iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 3 **Issue:** V **Month of publication:** May 2015

DOI:

www.ijraset.com
IC Value: 13.98

Volume 3 Issue V, May 2015
ISSN: 2321-9653

International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Nighttime vehicle Tail light detection in low light video frames using Matlab

Bhavinkumar M. Rohit[1], Mitul M. Patel[2]
EC Deptt. Parul Institute of Engineering and Technology, Gujarat, India

Abstract— In the night time the vehicles in front are generally visible by their taillights and brake lights. The tail lights are particularly important because they signal deceleration in distance from rear end vehicle and to avoid potential collision. At night situation only tail lights are the available information factor to detect the forehead vehicle. The previous studies based on light scattering when brakes are pulled, here instead that we depend tail lights detection based on the tail lights symmetry and its color characteristic.
Keywords—Tail-light detection; image processing; night-time road envirement.

I. INTRODUCTION

This paper is focused on tail light of vehicle in night time road driving conditions. Statistics data of on road accidents suggest that night conditions are an important area for scrutiny for road side safety. The appearance of vehicles during day time has many factors such as environment lights, colors of vehicle, reflection of light on the body of vehicles etc , where as in the night driving conditions ,we only have tail lights and brake light for computer vision based techniques in aiding with road safety and security.

Demand for system that can avoid or mitigate rear end collisions is expected to grow as consumer grows safety conscious. Automotive manufactures have started to introduce ADAS (Advanced Driver Assistance System) such as RADAR and LIDAR. A forward facing front camera could be a low cost alternative or assistant to such system, as well as many other functions.

Vehicle are viewed from behind at night, are primarily visible by the red color of rear facing tail lights. All car models have their own peculiar physical and structural features which make them distinctive from each other. But they must be red in color and at the same height. While all vehicles differ in appearance, with different style of rear light, they must adhere to certain guidelines. These properties can be identified by image processing systems. When in direct view and not occluded, tail light will be:

A. Amongst the brightest object in the image;
B. Close to each other in pairs;
C. Symmetrical ,same size and shape;
D. Must be red in color.

(a) (b)

Fig.1.(a)Tail light of vehicle (b)Brake lights of vehicle with center mounted lamp.

This paper describe a system for detecting vehicles based on their rear lights .this system focuses on near range upto 50-70 meter distance detection so that the distance in the between the rear lights is large enough so that the individual lights are disguisable. We do not account for vehicles that do not meet legislation requirements, such as vehicles with modified lights or broken lights that do not meet the common legal specification of color, brightness and position

In the proposed system ,introduced low light video frames which are low exposure value images , by using the low exposure image frames many factors such as street lights, unwanted reflections from vehicles body ,sign boards reflections can be removed and only the bright red color and head lights of oncoming vehicles are visible in the image frame.

To reduce the interference from environmental lighting sources such as street lights and signboards, a color filter is used for verifying the detected lights. The trichromatic coordinates specifying the regulation color for red lights are defined by the following inequalities:

$x+y \geq 0.$

$y \leq 0.335$

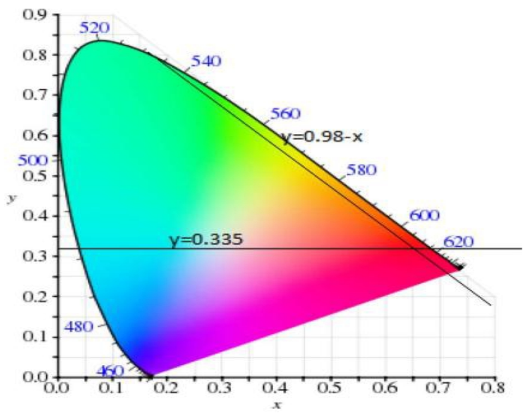


Fig.2.CIE xy chromatically diagram showing the regulation limits of light for red taillight signals.

II. LEGISLATION

Over the world automotive industry legislation provided that rear vehicle light must be red and placed symmetrically in pairs at the same height of the rear of the vehicle. This must be wired so they light up whenever the front lights are liten up. Also that tail lights and brake lights can be integrated into a single unit, there is specified brightness ratio for distinguish the tail and brake lights. The tail light can be of LED bulb also.

III. METHODOLOGY

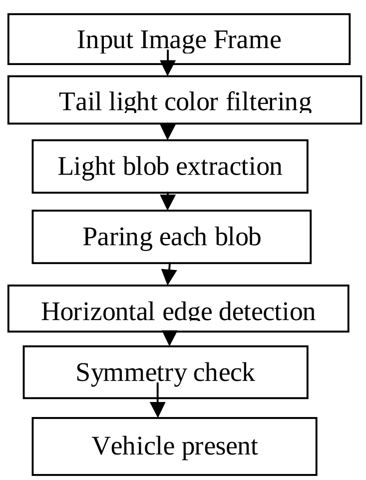
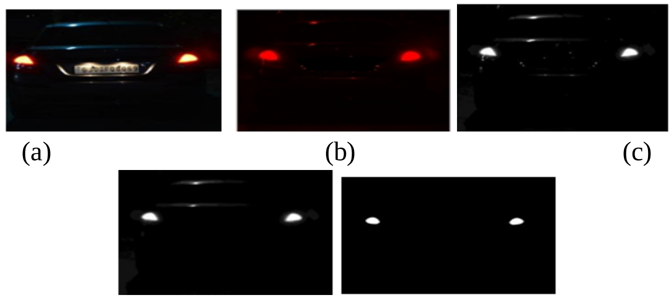


Fig.2. system flow for tail light detection and verification of the same vehicle.

Volume 3 Issue V, May 2015
ISSN: 2321-9653

International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Here steps are decided to detect the red color tail light so the approach is applied with firstly extracting the Red Layer from the RGB frame then getting the gray converted image of the input frame. After getting the gray frame subtract the gray frame from the Red frame. All the unwanted noises are removed using Median Filter Last, the convert the frame into Binary Image using Threshold value. Now put the blob analysis on the image frame to calculate the area and bounding box of those blobs.



(a) (b) (c)

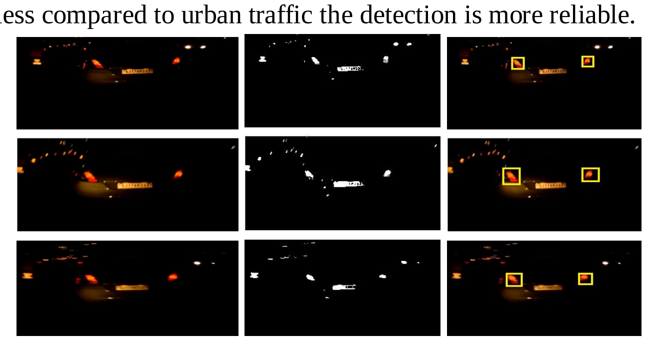
(d) (e)

Fig.2. (a) original image frame (b) Red color frame (c) gray converted image (d) Removed noise image (e) binary converted image frame

To pair the light blob, connected component analysis is applied to label each candidate in order to characterized parameters. After that blob candidate are paired with other to determine the symmetry between them. Depending upon the symmetry of the tail lights are identify as for a same vehicle and other blobs are rejected as a nuisance light spots.

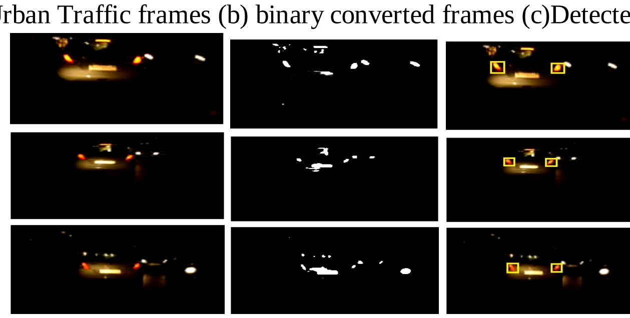
IV. EXPERIMENTAL RESULTS

The system has been performed with four different type of road conditions where the ratio of traffic is different, with the urban traffic situations, unwanted light sources such as various traffic sign boards and street lights are came into the frame, where in the case of rural traffic as the vehicles are very less compared to urban traffic the detection is more reliable.



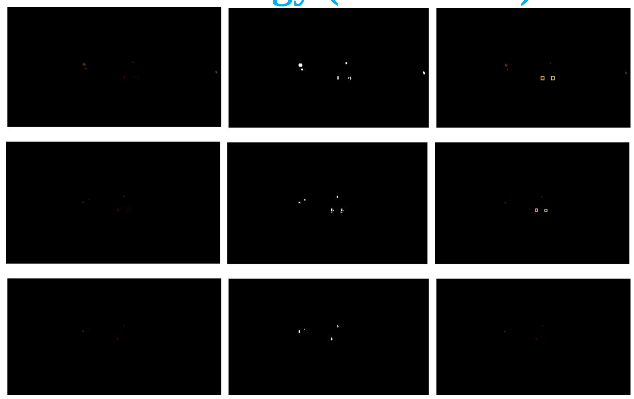
(a) (b) (c)

Fig.3.(a)Urban Traffic frames (b) binary converted frames (c)Detected tail lights



(a) (b) (c)

Fig.4.(a)Two way Traffic frames (b) binary converted frames (c)Detected tail lights.



(a) (b) (c)

Fig.5.(a)Highway Traffic frames (b) binary converted frames (c) Detected tail light.

V. QUANTATIVE PERFORMANCE EVALUTION

for performance comparison ,the proposed work is the perform the tail light detection, particularly in the low light night video sequences. The red color of the selected as a basic detection through the RGB color Model. This tail light is regarded as the taillights, and the size is used to determine the distance between the vehicle and the camera mounted rear vehicle.

Table I Camera configuration

Camera configuration	Value
Frame Rate	15
Height	160
Width	320
Bits per pixel	24
Color Model	sRGB

Table II Tail light Detection Rates.

Traffic conditions	Total frames	Detected frames	accuracy
Rural traffic	317	270	85.01%
Urban traffic	94	83	88.29%
Two way traffic	264	201	76.13%
Highway traffic	215	150	60.64%

Table III

Maximum Detection Distance. Using four different dataset of urban, rural, two way and highway traffic conditions.

Traffic video	10m	20m	30m	40m	50m
Video1	o	o	o	o	o
Video2	o	o	o	o	o
Video3	o	o	o	o	
Video4	o	o	o	o	

In addition, to evaluate the system performance under different traffic and road environment condition, data set of image frames are verified and tested. The detection rata are shown in table.

The system has been tested with 2.5GHz CPU. And the system has made detection on 15frames/s on Windows based platform with Matlab software. That means the system can be performed in near real time on vehicle based camera systems.

VI. CONCLUSION

Our proposed system can make detection on 15fps rate which is very near for real time applications. Now for the future work we will try to detect the brake light and distance for making the collision avoidance warning for driver assistance.

VII. ACKNOWLEDGMENT

I would like to thank my Guide, Prof. Mitul Patel for continuous motivation and enlightenment on this research work. Without his help, this is not going to be possible.

REFERENCES

[1] "Night Time Brake Light Detection Using Nagakami Imaging" Duan-Yu Chen, Yu-Hao Lin, and Yang-Jie Peng, IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, pp.1627-1637 VOL. 13, NO. 4, DECEMBER2012

[2] "Frequency Tuned Taillight-based Night Time Vehicle Braking Warning System" Duan-Yu Chen, and Yang-Jie Peng IEEE SENSOR JOURNAL.,pp. 3285-3292 VOl-12,NO. 11, NOVEMBER 2012

[3] "Rear-Lamp Vehicle Detection and Tracking in Low-Exposure Color Video for Night Conditions" Ronan O'Malley, Edward Jones, and Martin Glavin, IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS,pp. 453-462 VOL. 11, NO. 2,JUNE 2010

[4] "Vehicle Detection In Monocular Night Time Grey-level Videos", Umesh kumar ,pp-214-219, 978-1-4799-0833-7/13 IEEE 2013.

[5] "Traffic Safety Basic Facts 2007—Motorways," Eur. Road Safety Observatory, 2007.

[6] "Federal Motor Vehicle Safety Std. 108," Nat. Highway Traffic Safety Admin., Tech. Rep.

[7] "Regulation no. 7, Uniform Provisions Concerning the Approval of Frontend Rear Position (Side) Lamps, Stop-Lamps and End-Outline Marker Lamps for Motor Vehicles (Except Motor Cycles) and Their Trailers, "UN World Forum Harmonization Vehicle Regulations, 1968.

[8] Z. Sun, G. Bebis, and R. Miller, "On-road vehicle detection: A review", IEEETrans. Pattern Anal MachIntell.,vol. 28, no. 5,pp.694-711,May2006

[9] "An effective method of head lampand tail lamp recognition for night time vehicle Detection." hyun-koo kim,sangong kuk, Minkwan Kim. World academy of science, engineering and technology vol-4 2010-08-29

[10] "A hybrid method of Vehicle Detection based on computer Vision for intelligent transportation system" Huan Wang and Haichaun Zhang . International journal of multimedia and ubiquitous engineering. Vol.9 no.6(2014)pp.105-118

[11] [United Nations] Uniform provisions concerning the approval of front and rear position lamps, stop-lamps and end-outline marker lamps for motor vehicles (except motor cycles) and their trailers Addendum 6: Regulation No. 7 Revision 6 November 2012