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A Survey on Detection of Llegally Parked Vehicle in No Parking Area

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ABSTRACT

Nowadays with the increase use of vehicles traffic management becomes hectic problem. People dont find parking space easily and encouraged to do parking in no parking area. Due to vehicle parked on the busy traffic road, other vehicles may hit the car and cause the potential accidents which may create a public safety problem. The detection of illegally parked vehicles is an important part of any traffic management and video surveillance application. Camera Surveillance system becomes cheaper and due to this human activity or behavior detection and tracking also becomes more practical. So, many automated systems have been designed for number of detection tasks, but the unauthorized or illegally parked vehicle detection is still done by the human operators of such surveillance system. From the literature review different methods are identified such as background subtraction, frame differencing method, Single Shot Multibox Detector based on Deep learning, Scalable Histogram of oriented Gradient, Mixture of Gaussian modeling used to detect and track object from captured video sequence. Background subtraction method gives us better and accurate result for moving vehicles detection. Detecting an illegally parked vehicle in no parking area becomes more complex task due to illumination changes and sudden weather change condition. The goal of this paper is to analyze and review the previous approaches towards detecting illegally parked vehicle in no parking area using video sequences.

Keywords: Vehicle Detection, Real Time, Object tracking, Video Surveillance, Traffic Monitoring, Illegally parked vehicle

I. INTRODUCTION

From the study it has been found, vehicle parked on busy road or in no parking area creates heavy traffic which may cause for accidents or hitting situation. So to prevent such situation traffic management system has to detect unauthorized or illegally parked vehicle in the no parking area. Not only detecting such a vehicle in no parking area, further notification system or alarm system should be implemented to conduct immediate action by the traffic regulation authority. Recently many researchers have used different approaches to detect illegal parking of vehicle in no parking area. Generally, two types of cameras are used for any surveillance system: Static camera and moving camera. But in case of vehicle detection in no parking area static cameras are generally used. So, to detect vehicles from traffic scene most researches have used background subtraction method. After detecting vehicles in no parking area vehicle must be tracked in no parking region.

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If vehicle is detected static for more than some time limit, then alarm or notification should be given to traffic regulatory authority.

II. OVERVIEW

Generally, detection of illegally parked vehicle process is carried out on the basis of four generic steps: capturing image from video sequence, preprocessing, object detection, object recognition and object tracking. Basic flow diagram is shown in figure 1.

Figure 1. Basic flow Diagram of Object tracking[6]

A. PreProcessing

In preprocessing stage images captured by static cameras are generally of low quality and affected by various noise and different lighting conditions. So this images should be enhanced using different image sharpening and smoothing techniques. Morphological operators such as dilation, erosion, opening, closing may be applied on the images. As well as, different filters may also be applied to remove various types of noise from the images.

B. Object Detection

Object detection is one of the important tasks in many video surveillance systems. Frame differencing, optical flow, and background subtraction methods are used for this task, which is shown in the figure 2. In Table-I comparison between these methods are given.

C. Object Tracking

The next step is to track the object. Object tracking is used to identify location or position of moving object in consecutive video sequences. By locating a moving object in consecutive frames actually we track the object. Basically three types of object tracking approaches are used: kernel, point and silhouette based tracking. As per the literature review kernel based method is more used due to high accuracy and less computational cost compared to silhouette method. The point tracking method has less computational time but it is less accurate. The different types of object tracking techniques are shown in figure 3. Comparison of different object tracking techniques is shown in Table 2.

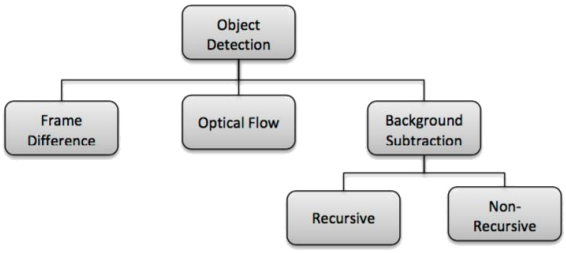

Figure 2. Types of Object Detection Method[6]

Table 1. Comparative Study Of Object Detection Technique [6]

Object Detection Method	Basic Principle	Computational Time	Accuracy
Temporal Differencing	Pixel-wise Subtraction of Current & Background frame	Low	High
Background Subtraction	Current frame is subtracted from background frame	Low to Moderate	Moderate to High
Mixture of Gaussian	Based on multimodal distribution	Moderate to high	Moderate to high
Optical Flow	Uses optical flow distribution characteristics of pixels of object	Moderateto high	High

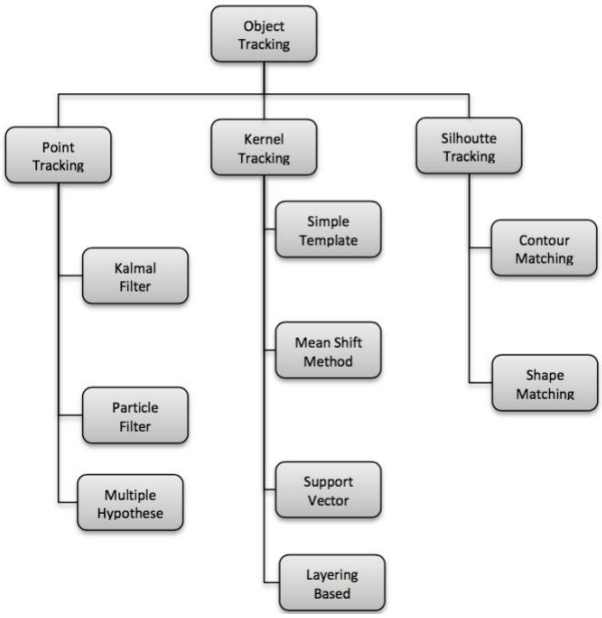

Table 2. Comparative Study Of Object Tracking Methods [6]

Object tracking method		Algorithm used	Computational time	Accuracy
Point Tracking	Kalman Filter	Kalman filtering algorithm	Low to Moderate	Moderate
	Particle Filter	Recursive Bayes filtering	Moderate to High	High
	Multiple Hypothesis tracking	MHT algorithm	Low	Low to Moder-ate
Kernel Tracking	Simple template matching	Matching region of interest in video	Low to Moderate	Low
	Mean shift method	Expression &,location object; optimal gradient decline	Low	Moderate
	Support vector Machine	Positive & negative training values	Moderate	Moderate
	Layering based tracking	Shape representation using intensity	Moderate	Moderate to High
Silhouette tracking	Contour matching	Gradient Descent Algorithm	Moderate	Moderate to High
	Shape matching	Hough Transform	High	High

Table 3. Comparative Study Of Object Classification Methods [6]

Object Classification Method	Computational time	Accuracy
Shape Based	Low	Moderate to High
Motion Based	High	Moderate
Color based	High	High
Texture Based	High	High

D. Object Recognition

After detection of object, object must be classified to the targeted object, such as vehicle, human or animal as per the requirement of the surveillance system which is known as object recognition or classification. For the object classification various approaches are used based on shape, motion, color, and texture. From the literature review comparison of these techniques are shown in Table 3.

III. LITERATURE REVIEW

1. In this paper author proposed a Methodology for detecting illegally parked vehicle in no parking area using projection of 2-D data into 1-D data. In the proposed methodology it consists four stages: Projection, Segmentation, tracking and reconstruction. In the first stage 1-D transformation is applied on source video 2-D data. By doing this they reduce complexity of segmentation and tracking. In second stage, foreground blobs are segmented which represents vehicles in 1-D transformed image. In third stage, these segmented blobs are tracked in each consecutive frames. In the fourth stage finally the transformation of illegally parked vehicles from 1-D data into 2-D original image data is performed. So, result after this stage is a 2-D image of the vehicle which is detected illegally parked vehicle which can be used for further process.

Advantages of this methodology is that it reduces complexity of segmentation and tracking process from o(n2) to o(n). But final result is fully dependent on the initial transformation results for static vehicle detection. It also results in false positives due to illumination change conditions and don't give accurate results in nighttime video frames.

2. In this paper author proposes a new methodology based on deep learning. It uses Single shot multi box detector (SSD) algorithm to locate and classify Illegally parked vehicles which are captured by camera. In this paper author used optimized SSD to improve performance of the detection algorithm. Here they adjust the aspect ratio of default box by adjusting k-means with actual dataset in efficient way. After the detection of illegally parked vehicle in region of interest tracking is performed. Thus, it is advantageous to use Optimized Single Shot Multibox Detector (SSD) to detect illegal parking , because it gives accurate results in complex weather conditions at realtime and can detect variety of vehicles like car, motor cycle, truck etc. Another advantage is that this methodology does not uses background subtraction methodology which is highly sensitive to environment changing condition, and results in higher accuracy and lower computational time.
3. In this paper author proposed two stage application framework which provides real time, illumination variation resistant and occlusion tolerant solution. It Segmentation history Images (SHI) is used to detect illegally parked vehicle in restricted parking area. SHI improves foreground segmentation accuracy for detecting stationary vehicles. In the second stage tracking of detected vehicles is performed using adaptive edge orientation based method. Advantages of this methodology are that it handles sudden illumination change condition and detects objects even when they are occluded. But often it failed to detect stationary object due to low light condition of the traffic scene.
4. In this paper author uses dual background model sub-traction to detect illegally parked vehicle. They used adaptive background model which is based on statistical information of pixel intensity. This method is highly efficient in lighting condition. To remove false region geometrical property based analysis is used. Scalable Histogram of oriented gradient (SHOG) is then applied to detect object is vehicle or not. SHOG is trained using Support Vector Machine (SVM). Then tracking is applied on the detected vehicle and time for which vehicle becomes static is counted. If vehicle stops more than some time limit than proposed system generates alert.
5. In this paper author used two background models with different learning rates for Gaussian mixture model, defined as short- and long-term models. Each model extracts foreground pixels and the stability of these pixels are then analyzed based on cumulative values and temporal positions over a certain pe-riod of time. The result shows that the proposed methodology is efficient and robust. But background subtraction method is easily affected by environments, such as illumination changing and the weather and reduces efficiency. This methodology also fail to detect vehicles which are located close to each others.

Table 4. Comparative Study Of Papers

Ref. no.	Methods Used	Advantages	Disadvantages
[1]	Background Segmentation of 1-D image	-Reduces computational complexity, -Detection rate is higher without any false positive detection	-Failed to detect closely parked vehicle, nighttime video and illumination change
[2]	Single Shot MultiBox Detector (SSD) algorithm	detection with illumination changing and complex weather conditions, robust,	Not handling occluded images
[3]	Dual Background Subtraction Scalable Histogram of Oriented Gradient (SHOG)	More robust and faster Handles Occlusion Detection problem	Fail to handle the sudden/slow changing of illumination condition
[4]	MOG,EGMM	reduce false positive detection handles occlusion detection	Affected by environment, illumination changing conditions
[5]	Foreground Segmentation	foreground segmentation adaptive edge orientation based tracking technique	sometimes failed to detect stationary object due to lighting condition of the traffic scene.

IV. RESULTS AND DISCUSSIONS

Comparative study of all papers is shown in table - IV.

1. The i-LIDS dataset is used to check the efficiency and accuracy of the proposed methodology. Results of all four daytime sequences in i-LIDS are accurate. They able to detect the illegally parked vehicles correctly as well as measure the durations of the illegal parking events with higher accuracy. The other dataset which they have taken in Austin, TX, System is able to detect two illegally parked vehicles but failed to detect illegally parked vehicle that arrive together, they could detect only one of the two illegally parked vehicles. For more accurate tracking of vehicles in a nighttime video sequence, system must be modified to accommodate the effects of headlights. One false positive was also detected due to the continuous glare of the headlights.
2. In this paper system is evaluated on their own dataset. Experiments were taken in sunny days as well as rainy days and achieved a 99 percent detection accuracy
3. In this paper the algorithm has been tested on i-LIDS dataset and their own recorded (Sussex Traffic Monitoring) dataset. i-LIDS datasets contain three progressively more demanding video sequences, taken in daylight, and one night time video sequence. From test and results shown in paper proposed system detects illegally parked vehicles more accurately than any other available system. The proposed system does not require the algorithm to shift from RGB to gray-level pixel values for the night time video sequences.
4. In this paper the proposed algorithm is evaluated using i-LIDS database as well as their own dataset. Based on exper-iment, proposed system successfully detect illegally parked vehicle for all scenarios, with zero false alarm. This method may fail to handle the sudden/slow changing of illumination condition due to transition of the day time. It is hard to design the SHOG feature, and cannot deal with complex weather conditions.
5. Proposed system is evaluated using their dataset, ISLab dataset. Proposed system successfully detect parked vehicle for all scenarios, but it produces false positives at night time due to lighting condition of scenes, the system performs average processing time

around 15 fps for video sequences with 640x480 pixels resolution. Thus, it can be said that the system is fast enough to be implemented on the real-time video surveillance system. Furthermore, Extracting foreground by background subtraction method is easily affected by environ-ments, such as illumination changing and the weather system fail to detect multiple occluded illegally parked vehicles which are located close to each others.

V. CONCLUSION

In this paper, review on different methods used for detection of illegal parked vehicle in ROI, tracking, recognition tech-niques and segmentation method which is based on the video frame and various tracking technologies are discussed. This approach used towards the illegal parked vehicle detection in ROI with new ideas. We have identified and discussed the limitation/future scope of various methods. A deep learning based framework to detect illegal parking in ROI. It achieves high accuracy and real-time detection results[2]. Even in case of occlusion a new pixel classification method based on GMM is used to detect stationary objects[3]. Another proposed algorithm, which is based on the 1-D projection, can be implemented in real time and is effective even in poor scene conditions[1]. The algorithm benefits greatly from the decreased complexity, allowing to use a more time consuming segmentation and tracking procedure. Dual background model subtraction method is used to extract candidate region of object. The SHOG and SVM-based vehicle detector is also integrated to classify the object into vehicle or other objects[4]. This method detect successfully most parked vehicle, with zero false alarm. Cumulative Dual Foreground Difference method detects successfully most parked vehicles[5]. However, It may fail to detect multiple occluded illegally parked vehicles which are located close each others.However, these all techniques need to concentrate towards handling sudden illumination changes, darker shadows and vehicle occlusions.

VI. REFERENCES

[1]. Jong T. Lee, M. S. Ryoo, Matthew Riley, J. K. Aggarwal,"Real-Time Illegal Parking Detection in Out-door Environments Using 1-D Transformation", IEEE Transactions On Circuits And Systems For Video Tech-nology, VOL. 19, NO. 7, JULY 2009

[2]. Xuemei Xie , Chenye Wang, Shu Chen, Guangming Shi, Zhifu Zhao,"Real-Time Illegal Parking Detection System Based on Deep Learning",Proceedings of the 2017 International Conference on Deep Learning Tech-nologies,Pages 23-27

[3]. W. Hassan, P. Birch, R. Young, and C. Chatwin, "Real-Time Occlusion Tolerant Detection of Illegally Parked Vehicles",International Journal of Control, Automation, and Systems, vol. 10, no. 5, pp. 972982, 2012

[4]. Wahyono, A.Filonenko,K. H. Jo , "Illegally parked vehicle detection using adaptive dual background model",Proc. of IEEE Indutrial Electronic Society Con-ference (IECON), Yokohama, Nov 2015.

[5]. Wahyono, Alexander Filonenko, Kang-Hyun Jo ,"De-tecting illegally parked vehicle based on cumulative dual foreground difference", IEEE 14th International Conference on Industrial Informatics, 2016

[6]. Mukesh Tiwari,Dr. Rakesh Singhai,"A Review of De-tection and Tracking of Object from Image and Video Sequences",International Journal of Computational In-telligence Research ISSN 0973-1873 Volume 13, Num-ber 5 (2017), pp. 745-765 Research India Publications