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Vehicle Detection And Count Using Opencv

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Abstract

In this paper the main focus is on detecting of vehicle and counting, particularly in traffic control. Vehicle detecting and also counting are becomes growing important in a area of highway regulators. However, because of the various structure of vehicles, their detections remain challenging which directly influence in accuracy of a vehicle count. This paper address a image-based techniques for vehicle recognition and counting based on OpenCV technologies. The outcome of an Experiment shows the accuracy of the proposed counting systems is around 96%.

Keywords—vehicle detection and counting, OpenCV

INTRODUCTION

The traditional traffic signal control system is based on the time and date, and it cannot respond to the road conditions in time. With the formation of the innovative city concept, the traditional traffic control system has been unable to cope with the ever-increasing traffic volume. According to the report in America, people wasted 20 percent of their travel time by waiting for the red lights [4]. The road re-planning project is expensive, and it is pretty dangerous for the traffic police standing in the middle of the intersection to relieve the traffic. Intelligent traffic control systems become a decent way to soothe traffic. In this project, we use camera images as the system input to deal with the traffic problem to make the traffic signal control system more intelligent and sufficient, hoping Taiwan becoming a smart city in the future.

We are developing a simulation from scratch using Pygame to simulate the movement of vehicles across a traffic intersection having traffic lights with a timer. It contains a 4-way traffic intersection with traffic signals controlling the flow of traffic in each direction. Each signal has a timer on top of it which shows the time remaining for the signal to switch from green to yellow, yellow to red, or red to green. Vehicles such as cars, bikes, buses, and trucks are generated, and their movement is controlled according to the signals and the vehicles around them. This simulation can be further used for data analysis or to visualize AI or ML applications.

The real-time traffic flow means how many vehicles pass through in a period. There are two parts to this section. The first part is the vehicle counter, and the second part is to decide the time length of calculating a result. We use four cameras erect on the lamppost, which is near the intersection, to watch out for the opposite side of the traffic conditions shown in Fig. 1

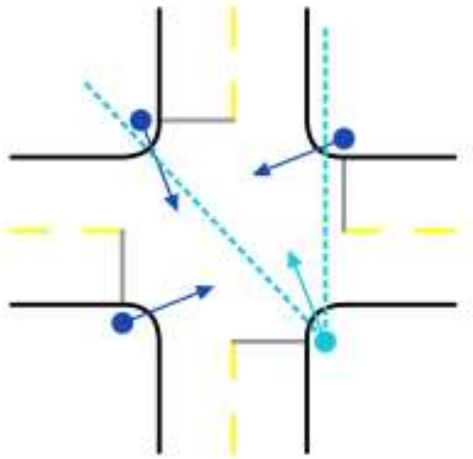


Figure 1 Positions of the Four Cameras.

The image obtained from the cameras is in Fig. 2.

Figure 2: Traffic Signal image

Here we will use opencv model to detect number of cars, trucks, bus, rikshaws and bike in image.

Scope

1. **Helps traffic police:** A vehicle detection and counting system could be beneficial for the traffic police because everything they can monitor from one place only likes how many vehicles have crossed this toll and which vehicle.

2. **Maintaining records:** It is challenging for some individuals to record all the vehicles with them because the cars are passing by in real-time. It's not like that one is watching the video, and they can pause it and have a note of it, so to remove this limitation, this application can be very well-versed to attain the time-saving quality and be automated.

3. **Traffic surveillance control:** As this application can be planted anywhere as it only requires a camera or some wires (for establishing the connectivity with the central system) hence if the traffic is high at someplace, then from that area, an officer can monitor it and forward the information to next toll officer so that they could be prepared beforehand.

I. PREVIOUS WORK

From the past few years the traffic control has turned into a serious issue for society. A variety of issues ranging from traffic blockage, absence of vehicle parking, pollution etc. have hassled humans. It has achieved major break in the recent era. However, the detection and classification of vehicles is a demanding concern. The scope in this area is huge because of the variety of challenging features that vehicles possess ranging from edges, colors, shadows, corners, textures, etc. Due to the progress in hardware and reduced manufacturing expenses, the amount of surveillance devices has risen in the past few years, and video cameras are of high resolutions used in these systems. An important study of the surveillance system is the detection of different vehicle types. The main phase in traffic management software is the classification of vehicles. Prior information of the model and vehicle type is required, because it allows for queries as to know "which direction the vehicle has passed and at what time?". Therefore, feature extraction and classification of vehicles cover a vast scope of traffic management applications [3, 4].

Yu Wang et al. 2019 [5], have developed a system for detection and classification of moving vehicles termed as Improved Spatio-Temporal Sample Consensus. Firstly, the moving vehicles are identified using Spatio Temporal Sample Consensus algorithm, from the intrusion of brightness variation and the vehicles shadow. Furthermore, by means of feature fusion techniques the objects are classified according to area, face, number plate and vehicle symmetry features.

Chia-Chi Tsai et al. 2018 [6], proposed an optimized Convolutional Neural Network architecture based on deep learning algorithms for vehicle detection and classification system used for intelligent transportation applications. PVANET as the base network, is selected and improved by fine-tuning to get better accuracy. It uses eight Concatenated ReLU convolution layers, eight inception layers as the base network and hypernet architecture is used to combine different levels of features, thereby making it better to achieve the desired bounding boxes for the Region Proposal Net layer.

In 2018, Velazquez-Pupo et al. [7] have presented a model based on vision analysis with a fixed camera for monitoring the traffic, detection of vehicle that includes occlusion handling, counting, tracking and classification. Even though the best classifier is SVM, still they reported that the OC-SVM with an RBF Kernel has delivered the best results with a high performance and F-measure of 98.190% and 99.051% for the midsize vehicles.

In the same year 2018, Murugan and Vijaykumar [8], have developed Adaptive Neuro Fuzzy Inference System classifier for classification of moving vehicles on the roads. It includes six main phases like pre-processing, feature extraction, detection, structural matching, tracking, and classification of vehicles. A background subtraction and the Otsu threshold algorithm are used for vehicular detection. The characteristics of the vehicles detected are obtained by the log Gabor filter and Harrish corner detector, which are used to classify the vehicles.

Ahmad Arinaldi et al. 2018 [9], presented a traffic video analysis system based on computer vision techniques. The core of such system is the detection and classification of vehicles for which they developed two models, first is a MoG + SVM system and the second is based on Faster RCNN, a recently popular deep learning architecture for detection of objects in images. They reported that Faster RCNN outperforms MoG in detection of vehicles that are static, overlapping or in night time conditions. Also, Faster RCNN outperforms SVM for the task of classifying vehicle types based on appearances.

In 2017, Audebert et al. [10] have conferred a segment before detect approach using deep learning techniques. Segmentation and followed by detection and classification of multiple wheeled vehicle

variants is tested for high-resolution remote sensing pictures. The process detection and classification of vehicles depending on a virtual detection zone was suggested by Seenouvong et al. 2016 [11], which comprises of foreground extraction, detection, feature extraction and classification. A Gaussian Mixture Model (GMM) is used in detection of vehicles and also some operations are performed to get the foreground objects and classification is done, using k-nearest neighbor classifier. In 2015, Dong et al. [12] have recommended a semi-supervised convolutional neural network technique for vehicles classification based on front view of vehicle. Yet, the features trained by the CNN are too biased to work in raster images. In the same year, Banu et al. [13] have recommended Histogram of Gradient feature extraction technique and morphological operations for better detection rate

II. METHODOLOGY

A. Prerequisites

We need to install the following python libraries if it is not already installed:

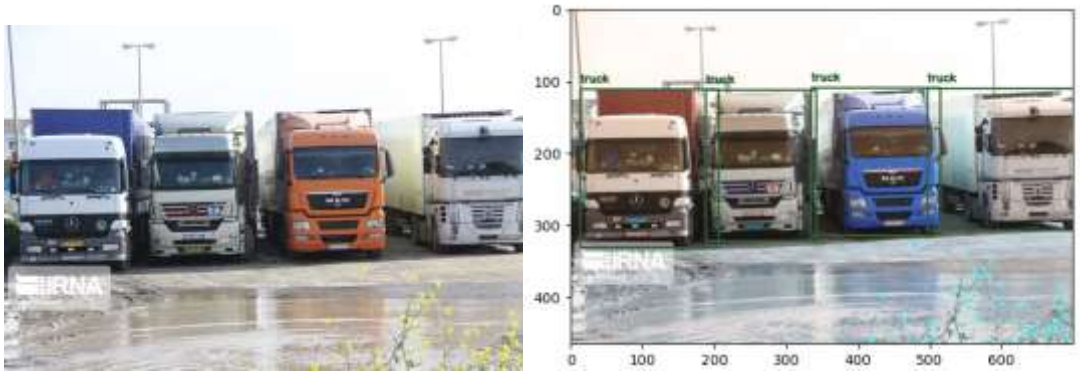
- opencv-python
- cvlib
- matplotlib
- tensorflow
- keras

B. Algorithm Showing Pseudo Code for Vehicle Detection Using OpenCV

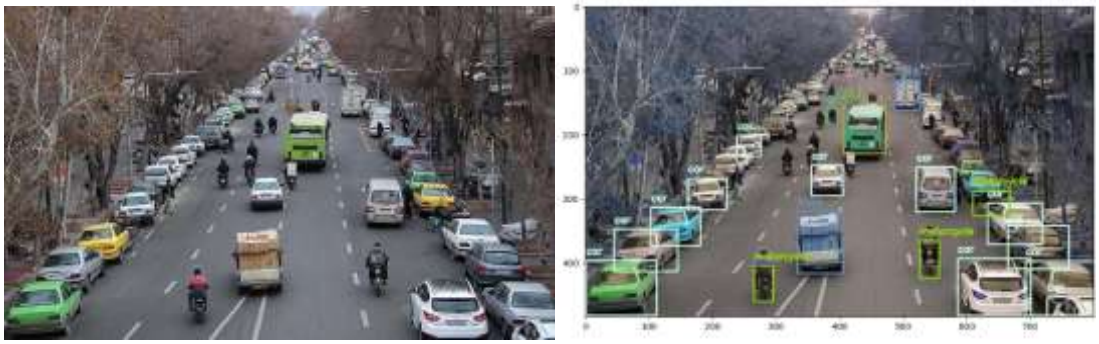
Here is the code to import the required python libraries, read an image from storage, perform object detection on the image, display the image with a bounding box and label about the detected objects, count the number of cars in the image and print it.

```
import cv2
import matplotlib.pyplot as plt
import cvlib as cv
from cvlib.object_detection
import draw_bboxim = cv2.imread('cars_4.jpeg')
bbox, label, conf = cv.detect_common_objects(im)
output_image = draw_bbox(im, bbox, label, conf)
plt.imshow(output_image)
plt.show()
print('Number of cars in the image is '+ str(label.count('car')))
print('Number of Bikes in the image is '+ str(label.count('motorcycle')))
print('Number of Truck in the image is '+ str(label.count('truck')))
```

C. Result obtained



(Left) Original image with vehicles (source), (Right) Output image with labelled vehicles



(Left) Original image with vehicles (source), (Right) Output image with labelled vehicles

Python version 3.6.9 was used for running this code.

III. CONCLUSION

During this work we have implemented vehicles detection and classification system using OpenCV. **Python version 3.6.9** was used for running this code. We have used various libraries of python like opencv-python, cvlib, matplotlib, tensorflow, keras. The performance of the system is evaluated using various real time vehicles images.

IV. FURTHER WORK PLAN

The further tentative work plan can further be carried as:

- Implementation of Basic Traffic Light System Using Pygame
- Design and implementation of intelligent traffic light system using Pygame
- Performance evaluation and validation of results.

V. RESEARCH REFERENCES

[1] Intelligent Transportation Systems Joint Program Office. United States Department of Transportation. Accessed 10 Nov 2016

[2] Aljawarneh, S.A., Vangipuram, R., Puligadda, V.K., Vinjamuri, J.: G-SPAMINE: an approach to discover temporal association patterns and trends in internet of things. Future Gener. Comput. Syst. 74, 430–443 (2017) 54 V. Keerthi Kiran et al.

[3] Huang, C.-L., Liao, W.-C.: A vision-based vehicle identification system. In: Proceedings of the 17th International Conference on Pattern Recognition, ICPR 2004, vol. 4, pp. 364–367 (2004)

[4] Kanhere, N.K.: Vision-based detection tracking and classification of vehicles using stable features with automatic camera calibration, p. 105 (2008)

[5] Wang, Y., Ban, X., Wang, H., Wu, D., Wang, H., Yang, S., Liu, S., Lai, J.: Detection and classification of moving vehicle from video using multiple spatio-temporal features, recent advances in video coding and security. IEEE Access 7, 80287–80299 (2019)

[6] Tsai, C.C., Tseng, C.K., Tang, H.C., Guo, J.I.: Vehicle detection and classification based on deep neural network for intelligent transportation applications. In: APSIPA Annual Summit and Conference 2018. IEEE (2018)

[7] Velazquez-Pupo, R., Sierra-Romero, A., Torres-Roman, D., Shkvarko, Y.V., Santiago-Paz, J., Gómez-Gutiérrez, D., Robles-Valdez, D., Hermosillo-Reynoso, F., Romero-Delgado, M.: Vehicle detection with occlusion handling, tracking, and OC-SVM classification: a high performance vision-based system. Sensors 18, 374 (2018)

[8] Murugan, V., Vijaykumar, V.R.: Automatic moving vehicle detection and classification based on artificial neural fuzzy inference system. Wirel. Pers. Commun. 100, 745–766 (2018)

[9] Arinaldi, A., Pradana, J.A., Gurusinga, A.A.: Detection and classification of vehicles for traffic video analytics. In: INNS Conference on Big Data and Deep Learning, Procedia Computer Science, vol. 144, pp. 259–268 (2018)

[10] Audebert, N., Le Saux, B., Lefèvre, S.: Segment-before-detect: vehicle detection and classification through semantic segmentation of aerial images. Remote Sens. 9, 368 (2017)

[11] Seenouvong, N., Watchareeruetai, U., Nuthong, C.: Vehicle detection and classification system based on virtual detection zone. In: International Joint Conference on Computer Science and Software Engineering (JCSSE) (2016)

[12] Dong, Z., Wu, Y., Pei, M., Jia, Y.: Vehicle type classification using a semisupervised convolutional neural network. IEEE Trans. Intell. Transp. Syst. 16(4), 2247–2256 (2015)

[13] Banu, S., Vasuki, P.: Video based vehicle detection using morphological operation and hog feature extraction. ARPN J. Eng. Appl. Sci. 10(4), 1866–1871 (2015)

[14] Frizziero, L. E. O. N. A. R. D. O., et al. "Stylistic design engineering (SDE) for an innovative green vehicle following QFD and TRIZ applications." Int. J. Mech. Prod. Eng. Res. Dev 9.2 (2019): 805-827.

[15] Malik, N. I. T. I. S. H., P. R. A. K. H. A. R. Agarwal, and A. J. A. Y. Rajput. "Design and performance optimization of the steering system of a vehicle." International Journal of Automobile Engineering Research and Development 7.3 (2017): 1-8.