

Traffic Analysis and Enhanced Plate Detection for Identifying Traffic Rules Breakers

Dave Nehakumari H.¹ Prof. J. S. Dhobi²

¹M.E. Student ²Professor

^{1,2}Department of Computer Science

^{1,2}Government Engineering College, Sector 28, Gandhinagar

Abstract— Breaking traffic rules is a crime as per the law. But it is difficult in today's crowded environment to find who broke the rules. Analysing today's situation, we can see there are lots of vehicles running on road. And so the traffic jam problems arise. As a result, people sometimes break the rules. Identifying rule breakers is as much important as Traffic management. Here we are going to use image processing. Image processing simply deals with images. For our work, we are going to capture images of vehicle by camera and then using Image processing we are going to identify rule breakers. For that we are focusing on plate detection method to analysis.

Key words: Image Processing, Traffic Management, Analysis, Plate Detection

I. INTRODUCTION

Nowadays we are living in fast world. Level of living is getting up. People generally don't like to travel in public transport. They use their individual vehicles. And we have to face a big problem that is traffic congestion. Traffic jam becoming more serious day after day. The major reason leading to traffic jam is the increase in number of vehicle. It was caused by the development of economy and population. To avoid this problem, people should get understood to travel in public transport. Government must also encourage them by setting low amount of transportation charges. Particularly, in some Asian countries such as Viet Nam, the local authorities passed law limiting to the number of vehicles for each family. [3]

A. Standard System for Traffic Control

1) Manual Controlling

Name itself denotes it requires controlling the traffic manually. Means man power is needed on the spot of the traffic point. Government recruits traffic police for this purpose. That man power will be wearing specific uniform, having whistle in one hand and sign board or sign light standing at the place to handle traffic.

2) Automatic Controlling

In this system, Traffic signal light are placed where there is possibility of traffic getting jammed. For this type of traffic signal light, timers are set. Up to few seconds, one of the road is set to green light. So the vehicles can pass easily. This light gets on and off automatically depending on the timers set.

B. Problem with both the system

In the manual system we need man power. Already we are having one person to handle traffic. That particular person is definitely not able to move in all direction at a time to check who is breaking traffic rule. With automatic system, it may occur that there is green signal to an empty road while other road is full of vehicle but having red signal. And this system

does not even deal with identification of traffic rules breakers.

C. Introducing Image Processing for Identification Purpose

There are many of the methods are implemented till now in the image processing area. In our system we are introducing image processing. So firstly we need to understand how the basic operations in image processing are done.

1) Steps:

Generally, image processing involves with the following basic steps.

- Image capturing
- Image cropping
- RGB to grayscale transformation
- Image enhancement

a) Image Capturing:

Images of the vehicle on road are captured by the camera.

b) Image cropping

Cropping the image captured by camera by removing sides of the vehicles is done.

c) RGB to Grayscale Transformation

The image captured by camera is in the RED GREEN BLUE (RGB) combination. Here specific transformation methods are applied to convert it in gray scale image.



Fig. 1: RGB to grayscale transformation

d) Image Enhancement

Image enhancement deals with the method to making image clear or we can say more suitable for further analysis.

Almost all the research done on traffic analysis by image processing follows these steps or includes these steps. Depending on their own criteria they involve some additional methods also.

II. MOTIVATION

As we think of the technology emerged till now, we know traffic management is being handled well. One of the methods for traffic management follows these steps. They use camera where the traffic light is situated. Camera captures the frames of vehicle running on the road. Images of vehicles captured by the camera are processed for conversion from RGB content to grayscale format. Next step contains cropping operation. It is there for identifying road

area where vehicles are running and it excludes the background information which is not necessary. By applying multiplication operation on cropped image, target area is fixed. Third step is object detection. In this step, identification of vehicles and counting of vehicles on the targeted area is done. Next step includes the conversion of real and referenced images into gray scale image. Here gray scale image is generated. Traffic density is also analysed. To handle emergency, they use GSM technique. This method is introduced in Application of Image Processing In Road Traffic Control. [1]

As there is technology, there will be different experiments also. The other method of traffic management also uses image processing. In that method, there are two approaches. One is vehicle plate detection system. Another is making traffic lights intelligent. By using vehicle plate detection system, automatic toll collection can be done instead of manual. We can also calculate duration of travelling with the help of camera situated at different points. Thirdly, we can measure average speed of a vehicle. By using second approach of making traffic lights intelligent, the lights can be set as per the incoming road traffic. This will in turn help in reducing traffic congestion.

Generally an image is a two-dimensional function $f(x,y)$. [3] The function $f(x,y)$ is characterized by two components. [3] They are the amount of source illumination incident on the scene being viewed, which is called illumination components and the amount of illumination reflected by the objects in the scene which is called as reflectance components. [3]

We can also apply morphological operation on the images. Erosion, dilation and hit-or-miss are three different morphological operation that can be applied on images. Erosion gradually decreases the size of objects and removes small anomalies by subtracting objects which have radius smaller than the structuring element. [4] With binary images, dilation connects areas that are separated by spaces smaller than the structuring element and adds pixels to the perimeter of each image object. [4]

One another method has involved thresholding technique in traffic management. First, we are having grayscale form of an RGB form image. In the thresholding step the gray scale image which we had converted previously is now converted into black and white form. The main purpose of thresholding is a radical reduction of information in order to simplify further processing. [6]

One research deals with Intelligent Transportation system. It is demanding technique for the effective traffic management. There are two phases. Both the phases applies same step as image acquisition, RGB to gray scale conversion, image enhancement and image matching using edge detection. But the difference is first phase applies this operation on empty road to generate reference image while the second phase applies these operations on images with traffic on the road. Both the images are matched and then depending on the results traffic lights are set.

III. OVERVIEW OF CRITERIA AND EDGE DETECTION TECHNIQUES

When we are going to introduce the concept of plate detection, we need to apply edge detection methods. There

are some criteria to be considered for applying edge detection techniques. The criteria are good detection, noise sensitivity, good localization, orientation sensitivity, and speed and efficiency.

- Good detection: The amount of false edges should be as less as possible. Once the threshold operation is done, we can detect edges. The high threshold will lead to less false edges, but it also reduces the number of true edges detected. [8]
- Noise sensitivity: The algorithm can detect edges in certain acceptable noise environments. [8]
- Good localization: edge localization accuracy means the edge location must be reported as close as possible to the correct possible position.
- Orientation Sensitivity: Orientation can be used in post processing to connect edge segments, reject noise and suppress non maximum edge magnitude. [8]
- Speed and efficiency: It is always expected that the algorithm must execute fast. An algorithm that allows recursive implementation or separately processing can greatly improve efficiency. [8]

For applying any of the edge detection technique, it is advisable to go through these criteria. Edge detector can be of two types. One is gradient based and another is laplacian based. Gradient based edge detection is having further three methods. They are Robert operator, prewitt operator and sobel operator. And the laplacian based method includes canny operator method. Gradient based edge detection methods falls under first degree whereas laplacian based method falls under second degree edge detection method. This study helps us to decide by which method we want to use edge detection techniques for our system.

There is similar method that uses plate detection for traffic management. In that, Images are taken from video sequence and then subsequent operations of normal image processing are applied. This research explains about two different approaches for traffic management. One deals with moving object tracking means vehicle tracking and speed measurement. Another one is automatic number plate registration and recognition. [9] Now, moving object tracking includes two methods. One is based on contour extraction and another is based on motion detection. Contour extraction is done by lane masking, background elimination and noise and blobs filtration. Contour extraction, contour linking, contour labeling and finally vehicle tracking are the methods applied one by one. Vehicle tracking by motion detection is also explained in the research. Speed measurement is also done for calculating vehicle average speed. The second approach of number plate registration and recognition is done by video camera which is oriented to fix front and rear position of vehicle number plate. Different background removal and noise filtration methods are applied for number plate recognition. This way the traffic management can be done with the help of image processing methods.

IV. COMPARATIVE STUDY

Paper	Methodology Used	Steps
Application of Image Processing In Road Traffic Control[1]	Object detection	<ul style="list-style-type: none"> - processing of video signal - image acquisition - Image cropping - object detection
Image Processing Application in Traffic Control[2]	Vehicle plate detection	
	Making traffic light signal system intelligent	
Traffic Control Using Digital Image Processing[3]	Edge detection	<ul style="list-style-type: none"> - Edge detection - Image matching - background subtraction
Traffic Jam Detection Using Image Processing[4]	Vehicle detection	<ul style="list-style-type: none"> - frame extraction - morphological operation - queue detection
Automatic Traffic Estimation Using Image Processing[5]	Vehicle Tracking Contour Extraction	
	Motion detection	
Intelligent Traffic Light Control Using Image Processing[6]	Image capturing and processing	<ul style="list-style-type: none"> - Image cropping, - Image enhancement, - Thresholding, - edge detection - object counting
Real Time Traffic Light Control Using Image Processing[7]	Edge detection	<ul style="list-style-type: none"> - Image acquisition, - RGB to gray conversion, - Image enhancement, - Image matching
Traffic Light Control System Using Image Processing[8]	Edge detection	
Embedded based Implementation: Controlling of Real Time Traffic Light using Image Processing[9]	Image matching	<ul style="list-style-type: none"> - Image acquisition - RGB to gray conversion, - Image enhancement, - edge detection - Image matching
Image Processing in Road Traffic Analysis[10]	Vehicle tracking based on contour extraction	<ul style="list-style-type: none"> - Lane Masking - Background elimination - Noise and blobs filtration - contour extraction - contour linking - Contour labelling - vehicle tracking
	Vehicle tracking based on motion detection	<ul style="list-style-type: none"> - speed measurement
	Number plate registration and recognition	

Table 1: Comparative study of Research papers

V. SYSTEM WORKFLOW

Till now we have gone through different methods that are used for traffic management. But still we are facing traffic jam problems and so there are possibilities of traffic rules breaking. All the studies until now describe the image processing techniques to analyse the road traffic. But for our system we are going to use the image processing methods in identification of rule breakers. If we get the right information about rule breakers then we can punish them by giving our recorded information to government. Like we can use the number plate recognition method and by getting the information of which number plate was licensed to which person, we can send them notice on the registered address.

VI. METHODOLOGY

For implementing the system we firstly need to follow the image processing steps. What we need to do additional steps involve following.

- Plate detection
- Recognition
- Database matching

Suppose there is heavy traffic at say for particular circle, and someone has broken the rule and he/she has passed her/his vehicle at the time when the signal light was red. So we can detect it by camera placed at the point of circle. We will get the number plate of the person who has wrongly crossed the road and broken the traffic rule. We

will recognize the number plate and then will check to whom that number plate was licensed. By doing this, we will get the information about that person. We can then easily send notice or we can also send fine on the registered address.

For doing this we need to collaborate our system with RTO database. Right now, simply we will do this in MATLAB and we will use our own database for the implementation purpose. But when we will implement the actual system, we will need to get approval from government for traffic management as well as for RTO database matching.

VII. ADVANTAGES

- No need to use sensors.
- Timers are also not needed.
- An empty road will not get green light.
- Traffic rules breakers will be caught even though they ran away.
- Easy setup.

VIII. DISADVANTAGES

- Installation cost is high.
- Maintenance is costly.
- Problem can arise when the driver is not the one whose name is licensed to that vehicle.

IX. FUTURE WORK AND SCOPE

Cameras that we are using should be having high resolution So that we can detect images of the driver also. Heavy vehicles like car, bus or truck are having glass over there. There should be a technique that can detect the driver face by penetrating the glass of the vehicle also. We can also attach connected alarm system with the camera. As the driver break the traffic rule and ran away, the alarm on the next traffic signal and to the nearest police station should blow. If this system is implemented then there will definitely be decrease in the number of traffic rules breakers.

X. CONCLUSION

Image processing is very effective and promising method for traffic management. Few decades ago, timer system was there which was not so convenient. Then image processing concept came into picture for setting the traffic signal light according to the incoming traffic. Here we introduce a new concept of identification of traffic rules breakers by image processing. This system can be very useful for stopping people to break the traffic rules and create a safe traffic environment.

REFERENCES

- [1] Ankita Panda, Ankit Naik, Purushottam Patel, "Application of Image Processing In Road Traffic Control, ISSN 2394-3777 (Print),ISSN 2394-3785 (Online)Vol. 2, Issue 4, April 2015
- [2] Amirhassan Najjar, Hamidreza Ghaffary, "Image Processing Application in Traffic Control", Najjar *et al.*, Int. J. Rev. Life. Sci., 5(3), 2015, 351-355
- [3] Chandrasekhar. M, Saikrishna. C, Chakradhar. B, Phaneendra Kumar. P & Sasanka. C, "Traffic Control Using Digital Image Processing",ISSN (Print): 2278-8948, Volume-2, Issue-5, 2013
- [4] Prof. Uma Nagaraj, Jinendra Rathod, Prachi Patil,Sayali Thakur,Utsav Sharma, "Traffic Jam Detection Using Image Processing", ISSN: 2248-9622, Vol. 3, Issue 2, March -April 2013, pp.1087-1091
- [5] Pejman Niksaz, "Automatic Traffic Estimation Using Image Processing", International Journal of Signal Processing, Image Processing and Pattern Recognition, Vol. 5, No. 4, December, 2012
- [6] Rahishet, Aparajita sahuo, Aparna indore, Vaibhavdeshmukh, Pushpa U S, "INTELLIGENT TRAFFIC LIGHT CONTROL USING IMAGE PROCESSING", Proceedings of 21st IRF International Conference, 8th March 2015, Pune, India, ISBN: 978-93-82702-75-7
- [7] Ms.Pallavi Choudekar, Ms.Sayanti Banerjee, Prof.M.K.Muju, "REAL TIME TRAFFIC LIGHT CONTROL USING IMAGE PROCESSING", ISSN : 0976-5166 Vol. 2 No. 1
- [8] Kavya P Walad, Jyothi Shetty,"Traffic Light Control System Using Image Processing", ISSN(Online): 2320-9801 , ISSN (Print): 2320-9798, Vol.2, Special Issue 5, October 2014
- [9] G. Lloyd Singh, M. Melbern Parthido, R. Sudha, "Embedded based Implementation: Controlling of Real Time Traffic Light using Image Processing ", National Conference on Advances in Computer Science and Applications with International Journal of Computer Applications (NCACSA 2012),Proceedings published in International Journal of Computer Applications@ (IJCA)
- [10] E.Atkociunas, R.Blake, A. Juozapavicius, M. Kazimianec, "Image Processing in Road Traffic Analysis", Nonlinear Analysis: Modelling and Control, 2005, Vol. 10, No. 4, 315-332