RESEARCH ARTICLE OPEN ACCESS

Detection and Classification of Vehicle using Video Processing (Survey)

Pratheesh S, Suraj Gowda K T, Sumanth C M, Ullaskumar K, Yashavant
Department of Computer Science, Malnad College of Engineering, Hassan
Assistant Professor, Department of Computer Science, Malnad College of Engineering, Hassan

ABSTRACT
Recent developments in automotive technology are focused on various fields like economy, comfort, and safety. Vehicle detection and classification systems are attracting the attention of many investigators focused on the safety of driving in the field of automotive mechatronics. The system to detect and classify moving vehicles, on any kind of road, is shown. The data acquisition by the video which given as an input, while the information processing is performed by clustering and classification algorithms.

Keywords — Computer vision, vehicle detection, vehicle classification, video detection. .

I. INTRODUCTION

Nowadays countries and governments require reliable and minimal cost systems for traffic automation and vehicle theft control. The enormous increase in the vehicles on roads and highways, the Increasing congestion, and problems associated with existing traffic detectors have motivated the development of new vehicle detection technologies. Computer vision systems are the most common choice, but several issues must be solved to perform the classification successfully. Identifying and tracking moving objects or vehicles in real-time that appear on different kinds of roads, by an intelligent vision system, is important to many areas of research and technological applications. In recent years, video monitoring and surveillance systems have been widely used in traffic management. Extracting useful information such as traffic density, object speed, driver behavior and vehicle types from these camera systems has become critical. Manual analysis is now inapplicable. The development of intelligent systems that can extract traffic density and vehicle classification information from traffic surveillance systems is crucial for traffic management. Otherwise, surveillance systems are also important in driver assistance applications, because a vision system allows the detecting and classification of vehicles that appear in a captured scene. In this model, a system for the detection, tracking, and classification of moving vehicle is described.

II. RELATIVE WORK

An There are many systems created to detect, count, and classify vehicles and can be utilized in various files like traffic reconnaissance in an intelligent transportation system. The conversation about such a system and the different techniques used to grow such systems.

Sheeraz Memon [1] proposed a system to distinguish, track and check vehicles utilizing a vision-based system. Here the basic interface is created for the client to choose the area important to be investigated that is the region of interest and afterward, image processing techniques are applied to an image to calculate vehicle count and classified the vehicles using machine learning algorithms. Here input source utilized is the traffic camera recordings from an assortment of sources in usage. This system is used for the detection, recognization, and tracking of vehicles for given input it divides detected vehicles into different classes based on their size. This system contains the three modules which are background learning, foreground extraction, and vehicle classification, which can be obtained by some of the inbuilt libraries in machine learning like OpenCV in that BackgroundSubstractionMOG and findContours() methods are used and also make use of BoF an SVM algorithm to classify the vehicle. The limitation of this system is not efficient at detecting occlusion of the vehicle, This problem can be solved by second-level feature classification such as classification based on the color.

Tursun, M and Amrulla, G [2] proposed a video-based real-time vehicle counting system using an optimized virtual loop method. They used real-time traffic surveillance cameras deployed over roads then they compute the input to get how many vehicles pass the road. The vehicle image is extracted using a double-difference image which is generated from the corresponding two successive images and logical AND operations are carried out on this image. This proposed system is making use of the virtual loop concept if the vehicle crosses the virtual loop region, the threshold in that region will be higher, and also make use of detection lines which help to avoid the recounting of a vehicle or avoid the counting of non-moving vehicle. In this system, the counting of vehicles is carried out in three steps by tracking vehicle movements within a tracking zone called a virtual loop. If we make slight changes to the algorithm this model can be used to extract the other traffic data.

Another video-based vehicle counting system was proposed [3] by Nilesh J. Uke, and Ravindra C Thool. "Moving Vehicle Detection for Measuring Traffic Count Using OpenCV", This system identifies the movement of vehicles by camera images with the assistance of a webcam on a PC using OpenCV which is coded using Microsoft Visual C++, and the video is stored in standard .avi format using XVID codec. The process of counting the vehicle acknowledges the video from a single camera and analyses the moving vehicles and counts them. Under diminished perceivability conditions, the system functions admirably on blanketed expressways, around evening time when the foundation is consistently dim, and in specific passages. A vehicle recognition and checking system on a roadway is created utilizing OpenCV image advancement units.

A. Suryatali and V.B. Dharmadhikari [4] proposed a Computer Vision-Based Vehicle Detection for Toll Collection System Using Embedded Linux, which helps with vehicle detection that counts and also classifies the vehicles into heavy and lightweight vehicles; Here they use the resolution setting of a camera on toll to get a perfect view to classify the vehicle which helps to detect the vehicle here they use OpenCV library to detect and classify the vehicle, object detection is fulfilled by making use of the Kalman filter which is known for computational efficiency, robustness, accuracy and recursive property which helps in background subtraction and then detecting the object in processed frame OpenCV libraries are used. This system is tested against the image frame sequence of the video captured on the highway and the model is capable of detecting, tracking, and classifying the maximum number of vehicles successfully.

Mithun, N.C., et al [5] proposed a vehicle detection and classification system using time spatial images and multiple virtual detection lines. The proposed detection method uses several VDLs and works in two major steps. First, multiple TSIs each corresponding to a VDL are generated from a video sequence. Next, distinct blobs that are sufficient for counting the number of vehicles are identified from these TSIs. TSI generated by MVDL based model has varying illumination hence here they use MVDL based detection and classification method, Here they make use of a two-step K nearest neighborhood (KNN) algorithm adopted to classify vehicles via shape invariant and texture-based features. The final result confirms the better accuracy and low error rate of the proposed method over existing methods since it also considers the various illumination conditions.

S. Santra, S. Roy, P. Sardar, and A. Deyasi proposed a system [6] "Real-Time Vehicle Detection from Captured Images" Where they make use of the YOLO algorithm to detect the vehicle from an image. This algorithm is capable of detecting vehicles with a very high sense of precision and also detects nearby people as pedestrians. In this paper, we have to detect common objects which are seen day-to-day, for which the OpenCV DNN module is used along with the trained YONO model.

Y. Qu, L. Jiang, and X. Guo, "Moving vehicle detection with convolutional networks in UAV videos" [7] presented a real-time and high detection rate moving vehic1e detection method for unmanned aerial vehicle videos. The first step is image registration here they divide the image registration into two parts rectilinear motion compensation and rotation motion compensation and they used the RANSAC algorithm to estimate the frames transposition matrix. The second step is to separate the background for static and moving vehicles. The final step is to classify the vehicle by using the neural network of three convolution layers. This model use idea of estimating motion between adjacent frames from aerial videos to stitch frames and use the frame difference method to get candidate targets, some of which are false alarms. Here they train the model using a convolutional neural network to classify the candidate targets into vehicles or background.

P. K. Bhaskar and S. Yong, [8] Image processing based vehicle detection and tracking method. A new algorithm for the detection and tracking of a vehicle in video frames has been designed. This system is built using gaussian mixture models and the blob detection method. By learning the background, first, they differentiated between the foreground from the background which is done using GMM which helps that the detection of vehicles becomes simple then to find the moving objects correctly, blob detection methods help to know the moment of each object in the frame and morphological operations used to remove the noise. binary computation is done to define the rectangular boxes around each object. Finally tracking and counting of vehicles is done based on the rectangular boxes drawn.

P. N. Chowdhury, T. Chandra Ray, and J. Uddin, Vehicle Detection Technique for Traffic Management using Image Processing [9]. In this paper, a model has been designed based on the concept of image processing which helps with vehicle detection in traffic monitoring. In this model there are two methodologies are defined for daytime processing and night time processing. In Daytime processing RGB format of the image is converted to a Gray image and subtraction is applied twice to identify the vehicle. Background subtraction is performed to identify the objects. The model uses the ambient light and headlight in the image intensity is analyzed for vehicle detection during the night time, and object counting methods are applied to count vehicles. The background is not always static this model does not apply to all the situations.

Another "Vehicle detection using image processing System "proposed in [10] by Seelam Shanmukha Kalyan where developed the model which is divided into four phases – Basic processing phase, Edge detection phase, Morphological operation phase, and a vehicle detection phase, In basic processing phase the image frame is captured by a

camera, the captured image is in RGB format which is converted to a grayscale image. The highlighting of the boundaries using "Sobel" operator in the edge detection phase, In morphological phase they make use of Erosion and dilation operation, In final phase connected component analysis is done and the vehicle is identified. All four phases have equal importance to the detection of a vehicle on a given image input. The perfect output can be obtained by placing the ambient light and headlight of a vehicle a night.

.

III. CONCLUSIONS

Here specifies various stages of vehicle detection, tracking, classification, and identification has been studied. The Literature review of a vehicle in a real-time environment and non-real-time environment uses many different approaches. The main aim of this paper identifying an object using different methods and many approaches to get the final result. In future, we can develop the model for detection and classification using two libraries of machine learning which are OpenCV and dlib then we examine them by comparing the accuracy from both libraries.

REFERENCES

[1] Sheeraz Memon, “A Video based Vehicle Detection, Counting and Classification System”, Mehran University of Engineering & Technology, Jamshoro, Pakistan, pp. 34-41.

[2] M. Tursun, and G. Amrulla, "A video-based real-time vehicle counting system using optimized virtual loop method", IEEE 8th International workshop on Systems Signal Processing and their Applications (WoSSPA), 2013.

[3] Nilesh J. Uke and Ravindra C. Thool, "Moving Vehicle Detection for Measuring Traffic Count Using OpenCV", Sinhgad College of Engineering, Department of Information Technology Pune, India, Vol 1, No 4.

[4] Suryatali, V.B. Dharmadhikari, “Computer Vision Based Vehicle Detection for Toll Collection System Using Embedded Linux”, International Conference on Circuit, Power and Computing Technologies (ICCPCT), pp. 1-7, 2015.

[5] N.C. Mithun, N.U. Rashid, and S.M. Rahman, “Detection and classification of vehicles from video using multiple time-spatial images”, IEEE Transactions on Intelligent Transportation Systems, vol 13, no 3, p. 1215-1225, 2012.

[6] S. Santra, S. Roy, P. Sardar, and A. Deyasi, "Real-Time Vehicle Detection from Captured Images," 2019 International Conference on Opto-Electronics and Applied Optics (Optronix), Kolkata, India, 2019, pp. 1-4, DOI: 10.1109/OPTRONIX.2019.8862323.

[7] Y. Qu, L. Jiang, and X. Guo, "Moving vehicle detection with convolutional networks in UAV videos," 2016 2nd International Conference on Control, Automation and Robotics (ICCAR), Hong Kong, 2016, pp. 225-229, DOI: 10.1109/ICCAR.2016.7486730.

[8] P. K. Bhaskar and S. Yong, "Image processing based vehicle detection and tracking method," 2014 International Conference on Computer and Information Sciences (ICCOINS), Kuala Lumpur, 2014, pp. 1-5, DOI: 10.1109/ICCOINS.2014.6868357.

[9] P. N. Chowdhury, T. Chandra Ray, and J. Uddin, "A Vehicle Detection Technique for Traffic Management using Image Processing," 2018 International Conference on Computer, Communication, Chemical, Material and Electronic Engineering (IC4ME2), Rajshahi, 2018, pp. 1-4, DOI: 10.1109/IC4ME2.2018.8465599.

[10] Seelam Shanmukha Kalyan, Voruganti Pratyusha, Nandikonda Nishitha and T.K. Ramesh “Vehicle detection using image processing” IEEE International Conference for Innovation in Technology (INOCON) 2020