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Vehicle Detection in a Video Frame Using Machine Learning Technology

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Abstract: *Motion tracking is one of the most active research titles of the computer vision concepts. Vehicle detection process on road are used for vehicle tracking, counts, traffic analysis and vehicle categorizing objectives and it can be implemented under different environments changes. Vehicle counting process provides appropriate information about traffic flow, and the vehicle crash occurrences and also traffic peak times in roadways[2]. Analysis of traffic may account traffic and also streamline the process, Analysis of traffic may account for the number of vehicles in an area per some time period[1]. Most of the design involve use of sensors to detect the vehicles. As it is a detection of vehicle in a video frame it uses the algorithms like Gaussian Mixture Model background subtraction it is a widely used approach for foreground detection. By the digital image processing methods which including object detection, edge detection, frame differentiation and kalman filter using the different library and algorithm with real time image[2]. This paper describes the detection of vehicle in a video frame, tracking in the video frame, counts the number of vehicle passes through the indicative line in roadways.*

Keywords: Vehicle Detection, Tracking, Counting, Gaussian Mixture Model, Background, Foreground, Video Frame

I. INTRODUCTION

Traffic analysis has been a big problem in the city local areas because of the increasing number of vehicles day to day[1]. There is a need for the management and frequently monitoring of the road traffic to control it[1]. In the intelligent traffic surveillance systems are very important part of modern day traffic management whereas in the regular traffic management techniques use the wireless sensors networks[3], inductive loops[4], and EM microwave detectors[5] are expensive, bulky and are difficult to install without interrupting the traffic. Therefore a good alternative to these techniques can be the video based system[1]. These technique is cheaper and easy to implement as because of using the libraries and algorithms. In digital processing image in real time vehicle detection uses the sensors to do this but the sensors have advantages and also disadvantages. In this case motions are realized by comparing the sequential frames. It includes the pre-filters, which can cause contrast changes and noise elimination along with video frames pixel size conversions[2]. It is using both sensors and python programming to design and implement for real time processing where they are expensive. Instead of working on the real time using video based processing which is efficient and cheaper. Open CV library of python programming is implemented which allow us to manipulate videos and images[2]. Open CV python makes use of the Numpy, the library used for numerical operations[2]. The traffic surveillance systems can have the applications in a range of fields such as, public security, detection of anomalous behavior, vehicle theft detection, parking areas, and accident detection[1]. Traffic surveillance system usually contains two parts, they are hardware and software. Hardware is a static camera installed on the roadside that captures the video feed and the software part of the system is concerned with processing and analysis of the process[1]. But these system is takes a video of traffic roads where the vehicles are moving and these system includes detection of vehicle, tracking of vehicle, and counts the number of vehicles passing the indicative line.

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II. RELATED WORKS

Various approaches were made to develop such systems that can detect, count and classify the vehicles and can be used for traffic surveillance in intelligent transportation systems. This section covers the discussion about such systems and the knowledge about the methods used to develop such systems[1].

Video based vehicle counting system was proposed by Lei, M., et al.[6]. In this system surveillance cameras were used and they are mounted at relatively high place to acquire the traffic video stream, the Adaptive background estimation and the Gaussian shadow elimination are the two main methods that were used in this system. The accuracy rate of the system depends on the visual angle and ability to remove shadows and ghost effects.

The system's incompetency to classify vehicle type is the core limitation of the system.

Bas et al. proposed a video analysis method to count vehicles[7] based on an adaptive bounding box size to detect and track the vehicles in accordance with estimated distance from the camera. The Region of Interest (ROI) is identified by defining a boundary for each outbound and the inbound in the image. Although the algorithm is improved to deal with some weather conditions it is unable to track vehicles when the directions are changed.

Habibu Rabiu proposed a the vehicle detection and classification for cluttered urban intersection [8]. In this system background subtraction and kalman filter algorithm are used to detect and track the vehicles and by using Linear Discriminant Analysis classifier for proper classification of vehicles.

For real time tracking by Stauffer, C. and W.E.F. Grimson[9,10]. Gaussian Mixture Model relies on assumptions that the background regions is visible more frequently than any foreground regions.

A.B. Godbehere, A. Matsukawa, and K. Goldberg, proposed a visual tracking of human visitors under variable-lighting conditions [11]. For a responsive audio art installation for a responsive audio art installation in a skylit atrium, they introduce a single-camera statistical segmentation and tracking algorithm. The algorithm combines statistical background image estimation, per-pixel Bayesian segmentation, and an approximate solution to the multi-target tracking problem using a bank of Kalman filters and Gale-Shapley matching.

III. BACKGROUND INFORMATION

3.1 Video Processing

Video processing is a subcategory of Digital Signal Processing techniques where the input and output signals are processed. In computers, one of the best ways to reach video analysis goals is using image processing methods in each video frame. In this case, the motions are simply realized by comparing sequential frames [12]. Video processing includes prefilters, which are the source of contrast changes and noise elimination along with video frames pixel size conversions[13]. Highlighting particular areas of videos, deleting unsuitable lighting effects and performable using video processing methods[14]. OpenCV library of python is equipped with functions that allow us to manipulate videos. OpenCV-Python makes use of Numpy, which is a library for numerical operations. All the OpenCV array structures are converted to and from the Numpy arrays. This also makes it easier to integrate with other libraries that use Numpy[15].

3.2 RGB to Grayscale Conversion

In the video analysis, converting of RGB color image to grayscale mode is done by the image processing methods[2]. The main goal of this conversion is that the processing of the grayscale images that can provide more acceptable results in comparison to the original RGB images[16]. In video processing techniques the sequence of captured video frames should be transformed from the RGB color mode to a 0 to 255 grayscale level. When converting an RGB color mode to a grayscale mode, RGB values for each pixel should be taken consider, and a single value reflecting the brightness percentage of that pixel should be prepared as an output[17].

IV. PROPOSED METHODOLOGY

The system is used for detection, recognition and tracking of the vehicles in the video frames and then counts the number of vehicles passing the indicative line. The proposed system is based on two modules which are background learning and foreground extraction vehicle counting is done as shown in fig. 1. Background subtraction is a classical approach to obtain the foreground image or in the other words to detect the moving objects[1]

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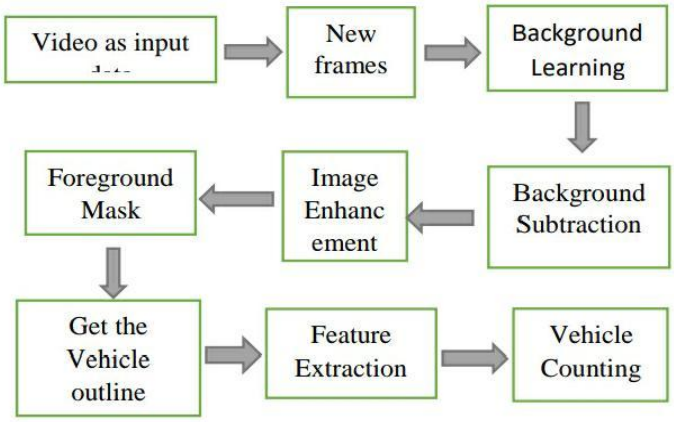


Figure.1. Block diagram of proposed system of vehicle detection, counting

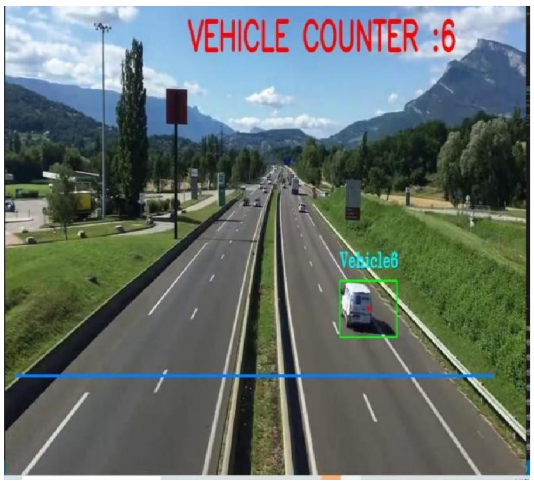
4.1 Background Learning Module

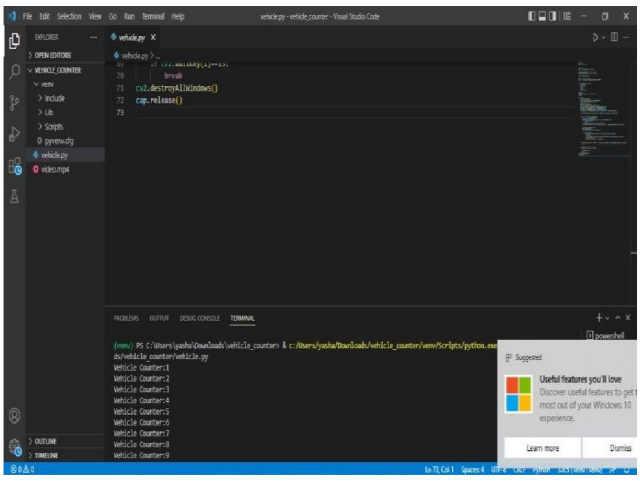
In this module the system whose main purpose is to learn about the background in a sense that how it is different from the foreground. Further the proposed system works on a video feed which is given as input, this module extracts the frames from it and learns about the background. In the given video frame, the moving objects can be considered as the foreground and static objects as the background[1]. Image processing algorithms are used to learn about the background using the above mentioned methods.

4.2 Foreground Extraction Module

In this module, it consist of background subtraction, image enhancement and foreground extraction. Background is subtracted so that foreground objects can be visible. This is done usually by static pixels of static objects to binary 0 and after background subtraction image enhancement techniques such as noise filtering, dilation and erosion are used to get the proper contours of the foreground objects[1]. Finally the foreground objects are obtained from this module.

These two modules are used to do the functions like detection of vehicle and tracking of vehicle for certain distance. Whereas counter function is used to count the number vehicles counting the indicative line with in the video frame by using software called visual studio and the language is python





The proposed system is able to detect the vehicle in the video frame and it has to track the vehicle for certain distance and it has to count the number of vehicles crosses the indicative line and then the counting is incremented time to time.

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VI. CONCLUSION

The proposed system is implemented on python, using OpenCV libraries. The video frame has given as the input training data of source is implemented. A simple interface is developed for the user to select the region of interest to be analysed and then image processing techniques are applied to calculate vehicle counting by using machine learning algorithms[1]. Currently proposed system works with already captured videos but it can be modified to be used for the processing live video streams[18] by adding microcontrollers.

REFERENCES

[1]. A Video based Vehicle Detection, Counting and Classification System by Sheeraz Memon
[2]. Vehicle Detection and Counting method based on Digital Image processing in Python by Reha Justin, Dr. Ravindra Kumar
[3]. S.-Y. Cheung, and P.P. Varaiya, "Traffic surveillance by wireless sensor networks: Final report", PhD diss., University of California at Berkeley, 2006.
[4]. S. Oh, S. Ritchie, and C. Oh, "Real-time traffic measurement from single loop inductive signatures", Transportation Research Record: Journal of the Transportation Research Board, (1804), pp. 98-106, 2002.
[5]. B. Coifman, "Vehicle level evaluation of loop detectors and the remote traffic microwave sensor", Journal of transportation engineering, vol. 132, no.3, pp. 213-226,2006
[6]. M. Lei, D. Lefloch, P. Gouton, K. Madani, "A video-based real-time vehicle counting system using adaptive background method", IEEE International conference on Signal Image Technology and Internet Based Systems (SITIS'08), pp. 523528, 2008.
[7]. E. Bas, A.M. Tekalp, and F.S. Salman, "Automatic vehicle counting from video for traffic flow analysis", IEEE Intelligent Vehicles Symposium, 2007.
[8]. H. Rabiu, "Vehicle detection and classification for cluttered urban intersection", International Journal of Computer Science, Engineering and Applications, vol 3, no 1, p. 37, 2013.
[9]. C. Stauffer, and W.E.L. Grimson, "Learning patterns of activity using real-time tracking", IEEE Transactions on pattern analysis and machine intelligence, 2000. Vol 22, no 8, pp. 747757, 2000.
[10]. C. Stauffer, and W.E.L. Grimson, "Adaptive background mixture models for real-time tracking", IEEE Computer Society Conference Computer Vision and Pattern Recognition, 1999.
[11]. A.B. Godbehere, A. Matsukawa, and K. Goldberg, "Visual tracking of human visitors under variable-lighting conditions for a responsive audio art installation", IEEE, American Control Conference (ACC), pp. 4305-4312, 2012.
[12]. P. Choudekar, S. Banerjee, M. K. Muju, "Real Time Traffic Light Control Using Image Processing," Indian Journal of Computer Science and Engineering, Vol. 2, No. 1, ISSN: 09765166.
[13]. W. Yao, J. Ostermann, Y. Q. Zhang, "Video Processing and Communications," Signal Processing Series, ISBN: 0-13017547-1, Prentice Hall, 2002.
[14]. R. Gonzalez, R. E. Woods, "Digital Image Processing," 2nd Edition, Prentice-Hall, 2002.
[15]. Learning OpenCV: Computer Vision with the OpenCV Library By Gary Bradski, Adrian Kaehler.
[16]. X. Fu, Z. Wang, D. Liang, J. Jiang, "The Extraction of Moving Object in Real-Time Web-Based Video Sequence," 8th International Conference on Digital Object Identifier, Vol. 1, pp. 187-190, 2004.
[17]. M. Fathy, M. Y. Siyal, "An Image Detection Technique, Based on Morphological Edge Detection and Background Differencing for Real-time Traffic Analysis," Pattern Recognition Letters, Vol. 16, pp. 1321-1330, 1995.
[18]. 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.