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A Survey on Traffic Monitoring System for Detection And Tracking Vehicles at Night Time

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***Abstract* - This study presents traffic surveillance system for detecting and tracking moving vehicles in nighttime traffic scenes. The objective is to reduce the risk caused by accident. It is the effective nighttime traffic surveillance is used to count the vehicles. The proposed method identifies vehicles by detecting and locating vehicle headlights and taillights by using image segmentation and pattern analysis techniques. First, to effectively extract bright-object, a fast bright-object segmentation process is applied on the nighttime traffic scene images. A robust and adaptable detection system that operates well under various nighttime illumination conditions by using the automatic multilevel thresholding approach. After the extracted bright objects are then processed by a spatial clustering and tracking procedure by locating and analyzing the spatial and temporal features of vehicle light patterns, and identifying and classifying the moving cars and motorbikes in nighttime traffic scenes. This method of traffic surveillance approach is effective for vehicle detection and identification in various nighttime environment conditions.**

***Index Terms* - Traffic information system, Nighttime, Nighttime surveillance, Bright-object extraction, Vehicle detection, Vehicle tracking, Traffic surveillance.**

I. INTRODUCTION

The data for the real time traffic monitoring systems can come various sources like the loop detectors, ultrasonic detectors, microwave sensors, radar sensors or video cameras. Due to the recent advancement in 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 sophisticated and robust because the information that is associated with the image sequences present in the video allows us to identify and classify the vehicles in the most effective manner. The temporal continuity of data in video stream helps in improving the accuracy during vehicle detection. A video based monitoring system must be able to handle various weather and illumination conditions [1].

In this technical world, Video surveillance system is a major system that used by number of companies, organizations, governments and so on. In traffic roads, government takes extra efforts in installing cameras for finding the various data like number of vehicles passing through the road, number of pedestrians walking along the road, etc. There are number of projects running throughout the globe for traffic monitoring system. Almost every projects running concentrate on daytime traffic monitoring [3].

This paper is a night time traffic monitoring system, which concentrates on the night time traffic which mainly concentrates on the reflections coming from the road surfaces because other projects didn't give much importance.

The main aim of this paper is to identify the number of vehicles being passed on the road by eliminating the reflections on the road surfaces. The headlights are identified, tracked and paired to find the number of vehicles passed on the road [2].

Vision based traffic surveillance systems extract useful and accurate traffic information for traffic flow control, such as vehicle count and vehicle classification. Most of the methods concentrate on traffic monitoring in the daytime, and few works address the issue of nighttime traffic monitoring.

In daytime traffic monitoring systems, vehicles are commonly detected and analyzed by exploiting the gray scale, color, and motion information. Under the nighttime traffic environment, the foregoing information becomes invalid, and the vehicle can only be observed by its headlight and rear light. Furthermore, there are strong reflections on the road surface, which further complicate the problem.

The proposed system is a novel approach for vehicle headlight detection, tracking, and pairing in nighttime traffic surveillance video [3].

The detection of moving object's regions of change in the same image sequence which captured at different intervals is one of interested fields. One of the video surveillance branches is the traffic image analysis which included the moving or motion vehicle detection and segmentation approaches. Even though various research papers have been showed for moving vehicle but still a tough task to detect and segment the vehicles in the dynamic scenes. It consists of three main approaches to detect and segment the vehicle, as mentioned below:

(1) Background Subtraction Methods.
(2) Feature Based Methods.
(3) Frame Differencing and Motion Based methods.

The object tracking in video processing is an important step to tracking the moving objects in visual-based surveillance systems and represents a challenging task. To track the physical appearance of moving objects such as the vehicles and identify it in dynamic scene, it has to locate the position, estimate the motion of these blobs and follow these movements between two of consecutive frames in video scene. Several vehicle tracking methods have been illustrated and proposed by several researchers for different issues, it consists of:

(1) Region-Based Tracking Methods
(2) Contour Tracking Methods
(3) 3D Model-Based Tracking Methods
(4) Feature-Based Tracking Methods
(5) Color and Pattern-Based Methods

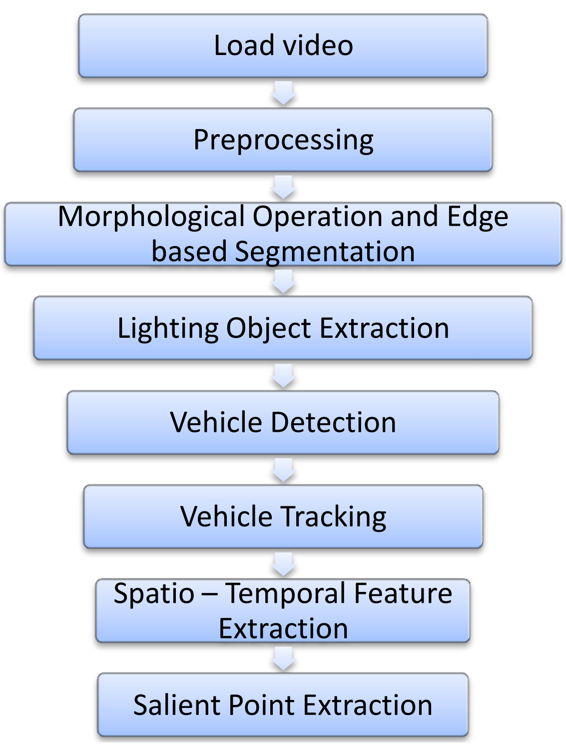

Fig.1 flow diagram of proposed method

II. PROBLEM DEFINITION

Most of the features employed for vehicle detection, such as color, shadows, edges and motion information, are difficult to extract in dark or nighttime situation [8].
In contrast to daytime traffic environments, headlights and rear lights become the salient features of moving vehicles in nighttime traffic conditions [9]. Nighttime traffic conditions are complicated with many potential light sources that are not vehicle headlights, such as traffic lights, street lights and reflections from vehicle headlights [10].

III. OBJECTIVE

To get higher accuracy for number of detected vehicles compare to real number of vehicles. The main objective of traffic system is to reduce caused by accidents. it is used to count the vehicles in night time traffic scenes. To implement effective traffic surveillance system for detecting and tracking moving vehicles for real time application.

IV. APPLICATION

Vehicle detection is an important problem in many related applications, such as self-guided vehicles, driver assistance systems, intelligent parking systems, or in the measurement of traffic parameters, such as vehicle count, speed and flow.

REVIEW OF METHODS

Vehicle Detection under Day and Night Illumination

In this paper the VTTS system (Vehicular Traffic Tracking System) for extracting vehicles from image sequences acquired in daytime and at night. The paper does not concentrate on the reflection from the road surfaces. Vehicle detection in daytime and nighttime can't be approached with the same image analysis techniques. A supervising level selects the set of algorithms to apply and performs vehicle tracking under control of a rule-based decision module. It describes the tracking module and gives experimental results for both vehicle detection and tracking [4].

The lane recognition and vehicle detection at night for a camera-assisted car on highway

This system recognizes the rear lights of vehicles from the night scene traffic image, as viewed by a camera-assisted car behind. The detection of rear lights is usually complicated by the existence of reflector plates on ground, multiple cars, and the environment lightening. The variation of the shape or size and height of rear lights, and the wide range of possible distance from the observing vehicle also add extra complexity to the recognition. In this research, they took the approach of first detecting the reflector plates among the bright spots in the highway night scene, which indicate the lane borders. Through the brightness and area filtering, the reflector plates can be extracted. Removing the reflector spots from the bright-spot image and using the information of detected lanes, the pairing of rear lights to find vehicles can be simplified. Experiment shows the success of this approach in detecting multiple vehicles on highway [5].

Vehicle detection and counting by using headlight information in the dark environment

This project is for detecting and counting vehicles in dark nighttime environment by using headlight information. The basic idea is to use variation ratio in color space to detect the ground- illumination resulted from the headlight of vehicle. Then headlight classification provides the headlight information for determining the moving-object region and compensating pixels, which are wrongly classified as ground-illumination, back to the object mask. Shadow is possibly detected by prediction rules and then excluded for deriving better results of vehicle segmentation and counting. This algorithm can detect vehicles and reduce both effects of ground-illumination and shadow [6].

A method for vehicle count in the presence of multiple-vehicle occlusions in traffic images

This project is for accurately counting the number of vehicles that are involved in multiple vehicle occlusions. Assuming that the occluded blobs are segmented from the image using some background subtraction method and that a deformable model is geometrically fitted on to the occluded vehicles. The method first find out the edges of the found blobs that are parallel to any one of the x,y or z axis. Then it fits it to the vehicle deformable model and find the number of vehicles occluded in the blob. This technique can be used for Vehicle occlusions [7].

Vehicle detection algorithm based on light pairing and tracking at nighttime

Wan et al. (2011) presented a new algorithm to extract, pair and track headlights but didn't consider the reflections of the headlights [8].

Tracking and pairing vehicle headlight in night scenes

To detect vehicles in nighttime traffic conditions, **Zhang et al**. (2012) applied a reflection intensity map and a suppressed reflection map, based on the analysis of the light attenuation model, in order to extract the headlights. In this the accuracy rate of headlight detection was high but the vehicle tracking rate was low [9].

Nighttime vehicle detection for driver assistance and autonomous vehicles

This is the system for detecting vehicles in front of a camera-assisted during night time driving conditions in order to automatically change vehicle head lights between low beams and high beams avoiding glares for the drivers. According to high beams output will be selected when no other traffic is present and will be turned on low beams when other vehicles are detected. The system uses a B&W micro-camera mounted in the windshield area and looking at forward of the vehicle. Digital image processing techniques are applied to analyze light sources and to detect vehicles in the images [10].

Rear-lamp vehicle detection and tracking in low-exposure color video for night conditions

Automated detection of vehicles in front is an integral component of many advanced driver-assistance systems (ADAS), such as collision mitigation, automatic cruise control (ACC), and automatic headlamp dimming. It is a novel image processing system to detect and track vehicle rear-lamp pairs in forward-facing color video. A standard low-cost camera with a complementary metal–oxide semiconductor (CMOS) sensor and Bayer red–green–blue color filter is used and could be utilized for full-color image display or other color image processing applications. The appearance of rear lamps in video and imagery can dramatically change, depending on camera hardware. Rear-facing lamps are segmented from low-exposure forward-facing color video using a red-color threshold. Lamps are paired using color cross-correlation symmetry analysis and tracked using Kalman filtering. A tracking-based detection stage is introduced to improve robustness and to deal with distortions caused by other light sources and perspective distortion, which are common in automotive environments. This project does not concentrate on the front headlight detection [11].

Color- based detection of vehicle lights

It is the vision system dedicated to the detection of vehicles in reduced visibility conditions. It is based on a self-adaptive stereo vision extractor of 3D edges or obstacle and a color detection of vehicle lights. The detection of vehicle lights uses the L*a*b* color space. The vision system detects three types of vehicle lights: rear lights and rear-brake-lights;

flashing and warning lights; reverse lights and headlights. Many unnecessary luminous lights are wrongly detected as nonmoving vehicles [12].

Vehicle detection and tracking in car video based on motion model

This project describes a comprehensive approach to localizing target vehicles in video under various environmental conditions. The extracted geometry features from the video are continuously projected onto a 1-D profile and are constantly tracked. We rely on temporal information of features and their motion behaviors for vehicle identification, which compensates for the complexity in recognizing vehicle shapes, colors, and types. We probabilistically model the motion in the field of view according to the scene characteristic and the vehicle motion model. The hidden Markov model is used to separate target vehicles from the background and track them probabilistically [13].

Image analysis and rule-based reasoning for a traffic monitoring system

This presents an approach for detecting vehicles in urban traffic scenes by means of rule-based reasoning on visual data. The strength of the approach is its formal separation between the low-level image processing modules and the high-level module, which provides a general-purpose knowledge-based framework for tracking vehicles in the scene. The image-processing modules extract visual data from the scene by spatio-temporal analysis during day time, and by morphological analysis of headlights at night. The high-level module is designed as a forward chaining production rule system, working on symbolic data, i.e., vehicles and their attributes and exploiting a set of heuristic rules tuned to urban traffic conditions. The synergy between the artificial intelligence techniques of the high-level and the low-level image analysis techniques provides the system with flexibility and robustness [14].

Moving Vehicle Detection for Automatic Traffic Monitoring

This paper presents an example-based algorithm for detecting vehicles in traffic supervision video streams labeled the vehicles from examples for detection process. Firstly, an adaptive background approximation is used, then, dividing the image into small non overlapped blocks for founding the candidate vehicles parts from these blocks. Secondly, Principal Component Analysis (PCA) is applied as a low-dimensional statistical method to measure the two histograms of each candidate, and support vector machine is considered for real vehicle parts classification. All classified parts shaped and connected as a parallelogram to represent the parts shapes for matching process [15].

Automatic traffic surveillance system for vehicle tracking and classification

In this paper a linearity feature technique is proposed line-based shade method which uses lines groups to remove all undesirable shades. This method undertakes well the occlusion resulting from shades and represented an automatic vehicle tracking and classification traffic observation system [16].

V. CONCLUSION

This paper presented a review on the techniques used in the night time vehicle detection based on the data which obtained from the video surveillance camera. A number of algorithms are surveyed and with the help of this methods vehicle detection and tracking can perform more accurately. These technique coupled with the tracking algorithms can increase the accuracy and efficiency. Robust tracking algorithms are available to aid vehicle detection and traffic surveillance.

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