RECOGNITION OF ILLEGAL PARKED VEHICLE USING MACHINE LEARNING APPROACH & HYBRID CLASSIFICATION METHOD

[1]Milan P. Patel, [2]Keyur Shah
[1]Student Of Master Of Engineering, [2]Assistant Professor
[1]Computer Engineering Department,
[1]Silver Oak College Of Engineering & Technology, Ahmedabad, India

Abstract : Nowadays one of the major issues for common human being is traffic. And its increasing day by day with increasing population and also it introduced more by illegal parked vehicles. In the paper works image processing and concepts for detecting illegal parked vehicles base on the time interval concept and try to overcome its limitations base on proposed model. In this paper, the use of Real time video database is given as input and uses segmentation and feature extraction base approach for selecting specific frame and differentiates illegal parked vehicles.

***IndexTerms* – Illegal Parked Vehicle, Background Subtraction, Foreground Object Detection, Classification, SVM .**

I. INTRODUCTION

In many urban cities the major problem arises due to the traffic, as day by day the increasing population with increase in the vehicles. The lack of parking space in the cities produces the major problem of illegal parking of vehicles here and there. Due to Illegal parked vehicles on the road begin the inconvenience to the other peoples and the accidental situations happen. This might create the public safety problems. Therefore, Smart vision based traffic monitoring system should be implemented to prevent the kind of situation by detecting any illegal parked vehicle in the monitoring area, further trigger the alert and to the relevant information to the staff in charge officer.

Since last few years many researchers have been proposed the different approaches to build a system for detecting the illegal parked vehicle. Typically, traffic monitoring system uses the static cameras, so mainly the approach followed the use of background subtraction method for extracting the candidate regions of illegal parked vehicles for foreground analysis. Similarly the tracking based approach and triggering the alert is used as if the parked vehicle stays stationary for a period of time within the restricted parked area zone. Generally the method is divided into the two major steps: Object detection and Tracking. According to the literature survey author Hassan utilized Segmentation History Images (SHI) to detect stationary vehicles from a foreground image. It segments adjacent moving pixel patches using a three step-pixels based classification method and it tracks all stationary pixels by performing an adaptive edge based tracking method. However, using only single background model potentially fail to detect stationary regions due to imperfect background subtraction which is affected by illumination condition of the traffic scene. So to overcome the above problem, Dual background segmentation is introduced. It copes well with the varying illumination changes and shadows. Other methods were also presented in the literature to segment the foreground object but it is computationally expensive and impractical in real life scenarios. By considering the above issues, this paper focuses on the robust solution of detecting the illegal parked vehicle in traffic scenarios.

The rest of the paper is organized as follows: Section II, the proposed flow diagram of the system is described. In Section III, experimental results are shown how it well accurate the system performs in varying environmental conditions.

II. PROPOSED SYSTEM

A. Overview

Our Proposed system is based on the dual background modeling and subtraction. It consist of mainly following steps such as background model, candidate region extraction, vehicle verification and tracking. The proposed flow diagram is shown in the figure-1. First the video is converted into the n consecutive reference frames as the background and they are taken in consideration for the background model. As the new upcoming frame appears it is labeled as the current background model. To generate the accurate candidate stable region some preprocessing steps are applied and the fetching interval of the frame is been set. The candidate region is extracted by applying the hybrid algorithm of shapes classifier i.e. sobel edge detector is used to get the edge and shape regions of the frame and the ROI based filtering is applied by setting the thresholding value. This technique is much more accurate, faster and robust in every varying illumination changes rather than performing the subtraction of reference and current frame. As the candidate region is extracted now the SVM classifier helps in classifying the vehicle, i.e. Vehicle detection is carried out based on SVM for rejecting the false candidate. Tracking of the parked car is calculated and if it is more than the threshold time then the further detail are send to the respective traffic management department.

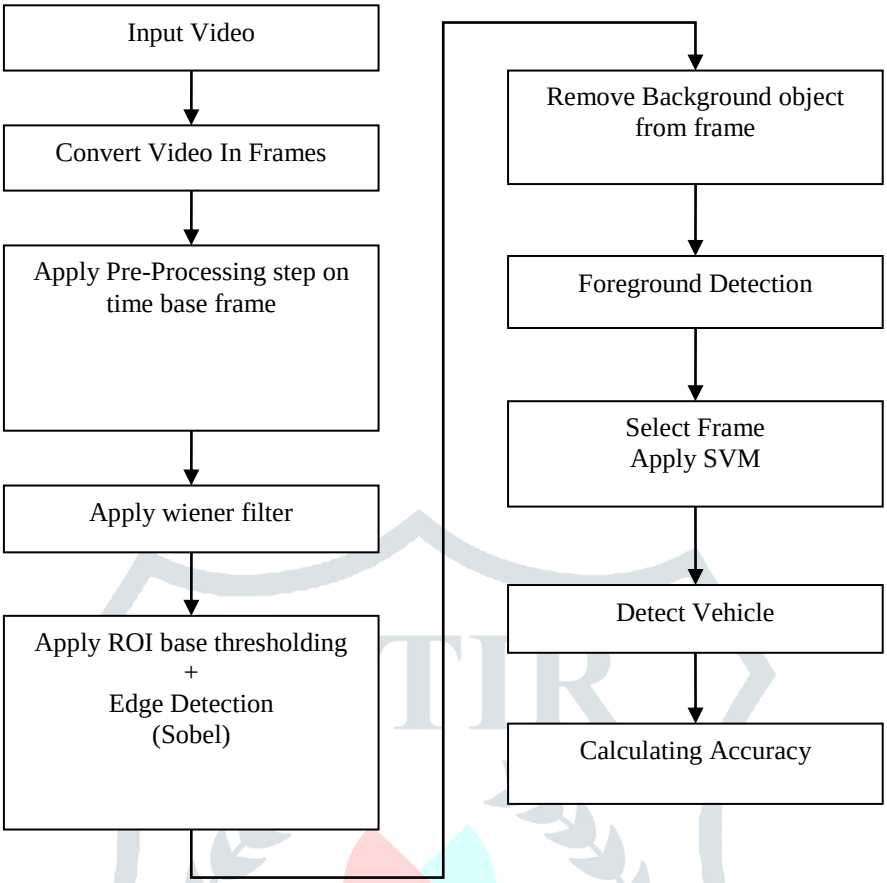

Figure 1: System diagram of Proposed System

B. Adaptive Background Model

In this part the algorithm, we discuss the process of applying the background modeling which is used to detect the illegal parked vehicle by updating the background model. This method is adopted so that it can handle the varying environmental conditions. The new slowly changing upcoming frame is labeled as the current frame to adjust illumination change and to detect the foreground object. The foreground object is also affected by flickering of image and vibration of camera. The intensity level of the background image is calculated by taking the max values and min valued of each coordinates x and y. The mean value of the intensity of previous frames is calculated and is compared to the values of upcoming frames. If the upcoming current frame have the same values as the previous then the background frame is updated as the new background. i.e. the upcoming frame is also the background frame.

Fig 2: An example of parked vehicle where the first image is the reference background model, Second image is the current background model and the third image is the dual background model subtraction result

C. Extraction of Candidate Region

Due to illumination changes there may get the unwanted regions are appeared in the frame. So to reject the false object region we used the proposed system. To extract the candidate region, the methodology we used in our proposed system is the hybrid solution of shape classification and the ROI based thresholding. In the shape classifier there are many methods such as sobel, canny, laplace, prewitt, etc. but according to the our proposed system the best suitable method is sobel edge detector which is used for region extraction of the image frame by fetching the edges values. And the ROI based thresholding is applied to the frame such that the rest of the image objects and shadows are removed from the frame. As a result the candidate region is detected accordingly and the removal of background is done in order to specify the particular interested region.

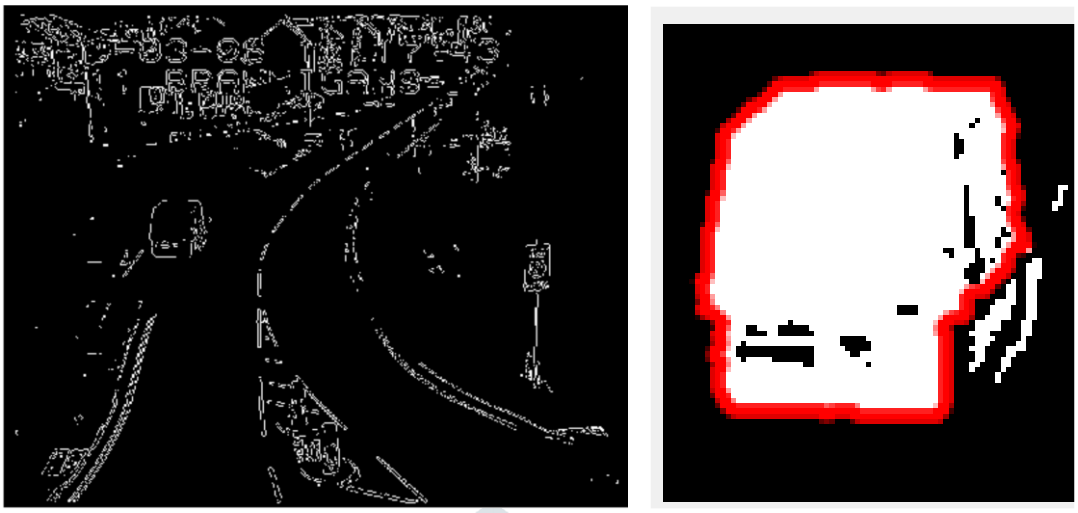

Fig 3: First image shows the sobel edge detector of the frame and the other image is the candidate region obtained using our hybrid classification algorithm.

D. Vehicle Verification

In this sub section the vehicle verification in the candidate region is offered. Here the candidate region is matched with the given trained datasets of parked vehicle based on SVM. Match points are taken into consideration to match it with the trained dataset and the detected candidate region. If the match points are more than the threshold value then it is considered as the vehicle. Here the data is divided into the training and validation set with ratio of 70% and 30% respectively.

E. Tracking Of Illegal parked vehicle

In real time, detecting the stable region may track the false region due to traffic situation or crowded scenes. So in the system the matching based tracking is performed. As our system has detected the vehicle, it is checked whether the upcoming frame has the same object or not. And the Occluded time of object is calculated for continuous time and if it is less than the fixed threshold time then the alert is provided and informed to the respective traffic management department.

III. EXPERIMENTS AND RESULTS

In the above proposed algorithm in the paper, it is tested using practical traffic scenes. The proposed algorithm is implemented on the MATLAB (R2015a) platform , and the CPU is the machine of Intel core i5-4200 @ CPU 2.30GHz having the ram configuration of 4 GB memory. Our algorithm is evaluated using the publically available data set as well as our own dataset. Firstly we have evaluated using the Library for Intelligent Detection System (i-LIDS) dataset. This dataset contains the several video benchmarks for the video surveillance system. The illegal parked video is tested under various environment such as day light, dark light. Under such conditions the system has detected the illegal parked vehicle with higher accuracy and zero false alarms. The difficulties of the database video are that contains the multiple cars travelling and parked on the road. This scenario is generally appears in the real time. Our system have successfully detected the illegal parked vehicle in various scenarios as shown in the figure.

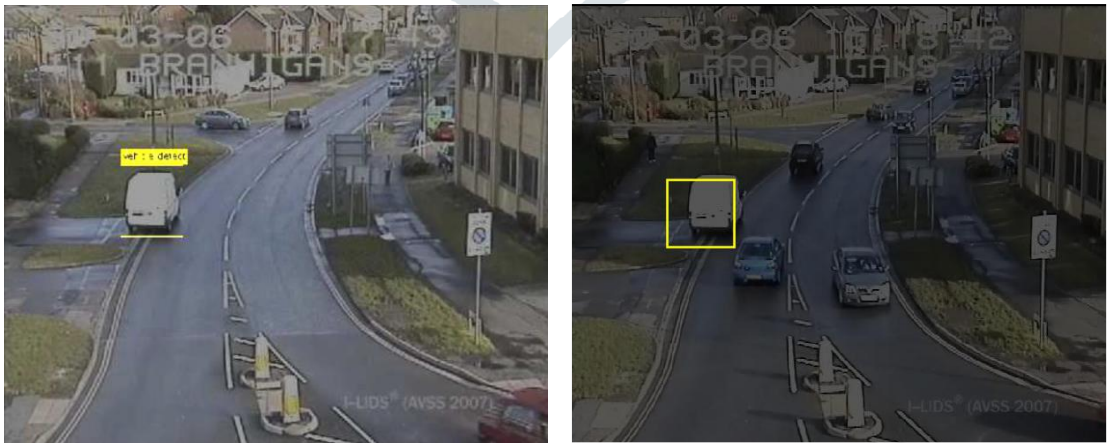

Fig 4: Example of detected illegal parked vehicle in the I-lids dataset. Detected illegally parked vehicles are drawn in the yellow rectangle.

The Table 1 shows the results in form of comparison table of performance of proposed system in varying environment and conditions. The proposed system is highly accurate in detecting the illegal parked vehicles.

Sequence	Accuracy of detecting the illegal parked vehicle
Morning	98.58
Evening	98.06
Night	97.74

Table 1: Performance Analysis

IV. CONCLUSION

According to analysis of different papers, illegal parked vehicle is major issues in current society and lots of manpower is already utilized for the same. Because of the necessity of vehicle control, traffic surveillance systems are improved by the use of a computer vision system. So for solving current issues, use of video processing concept with classification approach is used for solving current issue. In this paper, a robust solution for detecting the illegal parked vehicle in different traffic and environmental conditions has been presented. Our system was evaluated using the I-LIDS datasets. From the experimental results, it is observed that our proposed system is highly efficient and accurate in varying environmental conditions and can detect the illegal parked vehicle, with zero false alarms. However the system may fail to detect when there are multiple cars parked close to each other. Thus in future work, more efficient algorithm to handle these kind of situation is planned to implement for multiple parked cars together.

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