry pi .The system is designed to detect the moving vehicles and calculate its velocity. The system used Open CV as image processing software and Simple Mail Transfer Protocol(SMTP) to perceive and follow the moving vehicles. Several types of capturing size of the video are used in this system to check and measure the performance of the embedded board.

**Keywords**— Embedded linux; Raspberry pi.

## I. INTRODUCTION

Nowadays, the number of transport in the roadway rapidly grows since high standard vehicles are fabricated by satisfying the prime calibration. Due to the mushrooming of vehicles on highway and superhighway, the roads are prone to a multiplication of accidents. Taking it into concern a lot of systems contribute in the affordable detection speed and acknowledging the drivers to take a pathway which has less dense of vehicle and free from traffic issues. Similarly, measuring the speed of the vehicles is a very complex and difficult task, as the resulting accuracy depends on varies kind of situations stated as peak time traffic, the regular drivers of familiar path, climatic changes, the state of highway and also the component flexibility in the diagnosis process. Many new inventions focus on different types of modules for the purpose of integrating the composed data with the surfing module of traffic. Many promoted machineries are advancing to evaluate the travelling time with the usage of Global Positioning System(GPS), Radio Frequency(RF), etc. These kind of devices are commonly used by the people for the purpose of tracking their destination. There is an important need of the module in highways for the purpose of providing the number of vehicles and a number of high speed adapting vehicles. Using different algorithms in image processing domain many protocols are still in use ,of detecting the roadway vehicles but there is still an emptiness found in the qualified property of detection .All the existing methodologies can be adoptable only for city roads but it is ineffective for highways. Thus the emerging of embedded plays a vital role in the detection process by interference with the computer.

The upcoming system is just a combination of hardware and software like embedded with the video and image processing methodology. In video / image processing the primary goal of material detection is to obtain the clearest image without blurring of a vehicle in motion even before applying the image processing methods.

**Manuscript published on 30 September 2019.**

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For the purpose of object/Material detection most commonly adaptable methodology is backward subtraction. Even after extraction of the required region from the video frame the important processing is to extract the wheels of the moving vehicle. Most commonly the required area in a video frame appears to be blurred. Thus the extracted region alone undergoes the various stages of image processing. After filtering the filtered image is allowed to pass through the SMTP protocol. Then the programmed software is made to interfere with the Raspberry Pi software. This method of hardware and software interfacing proposed the solution for several real-time problems. In [1] deals with Hybrid electric vehicles on highways for the purpose of traffic estimation. The algorithm used here is a combination of machine learning along with Dynamic Programming. It is an effective advanced method for the drivers to their locality and tracking their destination involving Neural Network technology. While in [2] [7] describes an early stage of mechanism of destination path finding by the drivers. Here among all the vehicles on the highway a particular vehicle serves as a super vehicle. This super vehicles, tracks and obtain the information from an infrastructure or else from other super vehicles and communicate to the vehicles under its control using Super Vehicle Detection method. The Motion Stereo Technique is used in [3], where the camera footage provides the input database from which the highway and pedestrian regions are segregated. It proposed and concentrated in the detection and separation of obstacles in the road. [4] Satisfies all the categories expected by United Nations road safety rules. The vehicle speed is obtained using a spectrogram frequency domain with minimal error value.

The exertion conveyed in this focuses on the comparison within the acquisition of the frame of the video in the given system. The method of the paper is as follows. Section II discussed the system hardware and the Sectional continue discussing about the system's software. While in Section IV introduced the result of the system focused on CPU and memory performances.

## II. PROPOSED SYSTEM

The flowchart indicates the methodology of vehicle speed detection using raspberry pi. The video signal which is captured at varying time period with a particular time delay is taken as the input. These frames of the video signal are fetched to the raspberry pi using interfacing section. Here the images in the frames undergo the process of masking. After masking only the required region of processing is given as input to the next stage. Then the extracted region undergoes the centering in order to obtain the exact position of the wheels of the vehicle at varying time periods. This varying time period is useful in order to obtain the variety and amount of movement happened in the vehicle within that slot.



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According to the analysis if the speed is high an email of the image of the vehicle, vehicle number and speed of the vehicle will be sent to the department. On receiving the mail required actions are taken by the authorized organization and thus avoid the number of accidents in highway. If the speed is reasonable, then the system ends.

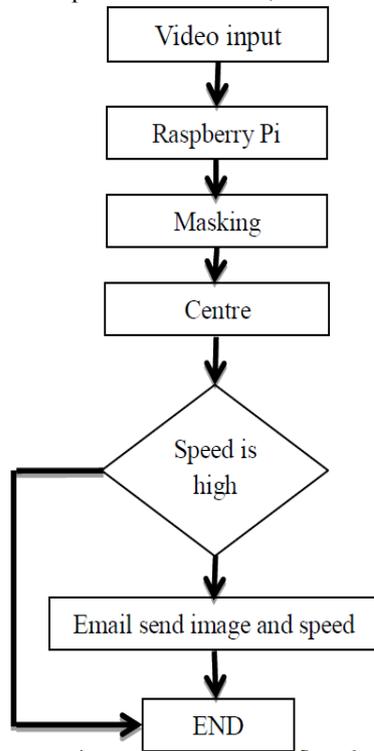


Fig 1 Proposed system flowchart

### III. VIDEO SURVEILLANCE

Video surveillance is the use of video cameras to transmit a signal to a specific place, on a limited set of monitors. It differs from broadcast television in that the signal is not openly transmitted, though it may employ point to point (P2P), point to multipoint, or mesh wireless links. In the U.S. television system for the first and foremost time came into the picture in the year 1949 which was named as Vericon. Fig 2 indicates the surveillance monitoring method of video processing.

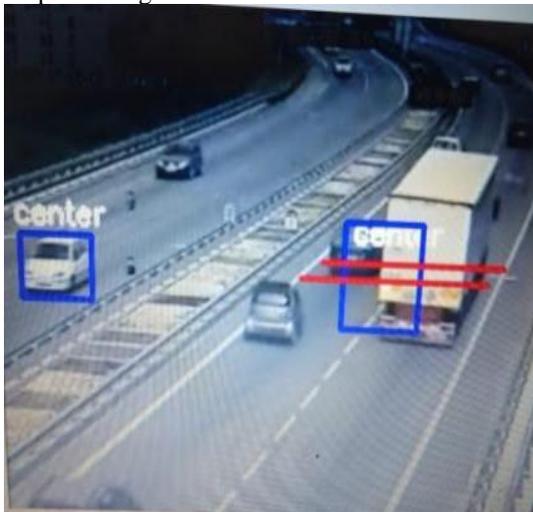


Fig 2 Surveillance monitoring

### IV. RASPBERRY PI BASED SURVEILLANCE SYSTEM

The application of raspberry pi mainly focuses on realtime based usages in security system which involves image processing operation, video processing operations and motion detection mechanism. The advanced system is that the end user can also monitor the things happening in his/her house. The image/video of the house at different time delay is received by the end user. Raspberry pi interconnection with external resources is provided in Fig 3.



Fig 3 Raspberry Pi interconnection

Several criteria have been used to select a security system required to safeguard a facility. This type of a typical system is executed with increased expenditure. There is no limitation in the performance of Raspberry pi. It is also a type of flexible system. The need and application of this is not only mentioned for security purpose, but also involved in automatic street lighting, proxy server methodology and temperature / pressure control mechanisms. It requires a DVR system to connect it to the data networks through TNP/IP. A DVR on its own is very expensive. Hence such a system may not be afforded by low income home owners

### V. VIDEO PROCESSING

The raspberry pi kit contains Wi-Fi module inbuilt in it. That module is connected to the system using the IP address of the network. Using the VNC viewer the connection is established between the hardware and the Personal Computer(PC) to operate it. Then the raspberry pi OS is being connected to the PC. Through which it can be accessed easily. Now the python is being used for running the software. The open CV is being connected to the raspberry pi by importing the library file which is present inbuilt in the tool. Then the program is being compiled and made ready to run as shown in the Fig 4 While running the input is being fetched by using video capture in python code.

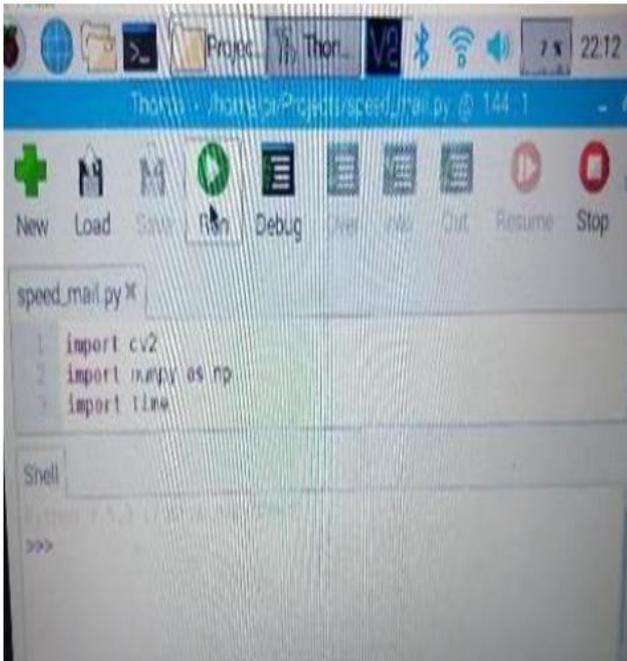


Fig 4 Running Program

**VI. FRAME EXTRACTION AND SPEED CALCULATION**

Using that the input video is captured and feed to process. There should be some empty point in the video which should be taken into consideration of reference. In Fig 5 the reference video frame is being captured.

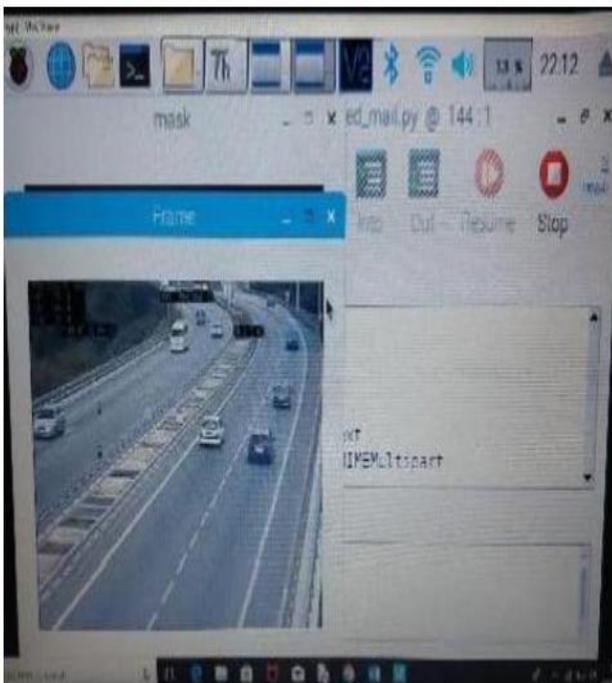


Fig: 5 Capturing Reference Frame

Then by considering the reference frame ,if any new object enters can be easily determined and that can be separated. Then two lines have been marked with some certain distance like 2m between them. One is the start line and other is the end line. Now the time taken by a vehicle to start from the start line and cross end line is calculated. Then by knowing the time and the distance the speed of the vehicle is being calculated. As shown in the Fig 6



Fig 6Speed Calculations

**VII. SMTP PROTOCOL**

Then, if the speed cross the fixed speed that particular vehicle frame is being captured and they are sent to the SMTP(Simple Mail Transfer Protocol) layer, as shown in the Fig 7.The SMTP layer consists of the sender mail id and password. And there should be permitted to access the mail. And it consists of the receivers mail Id. Then it also consists of the body of the message and the context which have to send along with the image of the captured vehicle is also present.



Fig 7 SMTP operations (1).

After the completion of the full video the mail is starting to send to the receiver using the SMTP protocol, as shown in the Fig 8.



Fig: 8 SMTP operation (2).

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Thus the final output is obtained in format of jpg in the mail. The image that is obtained consists of the speed and that particular vehicle which crossed the fixed speed.

## VIII. RESULT

Since the object to be detected is in motion it is always recommended to have a high calibrated device for the purpose of detection. Due to the increase in the growth of embedded system, it is effective to apply it for real-time systems



**Fig 9 Output frame with the speed of vehicle**

The input of video frames is first masked and centered to remove unwanted areas and concentrate only on the required portion. This picture of wheel at different time delays are obtained and fetched to the Raspberry Pi as input. If the speed is high the information is provided to the concerned authorized place along with an image and the speed of the vehicle .Open CV plays a vital role in interfacing the software with Raspberry Pi.

## REFERENCES

1. Yi Lu Murphey, Jungme Park, Zhihang Chan, Ming LKuang, M Abul Masrus, Anthony M Phillips ,”Intelligent hybrid vehicle power control Part 1: Machine learning of optimal vehicle power”, IEEE Transaction on Vehicular Technology 61(8),3519-3530,2012.
2. Jeffrey Milles,”Vehicle -to-vehicle-infrastructure(V2V2I) interlligent transportation system architecture”, IEEE Transaction,2008,IEEE intelligent vehicles symposium, 715-720,2008.
3. Massimo Bertozzi, Luca Bombini, Pietro Cerri, Paolo Medic, Pier Claudio Autonello, Mairizio Miglietta,”Obstacle detection and classification fusing radar and vision”,IEEE transaction, IEEE intelligent vehicle symposium, 2008.
4. Jie Wang, Jingyu Tong, Qinghuo Gao, Zhenyu Wu, Sheng Bi, Hongyu Wang,” Device-free vehicle speed estimation with WiFi”, IEEE transaction , 2018.
5. Y. Tanaka, “Travel-time data provision system using vehicle license number recognition devices,” in Proceedings of the Intelligent Vehicles’92 Symposium, 1992.
6. M. Gao, T. Zhu, X. Wan, and Q. Wang, “Analysis of travel time patterns in urban using taxi GPS data,” in Proceedings - 2013 IEEE International Conference on Green Computing and Communications and IEEE Internet of Things and IEEE Cyber, Physical and Social Computing, GreenCom-iThings-CPSCom 2013, 2013, pp. 512–517.

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