Nighttime Vehicle Detection, Counting And Classification.

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ABSTRACT

Intelligent transportation systems have received lot of attention in the last decades. Vehicle detection is the important task in this area and vehicle counting and classification are two important applications . In proposed system for nighttime vehicle detection, counting and classification we process the frames with different feature methods like background subtraction algorithm (identifying objects), track the object using tracking algorithm (blob analysis) and count the vehicles through ROI sensing line and classifying the vehicle using correlation matching process. The vehicles are tracked by creating bounding boxes around them. The vehicles can be effectively detected by using morphological processing techniques and the unwanted regions can be filtered using kalman filtering. Each time when the vehicle crosses the region of interest list the count will be updated for each frame. Different types of templates are used to classify vehicles into three categories as small (e.g. car), medium (e.g. van) and large (e.g. bus and truck). The templates used are different types of headlamps taken and matched with the vehicles present in each frame. The type of vehicle can be identified based on the distance between the two headlamps of the vehicle. The results obtained are such that it reduces the complexity of analysis and it improves the detection by avoiding other movable objects.

Keywords-*background subtraction, tracking, ROI, Kalman filtering, templates.*

1. INTRODUCTION

In recent days the vehicles on the road is keep on increasing. The number of vehicles on the road is keep on increasing and there is a huge traffic in the roads. The nighttime vehicle detection, counting and classification is becoming increasingly difficult. In our proposed method of vehicle detection, counting and classification we use different methods. The data for the real time traffic monitoring system can come under various source like the loop detectors, ultrasonic detector, microwave sensors, radar sensors or video cameras. Due to the recent advancement in the computer vision and image processing techniques, the video cameras have been found to be an efficient means to collect and analyze the traffic data. Video based camera systems are more accurate because the image sequence present in the video allow us to process in a very efficient manner. Video based system helps us to improve the processing methods. This method helps us to overcome the disadvantages in using adaptive masking which would result in the complexity of the system and improper masking. Before performing the process the pre-proessing steps should be effectively performed to obtain the improved performance. The preprocessing includes filtering of unwanted noise sources and conversion of image into grey scale. The main stages are preprocessing stage, equalizing stage and processing stage.

Generally most of the nighttime detection is done on the basis of headlight luminance intensity. In most cases the headlights and the rear tail lights are generally used for the analysis. The transport system of countries like USA has set up some standards for setting up of luminance intensity of the vehicle headlights.

In some cases the background objects and other moving objects are also detected during the process. This system effectively detects the presence of vehicles by avoiding the unwanted other moving objects in the background. The detection, counting and classification are done for every frames.

2. RELATED WORK

The nighttime vehicle detection and counting were researched recently. In [8] the vehicles were detected in dark time using adaptive mask training. In [1], the motion of vehicles in traffic detected, under non ideal weather conditions such as snowfall, heavy rain, fog and it has a disadvantage of detecting unwanted

objects. The Computer Vision system was used for detect moving objects by using Gaussian-based background modelling technique. In [3], placing vision-based vehicle detection in the context of sensor-based on-road surround analysis. vision-based vehicle tracking is in the monocular and stereo-vision domains, analyzing filtering, estimation, and dynamical models. Spatio temporal measurements are used to measure the speed of the vehicle.

3. PROPOSED SYSTEM

The block diagram of the proposed system is shown below in the fig 1.

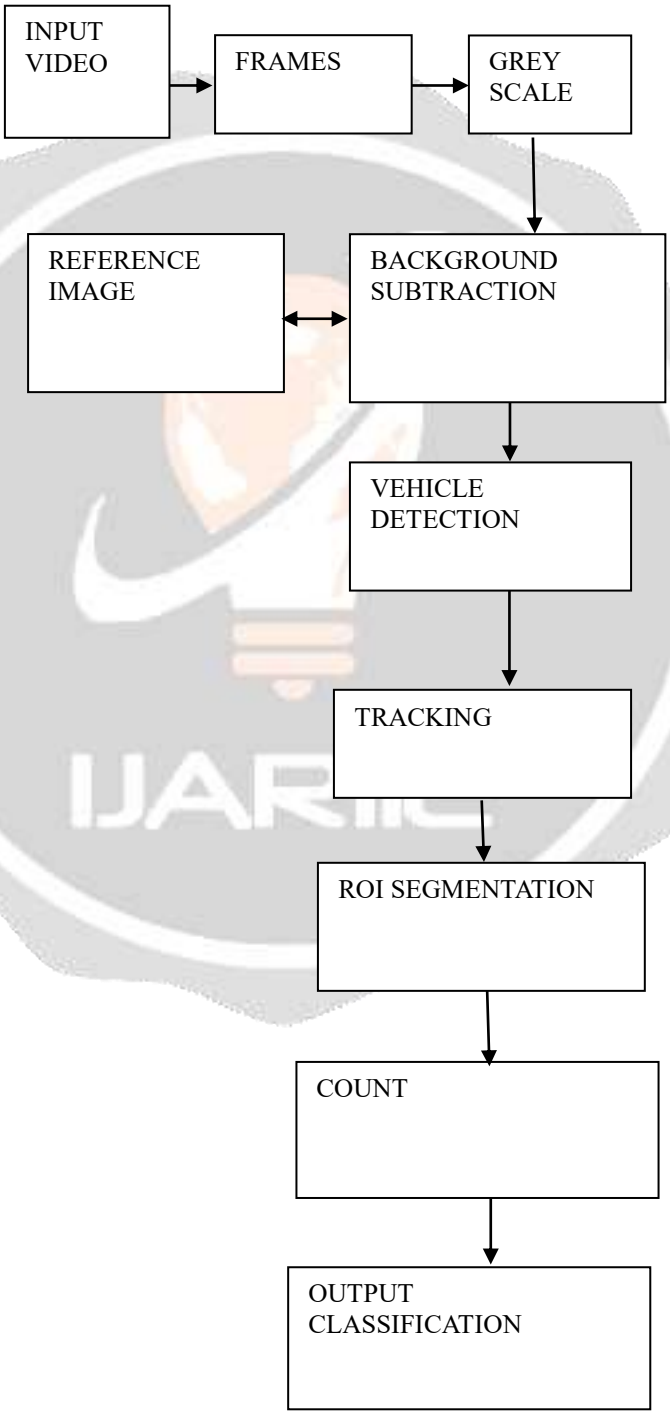

Fig-1: Block diagram

3.1 BACKGROUND SUBTRACTION

The background subtraction algorithm is used to detect the presence of vehicles in the frame. The background subtraction algorithm is done based on the threshold value. The threshold value is calculated based on the total pixel intensity. In the background subtraction algorithm the foreground image is subtracted from the background image. The background subtraction is done based on the threshold value. The pixel which has the value greater than the threshold is detected and it denotes the presence of the vehicles in the frame. The pixel value which is less than that of the threshold is eliminated which is the background. Thus the foreground image is subtracted from the background image effectively. The vehicle can be effectively determined by this method. The background subtraction is shown in the figure 2.

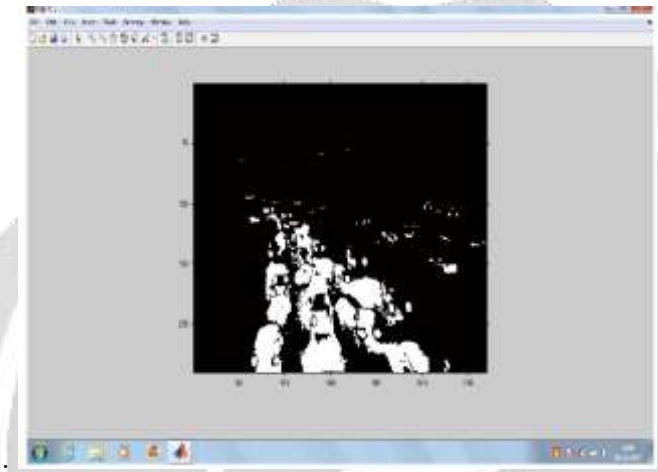

Fig 2 : Background subtracted Image

Thus the foreground image is effetively subtracted from the background and the thus the foreground image is effectively calculated it can be effectively calculated for each and every frame. The background subtraction algorithm involves preprocessing of images and then subjected to background modelling and then foreground detection is made. Then with the available results data validation is done .

3.2 BLOB DETECTION

The properties are constant over this region**.** Blob detection involves the following three process namely extraction,refinement and analysis. The image which is to be processed must be extracted and then refinement should be made to avoid error in the processing. Then with the results obtainned do the analysis. This blob detetion algorithm is used for tracking the vehicles. The blob is created around the vehicles which needed to be trackedand then ompare the distance between the vehicles in the current frame and the previous frame and the object is tracked untill it remains in the region of interest then the distance is computed using the formula as given below,

$$D=(R\_center.y-L\_center.y)/(R\_center.x-L\_center.x) \quad (1)$$

By this the headlight distance of vehicles is determined by creating a blob around them. The blob created are clustered and then the individual vehicles can be identified by further filtering and morphological processes. The blob creation is as shown in the figure 3.

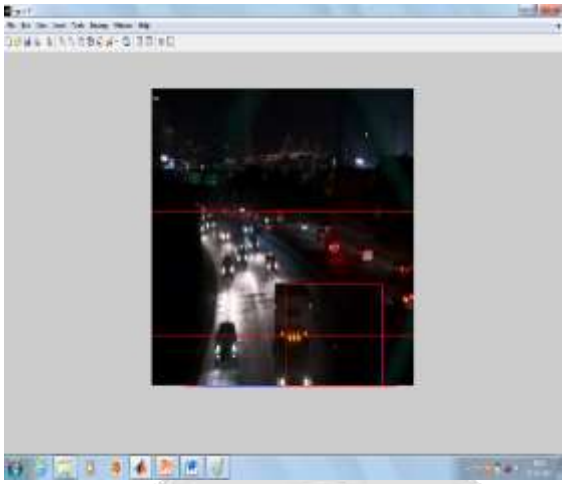

Fig 3 : Blob Creation

3.3 REGION OF INTEREST

Region of interest is drawn around the region which is to be focused. In this paper rectangular ROI is used as the intensity can be effectively calculated using rectangular ROI. The vertices is positioned with respect to the array of image pixels. The rectangular ROI is drawn by simply connecting the individual line segments. When the ROI intersects any of the pixel values then it is considered and the process is done. The ROI is the sub region extracted from the main image. This sub region is where the processing is done. Each time when the vehicle crosses the ROI line the count is updated. Thus the count can be obtained for every frame. The vehicles are tracked and classified only when it enters the ROI. When the vehicles enters the ROI line the vehicles are started to tracked and when the vehicles leaves the ROI line the vehicles are stopped tracking and then the count is updated for every vehicles crossing the ROI sensing. In the ROI region only the vehicles are detected, other moving objects can be avoided by performing filtering and morphological processing. The vehicles inside the ROI is tracked by creating bounding boxes around the vehicles and the process are carried on. The ROI creation is as shown in the figure 4.

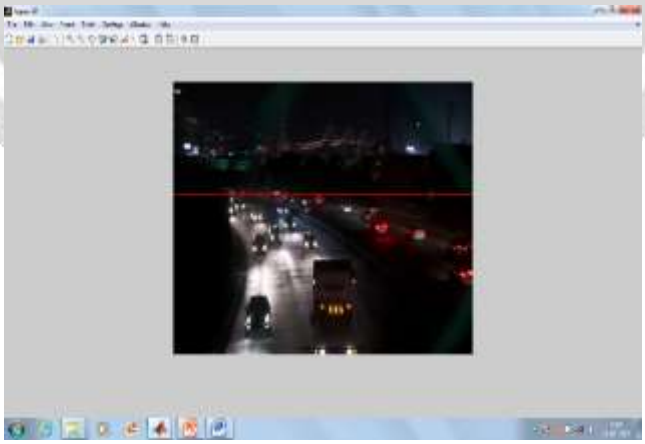

Fig 4 : ROI Creation

3.4 TEMPLATE MATCHING

Template matching is done by correlation process. The templates of different vehicles are taken and it is matched with all the incoming vehicles. The correlation matching between the different vehicles that are entering the ROI region is determined and the classification is done. The vehicle's headlights and the templates

stored are matched and and the type of vehicle is determined. The template matching is shown in the figure 5. count and the classification are as shown in the figure 6.

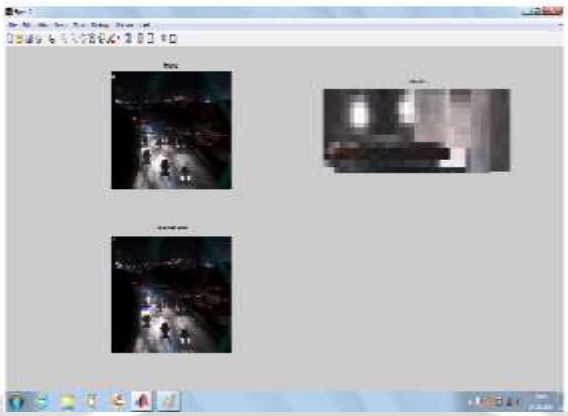

Fig 5 : Template Matching

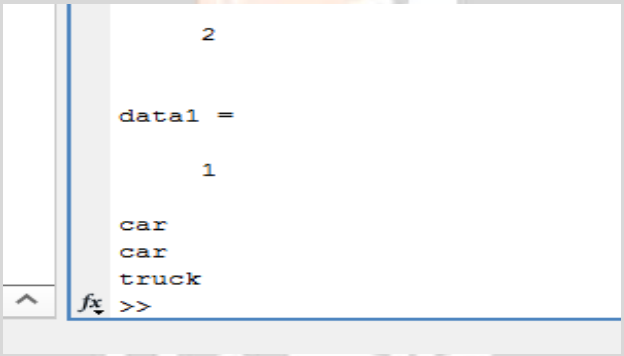

Fig- 6 : count and classification

The process results are as shown in the table 1

Table- 1 Process Results

Parameters	**Values**
Frame number	143
count	3
Type	Car, Car, truck

4. CONCLUSION

The vehicles can be effectively detected, counted and classified during night time and other atmospheric conditions using different algorithms. By using MATLAB techniques for image processing the complexity involved is reduced in implementing the same using open cv and it gives the analysis of each frame. This helps in avoiding improper masking and the use of rectangular ROI helps in calculating the intensity efficiently.

4.1 FUNCTIONALITIES

- No special cameras required.
- Simultaneous multiple detection.
- Controlled area search and capture.
- No special hardwares.
- Automatic detection and comparison.
- Can capture during high speed movements.
- Effective template comparison.

5. REFERENCES

[1]. Agalya A. (2014) "Segmentation of Moving Vehicles under Complex Outdoor Condition Using Block Matching Algorithm," International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 3, Issue .

[2]. S. Atev, G. Miller, and N. P. Papanikolopoulos, (2010) "Clustering of vehicle trajectories," IEEE Trans. Intell. Transp. Syst., vol. 11, no. 3, pp. 647– 657.

[3]. H. Bay, A. Ess, T. Tuytelaars, and L. V. Gool, (2013) "Looking at Vehicles on the Road: A Survey of Vision-Based Vehicle Detection, Tracking, and Behavior Analysis," IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, VOL. 14, NO. 4.

[4]. Cucchiara R., Grana C., Piccardi M., Prati A., (2003) "Detecting Moving Objects, Ghosts, and Shadows in Video Streams," Pattern Analysis and Machine Intelligence, IEEE Transactions on Volume 25, Issue 10. Page(s):1337 – 1342.

[5]. B.Fortin, R. Lherbier and J.C. Noyer, (2013) "A PHD approach for multiple vehicle tracking based on a polar detection method in laser range data", IEEE, pp. no. 1-8.

[6]. Fu-Yuan Hu, Yan-Ning Zhang, Lan Yao, (2005) "An effective detection algorithm for moving object with complex background," Machine Learning and Cybernetics. Proceedings of International Conference on Volume 8, 18-21 Page(s):5011 - 5015 Vol. 8.

[7]. W. Hu, T. Tan, L. Wang, and S. Maybank, (2004) "A survey on visual surveillance of object motion and behaviors," IEEE Trans. Syst.,Man, Cybern. C: Appl. Rev., vol. 34, no. 3, pp. 334–350.

[8]. Jing-Ming Guo, Chih-Hsia, Jing-Yu Wu, Yi-Ting Wu and Nai-Jian Wang, (2016) "Nighttime vehicle lamp detection and tracking with adaptive mask training,".