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Traffic Violation Detection Using Multiple Trajectories of Vehicles

Shruti Jawanjal*
*(Department of Computer Science, Sant Gagde Baba Amravati University, Amravati (Maharashtra), India)

ABSTRACT
In general lane change violations are likely to happen before the stop line in the red-light violation detection region. The system which can be detecting red-light and lane change violation is very useful for the traffic management detection using vehicles moving in the region of interest and combining with the evaluation of the trajectories behavior of multiple vehicles using mean square displacement (MSD) to detected both of violation. We are using image processing technique only to detected traffic signal without help of another other system. The experiment result shows that the algorithm is high accuracy to detect both of violation.

Keywords - image processing, lane-change, multiple trajectories, Mean square displacement, traffic signal detection

I. INTRODUCTION

The statistic from many countries showed that high percentage of serious road accident occurred at the road junction due to driver disobeying or red light violating Based on observation, drivers often change lanes before the stop line, which is one reason that cause traffic accidence and traffic jam. Many researchers developed some systems with advanced technologies for traffic-violation detection in action and taking photography of incidents for records. Those systems comprised of many equipment and devices such as induction coils, radar, ultrasonic, laser, video detection, etching comparison with the traditional traffic violation detection technology, the video-based image processing method for traffic violation detection has many advantages, for example easy maintenance, high accuracy of detection, long life service, real-time detection and inexpensive.

II. LITERATURE REVIEW

Chen and Yang proposed their algorithm for red-light violation detection by directly connect traffic signals from traffic signal box. That is a way to achieve high accuracy for traffic signal detection, but it is difficult to setup and always require hardware interface board or electronics interconnection.

Nelson and Andrew proposed the traffic light detection by using purely video processing and detecting the vehicles in the prohibited zone. When the red light was ON the system start recording to capture red-light violating vehicles. However, their system was unable to detect the transgression of vehicles before the stop line such as lane change violation. Because the lane-change violation often happened in the road junction in Bangkok, Thailand, the motorcycle always change their lane immediately before the road junction

III. METHODOLOGY

3.1MOTION DETECTION OPERATION: -

1. Differencing two consecutive frames.
2. Histogram of the key region parts of the frames is analyzed by comparing with the threshold value.
3. Key region should be at least 3-pixel-wide profile of the image along the road.
4. A median filtering operation is firstly applied to the key region (profile) of each frame and one-pixel-wide profile is extracted.
5. Difference of two profiles is compared to detect for motion.
6. When there is motion, the differences of the profiles are larger than the case when there is no motion. The motion can be detected by selecting a threshold value

3.2 VEHICLE DETECTION ALGORITHM: -

1. A vehicle detection operation is applied on the profile of the unprocessed image.
2. To implement the algorithm in real time, two strategies are often applied: key region processing and simple algorithms.
3. Most of the vehicle detection algorithms developed so far is based on a background differencing technique, which is sensitive to variations of ambient lighting.
4. The method used here is based on applying edge detector operators to a profile of the image edges are less sensitive to the variation of ambient lighting and are used in full frame applications (detection).

5. Edge detectors consisting of separable medium filtering and morphological operators, SMED (Separable Morphological Edge Detector) are applied to the key regions of the image. (The SMED approach is applied to each sub-profile of the image and the histogram of each sub-profile is processed by selecting dynamic left-limit value and a threshold value to detect vehicles.
6. SMED has lower computational requirement while having comparable performance to other morphological operators
7. SMED can detect edges at different angles, while other morphological operators are unable to detect all kinds of edges.

3.4 TRAFFIC MOVEMENTS AT JUNCTIONS (TMJ)

1. Measuring traffic movements of vehicles at junctions such as number of vehicles turning in a different direction (left, right, and straight) is very important for the analysis of cross-section traffic conditions and adjusting traffic lights.
2. Previous research work for the TMJ parameter is based on a full-frame approach, which requires more computing power and, thus, is not suitable for real-time applications. We use a method based on counting vehicles at the key regions of the junctions by using the vehicle-detection method [3].
3. The first step to measure the TMJ parameters using the key region method is to cover the boundary of the junction by a polygon in such a way that all the entry and exit paths of the junction cross the polygon. However, the polygon should not cover the pedestrian marked lines. This step is shown in the figure given below.
4. The second step of the algorithm is to define a minimum numbers of key regions inside the boundary of the polygon, covering the junction.

IV. FIGURES

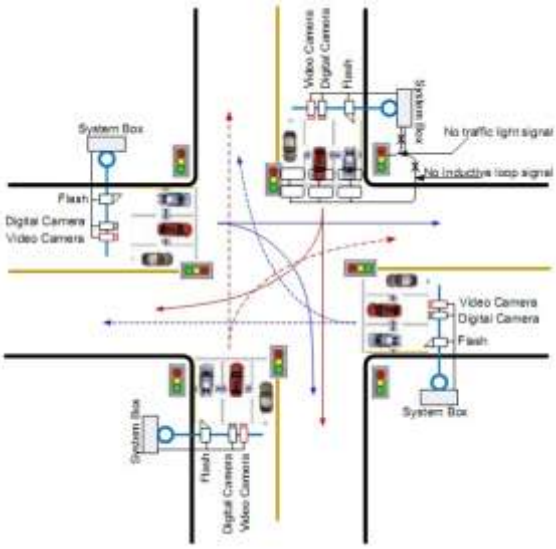

Fig 1. An overview of a purely video processing for red-light violation Detection system

V. CONCLUSION

The proposed method shows high performance in terms of accuracy for violation detection and computation complexity since the system can be perform in the real-time. The algorithm can be detecting traffic light signal using purely video processing with high accuracy and it showed high performance red-light and lane-change violations detections. In order to reduce computation time, motion detection operation is applied on all sub-profiles while the vehicle detection operation is only used when it is necessary.

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