

# Traffic Monitoring System

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**Abstract** - Nowadays, the traffic anomalies goes on increasing because of the day by day increment of numerous vehicles on the road. There are different anomalies related to the traffics such as traffic jam, vehicles on zebra crossing, etc. are recorded. The manual process to handle such traffic rule violation is difficult, time consuming and required more manpower. Hence to avoid the limitation of the existing system, an automated traffic assistance system has been proposed. In the proposed system, three traffic anomalies i.e. vehicle on zebra crossing, traffic jam (based on the density of the traffic) and ambulance detection are consider for implementation.

**Key Words:** Raspberry Pi 3, Camera, Micro SD Card, Image processing.

## 1. INTRODUCTION

A vast number of reports and statistics state the vulnerable role played by pedestrians in traffic accidents, especially in those who take place in surroundings considered safe by them. Walking under those circumstances is approximately ten times more dangerous than travelling as a passenger by car. The population of the India grows exponentially as the population increases the number of vehicle on the road increases. The most of the accidents on the roads are due to the rule violations such as breaking traffic signals, over-speeding, driving on wrong sides etc. The traffic management is the important task to reduce the accident and traffic congestion. To detect the traffic rule violations and traffic congestion avoidance, the automatic system needs to be developed. In the proposed approach, we are going to develop the image processing and computer vision based system. In this system, we will focus on the three traffic violations

- **Vehicle on zebra crossing:**

The unique geometrical feature is zebra-crossing stripe's edges are arranged in sorted order. Various zebra-crossing images are utilized to evaluate the proposed framework and presented outcomes demonstrate the adequacy.

- **Traffic Congestion:**

Managing the traffic dynamically will reduce the traffic congestion. The videos are captured by stationary cameras. Using this output we apply a real time traffic management algorithm which controls the traffic signal by synchronizing all the neighboring signals and manage the time duration of the signal accordingly.

- **Ambulance detection**

In today's world health hazards are a major concern. Ambulance service is one of the major services which gets affected by traffic jams. To solve this problem we have come up with the solution of detection of ambulance and accordingly change the signal conditions to provide the path for ambulance.

## 2. BLOCK DIAGRAM

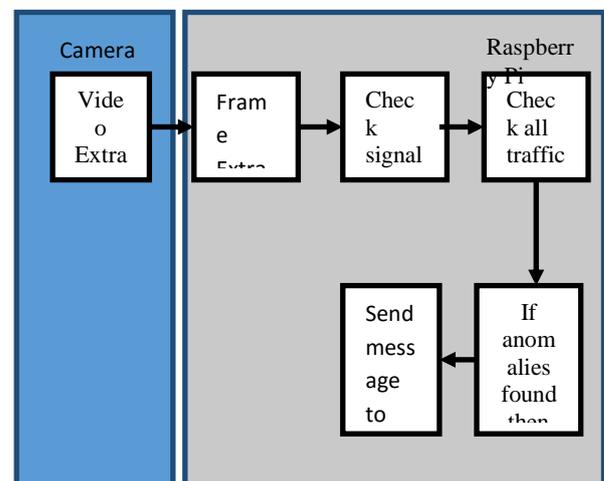


Fig.1. Block Diagram

## 3. HARDWARE COMPONENT

**1. Raspberry Pi 3:** Raspberry Pi is a credit card sized computer. It will hold the camera driver. The videos which are captured by the camera will be processed here. Images will be extracted one frame per second from the live video. An image processing algorithm will be enforced on the extracted frames. The number of objects seen in the image will be counted and it will be taken as input. A dynamic traffic management algorithm will be performed which will synchronize the traffic signals.

**2. Camera:** The camera will be located near the traffic lights. It will capture videos of the traffic coming from a particular direction. It will be located on an angle so that it can capture maximum number of vehicles. The camera will send the captured video to the Raspberry Pi board.

**3. Micro SD Card:** 16GB.

**4. Video Capture:** The video frame is capture from the webcam install on the signal. The camera places at the signal monitor the activity of opposite side of signal.

**5. Frame extraction:** The frames are extracted from the video feed which is used for further processing.

**6. Signal colour detection:** For Indian traffic, the traffic signal is monitored through three colours Red, Green and Yellow. The colours are detected in HSV (Hue, Saturation and Value) ranges hence first convert RGB image into HSV. The HSV range for RED, Green and Yellow colour is detected by image processing technique. The process of conversion of RGB to HSV value is as explain as follow:

- Hue represents the colour type. It can be described in terms of an angle on the above circle. Although a circle contains 360 degrees of rotation, the hue value is normalized to a range from 0 to 255, with 0 being red.
- Saturation represents the vibrancy of the colour. Its value ranges from 0 to 255. The lower the saturation value, the more gray is present in the colour, causing it to appear faded.
- Value represents the brightness of the colour. It ranges from 0 to 255, with 0 being completely dark and 255 being fully bright.

Now, we get the hue, H, value. To do that, we look at the largest of the R, G, B, values. The smallest two are subtracted and divided by the difference between the largest and the smallest. We then normalize the hue by adding 0, 2, or 4. The resulting H is any real number. However, any arbitrary number below 0 and above 6 is considered redundant, and you may as well derive a value  $H \bmod 6$ , or if H is negative, then  $(H \bmod 6) + 6$ , but it's not necessary, since a relatively decent HSV to RGB conversion algorithm should be able to work with any values of H. The formulas for conversion of RGB to HSV are given as below.

$$H = \arccos \frac{\frac{1}{2}(R-G)+(R-B)}{\sqrt{((R-G)^2+(R-B)(G-B))}} \quad (1)$$

$$S = 1 - 3 \frac{\min(R,G,B)}{R+G+B} \quad (2)$$

$$V = \frac{1}{3}(R + G + B) \quad (3)$$

Where, R is Red channel,  
 G is Green channel,  
 B is Blue channel  
 H is Hue  
 S is Saturation

#### 4. CONCLUSIONS

In the proposed approach, the algorithms for three anomalies ambulance detection, vehicle at zebra crossing and traffic jam has been proposed. From the study it is observed that processing is a better technique to detect the

traffic anomalies. It visualizes the reality so it functions much better than those systems that rely on the detection of vehicles metal content. This system can be useful to capture the culprit and better for the traffic controlling. The proposed system is planned to be implemented on the raspberry Pi hardware platform which is easy to make system portable and real time.

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