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# Vehicle Counting and Classification Based on Traffic Congestion

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**ABSTRACT:** We are very much aware of the fact that, the population of city and number of vehicles on the road are increasing day by day. With increasing urban population and hence the number of vehicles, need of controlling streets, highways and roads is major issue. The main reason behind today's traffic problem is the techniques that are used for traffic management. Today's traffic management system has no emphasis on live traffic scenario, which leads to inefficient traffic management systems. These traffic timers just show the preset time. This is like using open loop system. If we incorporate a closed loop system using camera, it is possible to predict the exact time on traffic light timers. If the traffic light timers are showing correct time to regulate the traffic, then the time wasted on unwanted green signals (green signal, when there is no traffic) will be saved. Timer for every lane is the simplest way to control traffic. And if those timers are predicting exact time then automatically the system will be more efficient. This paper represents the project that has been implemented by using the Matlab software and it aims to prevent heavy traffic congestion. This project measure the number of vehicles present on the road. At first, film of highway is captured by a camera has been installed in highway. A web camera is placed in a traffic lane that will capture images of the road on which we want to control traffic. Then these images are efficiently processed to know the traffic density. According to the processed data from matlab, the controller will send the command to the timer to show particular time on the signal to manage traffic.

**KEYWORDS:** Matlab, Traffic Congestion, Open loop System, Closed loop System

## I. INTRODUCTION

In this Traffic light controller and Traffic congestion system, we approached two different methods for the traffic light and traffic congestion. These approaches are very helpful for the current problem i.e, Road congestion becomes the national focus. For Traffic light controller, we are using the foreground detector, morphological process, blob detection operations to control the traffic by counting the vehicles. For Traffic congestion system , we are using the image texture feature extraction and texture analysis. By this real-time road congestion detection algorithm based on texture analysis is proposed, which deals with image data from road surveillance systems and carries out the accurate identification of vehicle density in different scenes.

## II. METHODOLOGY

**1.For Traffic light controller(Counting)**

The methodology used in this Traffic light controller is based on counting of vehicles using image processing operations in matlab.

The operations are:

a. Foreground Detector
b. Morphological Operations
c. Blob Detection and Tracking
d.

**2. For Traffic congestion system(Classification)**

The methodology used in this Traffic congestion system is based on classification of vehicles using image processing techniques in matlab.

The operations are:

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a. Vehicle area calibration
b. GLCM calculation
c. Road congestion recognition

## III. MODELING AND ANALYSIS

The above methodologies and modelings are understand briefly here

**1.Traffic light controlling**

Using the counting of vehicles, the traffic light signal timer is set. The techniques used are

**a. Foreground Detector**

This foreground detector is a pre-processing technique which is using the Gaussian Mixture Model(GMM).GMM method is detection method that compares between foreground object (moving object) and background object (stationary object).

**Figure 1:** Foreground Detector

**b. Morphological operation**

The accuracy of GMM model is satisfactory. However, sometimes noises are there in the background with the detected object.we can use morphological opening to remove the noise and fill the gaps in the detected objects.

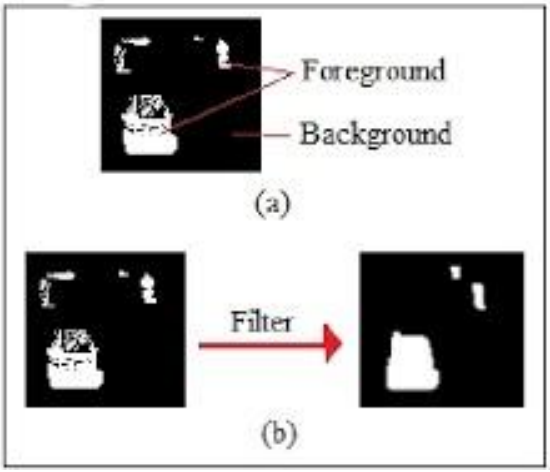


**Figure 2.** Morphological Process

**d. Blob detection and Tracking**

Blob detection identifies the number of objects in the threshold images.we can use the 'MinimumBlogArea' parameter and set the value to 150 to force the 'vision.BlobAnalysis()' to ignore blobs larger than 150 pixels.

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**Figure 3.** Blob detection and Tracking

After the identifying of the vehicle and the tracking is tracking is observed throughout the video from frame to frame. Now the traffic signal timer will be updated by identifying the no of vehicles on the road.

**2. For Traffic congestion system**

By the classification of the vehicles in a particular road or highways, we can identified the road congestion level.
The algorithm proposed in this traffic congestion system includes four steps, which are vehicle area calibration, GLCM calculation, feature extraction and road congestion recognition. The details are as follows.

**a. Vehicle area calibration**

The current method of congestion detection basically carried out background training at first. However the proceeding is not only time-consuming, but easily affected by many factors. For time-saving, the paper proposed a fast method of human-computer interaction. That is artificially setting vehicle area firstly, and then using the texture analysis method for congestion estimation. After the setting, the gray value of vehicle area remains the same, while the other area is set to zero, which means the background. This approach is time-saving, at the same time the interesting area can be selected freely.

**b. GLCM Calculation**

The standard gray image is 256 gray scale, the corresponding GLCM is 256X256. Computing GLCM with this size is both time-consuming and not necessary. It is well known that mostly the colour of vehicle is single, so in image the gray value of vehicle should be single or several successive values. But because of the light reflection, actually the gray value of vehicle area may have dozen choices. It results in that GLCM histogram distribution is more homogeneous than real, therefore the extracted texture features cannot truly reflect the density of vehicles. To solve this problem, we can reduce the gray levels. After testing, it is suitable to reduce 256-level to 32-level. In 32-level image, the pixel value in the area of black vehicle only has less than 3 choices.
The GLCM can be calculated after gray scale reduction. In our approach, d is set to 1, that is to calculate the distribution of adjacent pixels. This method can be applied to deal with images taken from different places. As mentioned before, after gray scale reducing the area with zero pixel value was treated as background. When carrying out texture analysis on the image, the background area should be abandoned. So, the first row and the first column of GLCM are removed. Consequently, the size of GLCM is changed from 32X32 to 31X31.

The GLCM calculation is one of the Texture analysis method.

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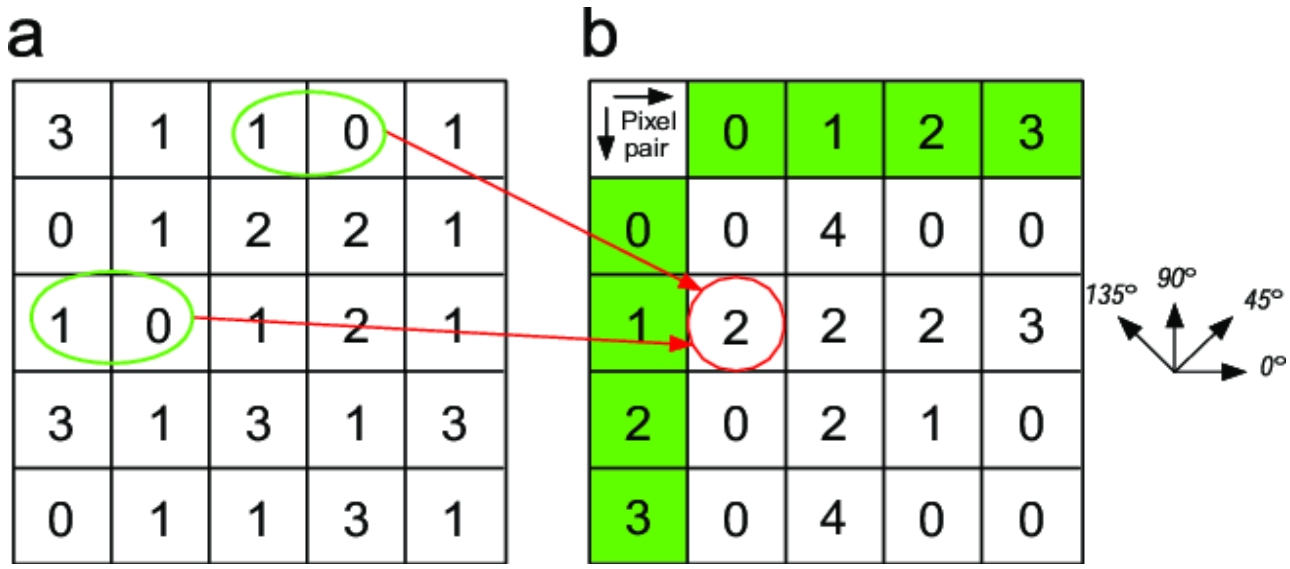


**Figure 4.** GLCM Calculation

**c.Road congestion system**

Feature *S* reflects the density of vehicle in the image, bigger *S* means heavier road congestion, smaller *S* means unobstructed road condition. We carried out hundreds of experiments to obtain the decision threshold *ST*. When *S*>*ST*, there are crowded vehicles on the road, which may lead to traffic congestion. When *S*<*ST* , the traffic is smooth. In the next section, the detail of obtaining threshold *ST* will be introduced.

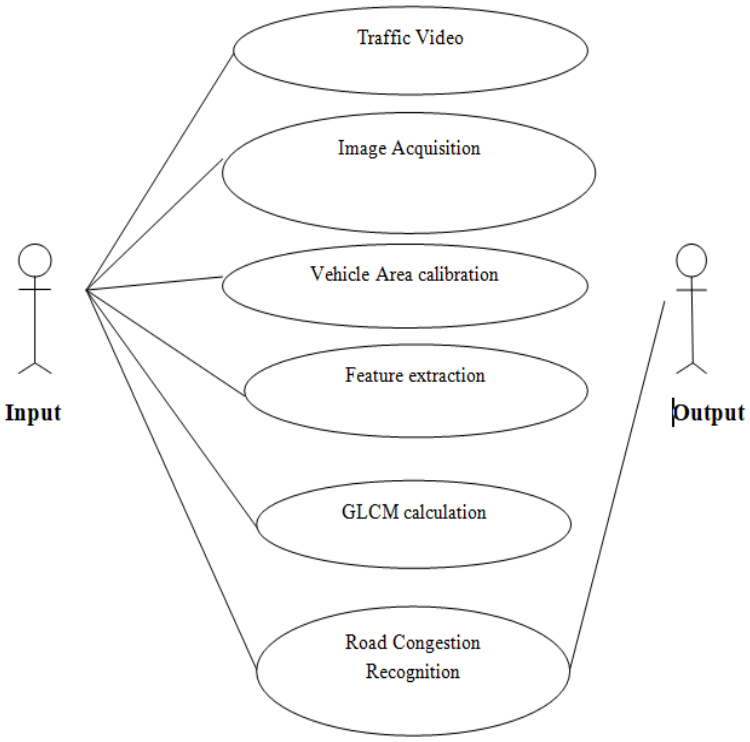


**Figure 5.** Use-case diagram

## IV. RESULTS

For Traffic light controller, the estimated results are appeared as below based on counting of vehicles

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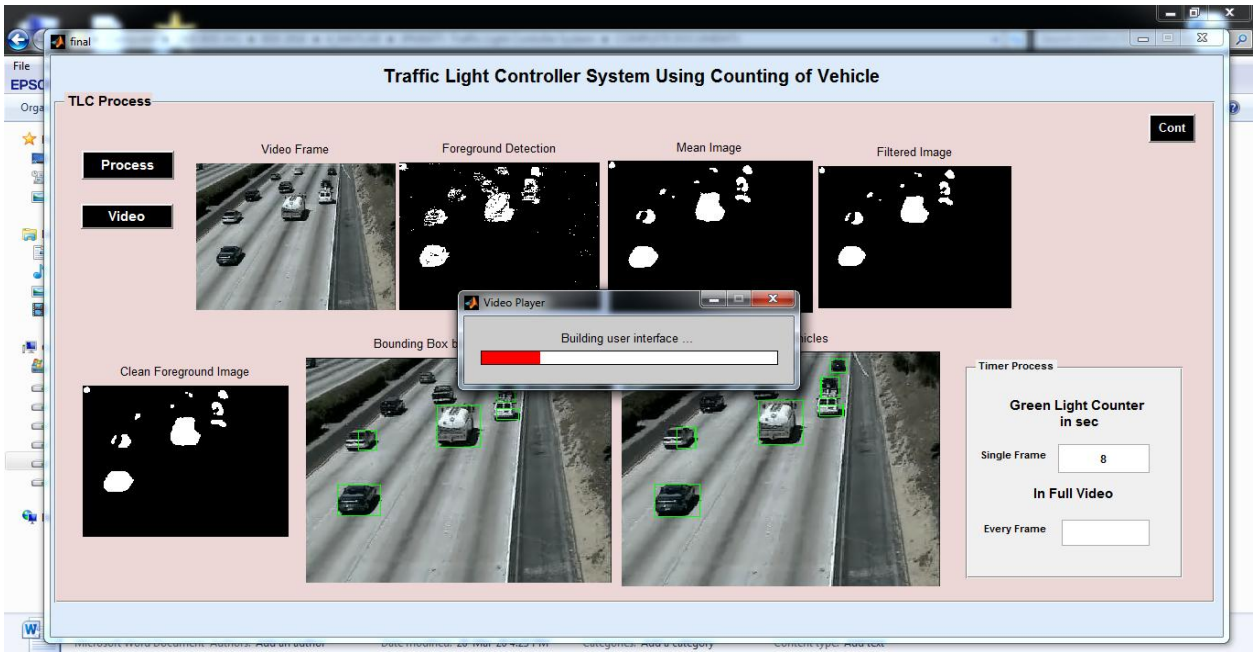


**Figure 6.** Traffic light controller system

For Traffic congestion system, the estimated results are appered as below based on classification of vehicles

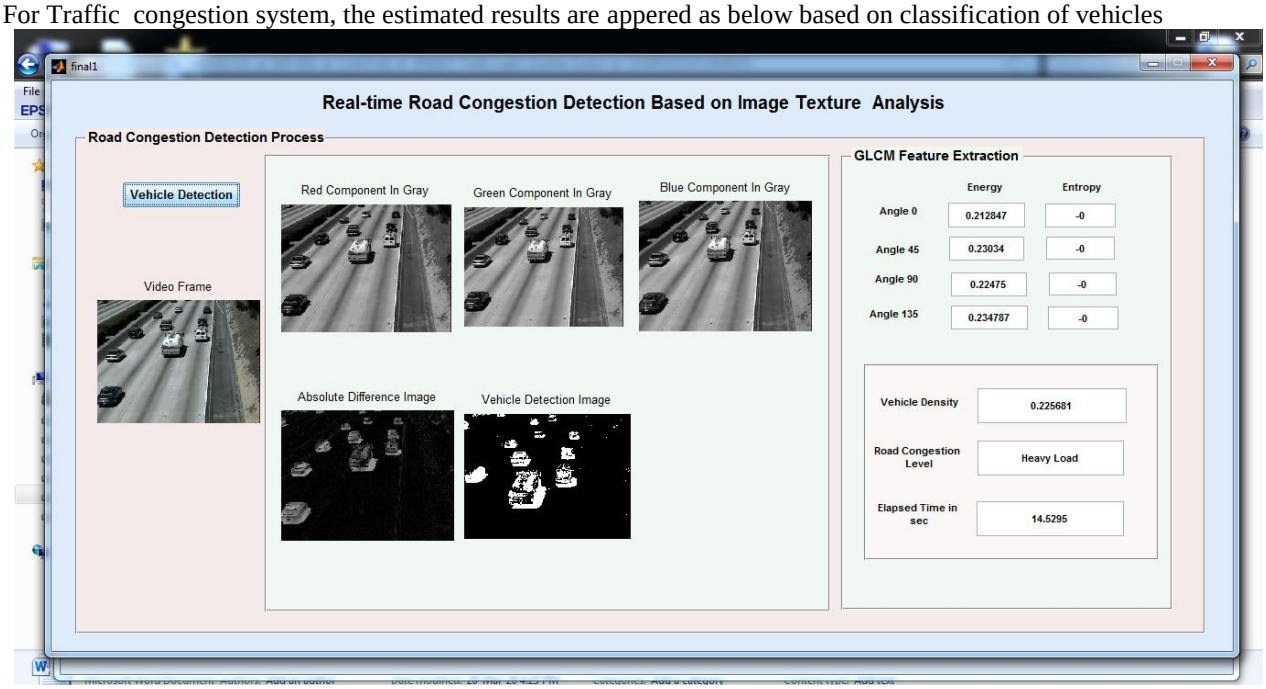


**Figure 7.** Traffic congestion system

## V. CONCLUSION

The above paper presents the method of traffic light control through image processing. The earlier techniques had a drawback of time being wasted on green light on the empty road. Our implemented system avoids this problem. We have successfully implemented real time image processing based traffic light controller .

This paper illustrates that image processing is the best way to control traffic when it comes to real time feedback. The key feature of this paper is that it removes the need of hardware sensors such as infrared sensors and RFID tags.

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