International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 3176-3180 www.ijaem.net ISSN: 2395-5252

Digital Video-Based Vehicle Detection andCounting

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Submitted: 10-07-2021 Revised: 23-07-2021 Accepted: 26-07-2021

ABSTRACT-- Traffic Analysis has been a problem that city planners have dealt with for years. Smarter ways are being developed to analyse traffic and streamline the process. Vehicle counting process provides appropriate information about traffic flow on the roadways. An acceptable technique to achieve this goal is using digital video processing methods on the roadway with the help of traffic cameras. The Vehicle counting system which we built is made up of two main components: a detector and counter. The detector identifies vehicle in a given frame of video and returns a list of bounding boxes around the Vehicle. The counter counts the vehicles whenthey leave the frame or makes use of a counting line drawn across a road. An implementation of proposed technique has been performed using open CV with python programming language used for traffic flow counting and using different library on digital video processing.

Keywords-Vehicle Detection, Computer Vision, Vehicle Tracking, Intelligent Transport System, Traffic Surveillance.

I. INTRODUCTION

The result of the increase in vehicle traffic, many problems have appeared. For example, traffic accidents, traffic congestion, and so on. Traffic congestion has been a significantly challenging problem. It has widely been realized that increases of preliminary transportation infrastructure, more pavements, and widened road, have not been able to relieve city congestion. As a result, many investigators have paid their attentions on intelligent transportation system (ITS), such as predict the traffic flow on the basis of monitoring the activities at traffic intersections for detecting congestions. To better understand traffic flow, an increasing reliance on traffic surveillance is in a need for better vehicle detection at a wide-area. Detecting vehicles in video surveillance data is a very challenging problem in computer vision with important practical applications, such as traffic analysis. Vehicle detection and counting is important in computing traffic congestion on roadways. The main goal Vehicle detection and counting in traffic video project is to develop methodology for vehicle detection and its counting on roadways. A system has been developed to detect and count dynamic vehicles efficiently. Intelligent visual surveillance for road vehicles is a key component for developing intelligent transportation systems. Detecting and Tracking vehicles in surveillance video which uses segmentation with initial background subtraction using morphological operator to determine salient regions in a sequence of video frames. Edges are be counting which shows how many areas are of particular size then particular to car areas is locate the points and counting the vehicles in the domain of traffic monitoring over roadways.

II. LITERATURE SURVEY

[1] Gupte S., Masoud O., Martin R. F. K. and Papa Nikolopoulos N. P., proposed―Detection and Classification Vehicles‖ in the March, 2017, The presents algorithms for vision-based detection and classification of vehicles in monocular image sequences of traffic scenes recorded by a stationary camera. Processing is done at three levels: raw images, region level, and vehicle level. Vehicles are modelled as rectangular patches with certain dynamic behaviour. The proposed method is based on the establishment of correspondences between regions and vehicles, as the vehicles move through the image sequence. Experimental results from highway scenes are provided which demonstrate the effectiveness of the method. Briefly describe an interactive camera calibration tool that is developed for recovering the camera parameters using features in the image selected by the user.

[2] Toufiq P. Ahmed Egammal and Anurag Mittal, proposed ―A Framework for Feature Selection for Background Subtraction‖, in 2018. Background subtraction is a widely used

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paradigm to detect moving vehicles in video taken from a static camera and is used for various important applications such as video surveillance, human motion analysis, etc. Various statistical approaches have been proposed for modelling a given scene background. However, there is no theoretical framework for choosing which features to use to model different regions of the scene background. They introduce a novel framework for feature selection for background modelling and subtraction. A boosting algorithm, namely Real Boost, is used to choose the best combination of features at each pixel. Given the probability estimates from a pool of features calculated by Kernel Density Estimate (KDE) over a certain time period,the algorithm selects the most useful ones to discriminate foreground vehicles from the scene background. The results show that the proposed framework successfully selects appropriate features for different parts of the image.

[3] Morris and M.Trivedi "Improved vehicle classification in long traffic video by cooperating tracker and classifier modules," IEEE International Conference on on Video and Signal Based Surveillance, 2019 pp. 9-11

[4] J.Scott,M. PUsateri and D.Cornish, "Kalman Filter Based Video Background Estimation, " Applied Imagery Pattern Recogntion Workshop(AIPRW), Oct 2017, pp1-7

III. PROBLEM STATEMENT

Traffic congestion has been a significantly challenging problem. To better understand traffic flow, an increasing reliance on traffic surveillanceis in a need for better vehicle detection at a wide-area. Detecting vehicles in video surveillance datais a very challenging problem in computer vision with important practical applications, such as traffic analysis.

IV. OBJECTIVES

The objectives of this project are as follows:

- Traffic management
- Parking
- Toll Gate management
- Security cameras
- Advertisement

V. PROPOSED WORK

Previously, Detection and Classification Vehicles was proposed in March,2002 by Gupte S., Masoud O., Martin R. F. K. and Papa Nikolopoulos N. P. The presents algorithms for vision-based detection and classification ofvehicles in monocular image sequences of trafficscenes recorded by a stationary camera. Processing is done at three levels: raw images, region level, and vehicle level. Vehicles are modelled as rectangular patches with certain dynamic behaviour. The proposed method is based on the establishment of correspondences between regions and vehicles, as the vehiclesmove through the image sequence. Experimental results from highway scenes are provided which demonstrate the effectiveness of the method. Briefly describe an interactive camera calibration tool that is developed for recovering the camera parameters using features in the image selected by the user.

VI. METHODOLOGY

- Python is easy to learn, exceptionally powerful, universallyaccepted and an effective learning tool.
- Can connect to database systems. It can also read and modify files.
- LIBRARIES USED-- **OPENCV**
- **OpenCV** is the huge open-source library for the computer vision, machine learning, and image processing
- By using it, one can process images and videos to identify objects, faces, or even handwriting of a human. When it integrated with various libraries, such as Numpuy, python is capable of processing the **OpenCV** array structure for analysis.
- Background Subtraction :

Background or image subtraction is the process of Extractiong the foreground image from its background.

CASE-1: If you have a background image like a road without vehicles in it, you can subtract this image from another image of the same road (from the exact same view) which contains vehicles to detect those vehicles. The background pixels would cancel each other out and the objects in the foreground would pop out.

CASE-2: What if you don't have a background image? You can achieve the same results if the objects you're interested in detecting are in motion, the background is static and the camera is stationary. In this case, all you have to do is evaluate the difference between consecutive images i.e image 2 minus image 1,image 3 minus image 2, image 4 minus image 3 etc. This works because the pixels of moving objects constantly shift hence are not cancelled out like the background pixels and thus pop out as the foreground.

VII. IMPLEMENTATION

Present, we had implemented our project

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based on the algorithm called as background subtraction. And we had used python code to develop our project. We developed the code in Anaconda because in Anaconda libraries can be easily installed. And in our project, we used the libraries OpenCV and NumPy.

Background subtraction is a widely used algorithm used in computer vision application. Itis basically pixel value difference two images (although some generalization is done after subtracting, like shadow detection). This approachis widely used in motion detection, object tracking, counting the number of vehicles etc. OpenCV alreadycontains the implementation ofthis algorithms like

- BackgroundSubtractorMOG
- BackgroundSubtractorMOG2 (usedalgorithm)
- BackgroundSubtractorGMG

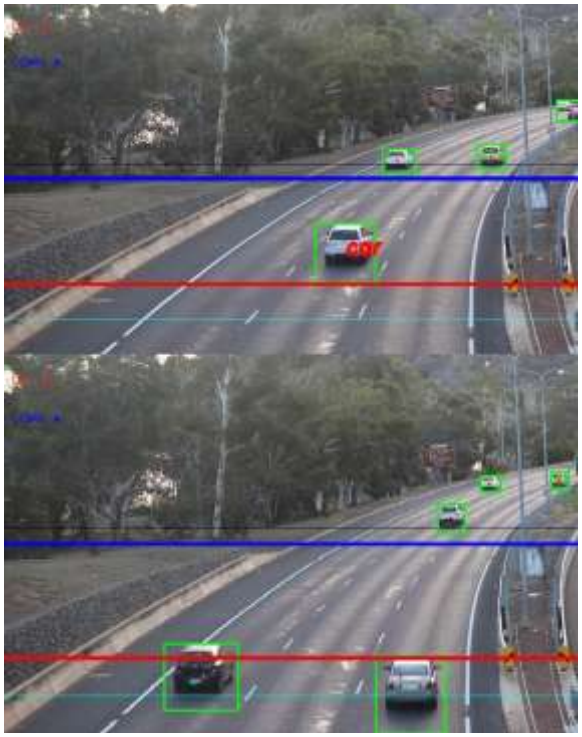
In This we are initializing BackgroundSubtractorMOG2 algorithm. It alsoaccepts 3 parameters

- history
- distance threshold
- shadow detection

After this we are going to process all frames in infinite loop until user is processing or it consumed all the frames.

For visualization purpose, we need rectangle over the detected contours. For that we are using boundingRect method.

VIII. RESULTS



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The above figures shows us the outputs of our developed project. Our main result or output outof our work is time efficieny and accuracy. For example, if a video of 10 seconds is played then around 9 cars are detected in a span of 7seconds from that video. This means that the result is fast in less time and an accurate result is presented.

The main difference between our work and the previous work which is done in machine learning is time efficieny and accuracy.

IX. CONCLUSION

"Vehicle Detection and Counting based on Digital Video Processing in Python" can be cheaply made from low cost, locally available components and can be used for various traffic streets. We can use it to count the number of dynamic vehicles that are passing on roadways to know the density, and we can use it to control the traffic. Several future enhancements can be made for the system of detection, tracking and counting of moving vehicle can be extended to real-time live videofeeds.

X. FUTURE ENHANCEMENTS

Several future enhancements can be made to the system. The detection and tracking and counting of moving vehicle can beextended to real-time live video feeds. Apart from the detection and extraction, process of recognition can also be done. By using recognition techniques, the vehicle in question can be classified.

Recognition techniques would require an additional database to match with the given vehicle. The system is designed for the detection and tracking and counting of a multiple moving vehicle.

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