A REVIEW PAPER ON REAL TIME APPROACH TO DETECT MULTIPLE LOST VEHICLES

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Abstract: The detection of vehicles has been receiving attention in the computer vision community because vehicles are such a significant part of our life. Everyone knows how much amount of traffic increases on the road day by day. To control and managing the large amount of traffic in urban areas, the vehicle detection is a very important technique for analyzing and detecting different types of vehicles on the road which is very helpful for the traffic department for recognizing and monitoring the vehicles, intelligent parking system, prevention and investigation of accidental activities. This paper presents a study on vehicle detection. Also, various techniques used to detect vehicles are discussed in this paper and a survey based on vehicle detection is performed.

Keywords: Vehicle detection, traffic surveillance, knowledge based method, motion based method, wavelet based method.

I. INTRODUCTION

Nowadays, there is an urgent need for the robust and reliable traffic surveillance system to improve traffic control and management with the problem of urban congestion spreads. Vehicle detection technique appears to be the weakest link in traffic surveillance and control system. Although many detect devices such as closed loop, supersonic and radar are exist and widely used, the most important drawback of these equipments is their limitation in measuring some important traffic parameters and accurately assessing traffic condition. The first reason is that "blind" type of detection technology is employed. These sensors cannot provide full traffic scene information. Detecting through video image processing is one of the most attractive alternative new technologies as it offers opportunities for performing substantially more complex tasks and providing more information than other sensors. Therefore, developing real-time traffic parameter surveillance systems based on video aiming to derive reliable and robust traffic state information has attract a lot of attention during the past decade. As a result, vehicle detection and tracking by stationary video camera is one of the most promising new techniques for large scales traffic information data collection and analysis. Traffic video surveillance system can be broadly divided into three sections: detection, classification and tracking of vehicle. Several algorithms are available in the literature to accomplish these tasks. Compared to the normal object detection from a single image, object detection using consecutive frames of a video is easier since the foreground has significant motion where as the background is assumed to be static. So the moving vehicles are detected from video frames by foreground segmentation [5].

The objective of classification is to identify the type of vehicles. By definition, classification is the task of assigning a new instance to a group of previously seen instances called the class. Feature extraction is a kind of dimensionality reduction in which the information conveyed by a big image is expressed using its features. Moreover a good feature should be informative, invariant to noise, fast to compute at the same time, sparse. The commonly used features for image classification are its colour, geometry, gradients, edges, Eigen vectors etc. Scale Invariant Feature Transform (SIFT) is one of the well known image descriptor commonly used for object recognition. The SIFT feature is invariant to rotation, scaling, translations etc. Speeded up Robust Feature (SURF) is another image descriptor which uses some interest points to identify objects [1].

Research of vehicle detection techniques based on video camera started from later 1970s. A wide-area multisport video imaging detection system, called Autoscope, was initiated at the University of Minnesota in 1984. After that, the need for advanced traffic detection devices that reduce installation and maintenance costs while extracting more traffic flow measurements has lead to the development of computer vision, wide-area detection system. A full test among vehicle detection between loops and video cameras funded by Minnesota Department of Transportation was held in 1990's. The comparison results are favorable for wide-area video camera detection as the tests showed the video system was cost-effective for traffic surveillance even without accounting for many of its intangible benefits [5].

Numerous research projects aiming to detect and tract vehicle from stationary rectilinear cameras have been carried out in terms of measuring traffic performance during the past decades.

II. VEHICLE DETECTION TECHNIQUES

The input to the vehicle detection step is the set of ROI from the selection of ROI step. Vehicle detection methods can be classified into the following three categories: 1) knowledge-based methods; 2) motion-based methods and wavelet-based methods.

Knowledge-based methods employ a prior knowledge detect the position of vehicle in ROI. Motion-based techniques detect vehicles using optical flow. Wavelet-based approaches detect vehicles wavelet neural network or wavelet based function [5].

A. Knowledge-based Methods: Knowledge-based methods employ a prior knowledge to decide whether the ROI is vehicle or not in an image. Here some representative approaches using information about symmetry, color, shadow, vertical/horizontal edge, and texture are discussed.

a) *Symmetry* As one of the main signatures of man-made objects, symmetry has been used often for object detection and recognition in computer vision. The observation of vehicles from the stationary camera are general symmetrical in the horizontal and vertical directions. That can be used as a cue for vehicle detection in several studies. However, symmetry is sensitive to noise.

b) *Color* Although few existing systems use color information to its full extent for vehicle detection, it is a very useful cue for vehicle detection, lane road following, etc. Several prototype systems have investigated the use of color information as a cue to follow lanes, or segment vehicles from background. Techniques based on motion and color segmentation have been introduced to detect moving objects by taking advantage of color images. Vehicle segmentation is obtained by frame differentiation while color segmentation consists of a split-and-merge algorithm. Y. Liu proposed an approach combining adaptive background representation with hue-saturation value (HSV) color spacing mapping to automatically adapt the feature segmentation algorithm to detect moving objects in outdoor scenes with high robustness to weather and lighting variations.

c) *Shadow* Using shadow information as a sign pattern for vehicle detection was initially discussed in. By investigating image intensity, it was found that the area underneath a vehicle is distinctly darker than any other areas on an asphalt paved road.

d) *Vertical/Horizontal Edges* Using constellation of vertical and horizontal edges has shown to be a strong cue for vehicle detection. There are two types of edges based detection methods: conventional gradient based edge detector and morphological edge detectors. The conventional gradient-based edge detection operations have found wide acceptance in image processing applications, such as Sobel operator and generalized Hough transform (GHT). However, morphological edge detectors have shown better performance than conventional edge detectors while having a lower computation cost.

e) *Texture* The presence of vehicle in an image causes local intensity changes. Due to general similarities among all vehicles, the intensity changes follow a certain texture pattern. This texture information can be used as a cue to locate the possible vehicle in ROI for vehicle detection. Entropy was first used as a measure for texture detection. Only regions with high entropy were considered for future processing. Another texture-based segmentation method uses co-occurrence matrices introduced in. The cooccurrence matrix contains estimates of the probabilities of co-occurrences of pixel pairs under predefined geometrical and intensity constraints.

B. Motion-based Methods: All the cues discussed so far use spatial features to distinguish between vehicles and background. Another cue can be employed is motion of vehicles via the calculation of optical flow. Pixels on the images appear to be moving due to the relative motion between the sensor and the scene. The vector field of this motion is referred as optical flow. Motion-based vehicle detection methods use characteristics of flow vectors of moving objects over time to detect moving regions in an image sequence.

C. Wavelet-based Methods: Wavelet transform has recently been recognized as useful tools for various applications such as signal image processing. For vehicle detection based on wavelet analysis, the motion is characterized via the entire 3-D spatio-temporal data volume spanned by the moving vehicle in the image sequence. These methods generally consider motion as a whole characterize its spatio-temporal distributions. Wavelet-based methods by taking advantage of spatiotemporal motion characterization are able to acquire better performance both in spatial and temporal information of vehicle motion. Their advantage is low computational complexity and a simple implementation. However, these methods are susceptible to noise and to variations of timings of movements.

III. LITERATURE REVIEW

Saran et al. [1] arranged a vehicle discovery and characterization calculation which works continuously. Vehicle discovery and order is the most essential and testing phase of activity reconnaissance utilizing PC vision methods. The recordings caught utilizing the shut circuit TV (CCTV) cameras set in roadsides or carports are utilized for the observation. The observation framework incorporates identification of moving vehicles, checking the quantity of vehicles and the order of the distinguished vehicles. The principle test of the PC vision system is the ongoing pertinence of the calculations utilized. The discovery is completed by the strategy for foundation subtraction where the foundation is demonstrated utilizing the blend of Gaussians and the recognized vehicles are characterized utilizing the Artificial Neural Network (ANN) with another arrangement of highlights, Histograms of Oriented Gradients (HOG) and geometric measures of the vehicles. Test comes about demonstrates that the proposed technique with the new mix of highlights as preparing parameters for ANN gives better outcome when contrasted with other prevalent calculations.

Momin et al. [2] displayed a symmetrical SURF strategy for the vehicle discovery framework for any climate conditions, for example, blustery, shady, day, night and it is utilized as a part of continuous applications. The proposed work is distinguishing the focal line of the vehicles. The vehicle is a symmetrical protest from front and back. For the recognition of vehicle, Symmetrical SURF (Speeded-Up Robust Feature) is one of the descriptor which is utilized for recognizing the symmetrical focuses and these focuses is the mirror adaptation of each other; all the conceivable coordinating sets are distinguished. From that point onward, recognizing the

focal line and ROI of each casing of the vehicle is finished. When contrasted with the past strategies like foundation subtraction and picture sifting, this technique is better for the vehicle location without utilizing any movement highlights.

Momin et al. [3] introduced co-preparing based approach for vehicle discovery. Highlight chose for discovery is haar. In light of haar-preparing classifier is prepared and adaboost is utilized to get solid classifier. After location of vehicle, following stage is to scan for specific vehicles in view of its portrayal. Looking of suspicious vehicles is critical in criminal examination. Inquiry structure enables the client to scan for vehicles in view of characteristics, for example, shading, date and time, speed, course in which vehicle is voyaging. Characteristic based Vehicle look incorporates case question "Scan for yellow autos moving into flat bearing from 5.30pm to 8pm".Output of pursuit inquiry is lessened size adaptation of recognized vehicles are shown.

Lin et al. [4] proposed a coarse-to-fine strategy, which can be isolated into two phases of pre-preparing and arrangement examination. In pre-handling stage, the hopefuls locales of moving vehicle are gotten by utilizing Road Detection, Removal of Non-vehicle Regions and Moving Regions Extraction. The speed of this stage is quick however there is still moderately high false-positive-rate. In characterization examination arrange, an all around prepared course classifier, which refines the applicant districts, is intended to keep up a higher location rate and a lower false alert rate. Test comes about show that contrasted and delegate calculations, our technique achieve better execution in recognition rate and false-positive-rate, while addressing the requirements of continuous application.

Wang et al. [5] presented a review of recent vehicle detection and tracking techniques based on stationary video. The primary spotlight is on frameworks where the rectilinear stationary camera is arranged on roadside as opposed to mounted on the vehicle. For the most part, three stages are used to procure activity condition data, including determination of area of intrigue (ROI), vehicle discovery and vehicle following. Initially, creators talk about different strategies identified with the choice of locale of intrigue (ROI) by a short audit. At that point an assortment of calculations and systems created to distinguish vehicle are talked about. Incorporating vehicle discovery techniques are additionally outlined to extricate strong and precise activity parameters. At long last, a concise review on shadow dispensed with methods is additionally displayed.

Chellappa et al. [6] presented a combination structure utilizing both video and acoustic sensors for vehicle location and following. In the location stage, a harsh gauge of target bearing of-entry (DOA) was first gotten utilizing acoustic information through pillar shaping strategies. This underlying DOA appraise assigns rough target area in video. Given the underlying target position, the DOA is refined by moving target identification utilizing the video information. Markov Chain Monte Carlo procedures are then utilized for joint varying media following. A novel combination approach has been proposed for following, in light of various qualities of sound and visual trackers. Exploratory outcomes utilizing both manufactured and genuine information are displayed. Enhanced following execution has been seen by melding the observational back likelihood thickness capacities got utilizing the two kinds of sensors.

Choudhury et al. [7] described a vehicle detection technique that can be used for traffic surveillance systems. An astute movement observation framework, furnished with electronic gadgets, works by speaking with moving vehicles about activity conditions, screen standards and controls and stay away from impact between autos. In this manner the initial phase in this procedure is the recognition of autos. The framework utilizes Haar like highlights for vehicle recognition, which is for the most part utilized for confront discovery. Haar highlight based course classifiers are a viable question identification technique initially proposed by Viola and Jones. It's a machine learning based method which utilizes an arrangement of positive and negative pictures for preparing reason. Results demonstrate this technique is very quick and successful in identifying autos progressively CCTV recordings.

Tseng et al. [8] presented a real-time video surveillance for traffic monitoring of vehicle volume on major thruways. Deciding activity volume naturally and progressively helps drivers to powerfully design their outings all the more proficiently. This movement observing framework utilizes the virtual line diagram to encourage the discovery of vehicles, arrangement of vehicle composes, following of individual vehicles, and along these lines a precise tally of the quantity of vehicles. The virtual line analyzer recognizes vehicles as they cross a virtual limit. The objective of this movement checking framework is to give a constant and exact vehicle counter while exploiting stationary web-cams, futed expressways and paths, and deterministic vehicle attributes.

Chen et al. [9] introduced a novel framework going for uniting programmed tag acknowledgment motors and distributed computing innovation keeping in mind the end goal to acknowledge monstrous information investigation and empower the location and following of an objective vehicle in a city with a given tag number. It understands a completely coordinated framework with a reconnaissance system of city scale, programmed expansive scale information recovery and examination, blend with design acknowledgment innovation to accomplish relevant data investigation. Execution assessment and a few consequences of applying the proposed framework to true information are exhibited and the encounters we picked up while actualizing it are additionally examined.

Pawar et al. [10] presented morphological methods for video vehicle discovery which depend on Morphological approach. Identification of vehicles is the most basic space lately. It performs fundamental part in non military personnel and military application, vehicle following is one of the real application in guard division. Activity arranging, city arranging, movement observation and control are the principal application in non military personnel area. Writing overview exhibited late work on vehicle location systems on vision based vehicle recognition utilizing sensors. Following the vehicle movement and perceive their highlights has been rising examination region in the field of PC vision and picture preparing.

IV. CONCLUSION

This paper studies and reviews various techniques and research progress in the field of vehicle detection. Vehicle recognition is an innovation which its point is to find and demonstrate the vehicle measure in advanced images. Detecting and following vehicles from transportation observation recordings is fundamental for applications going from activity line identification, volume figuring to

episode and vehicle distinguishing proof. In future, we propose a technique to detect vehicles based on sift-surf technology to extract features of multiple vehicles.

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