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Vehicle Detection and Traffic Prediction

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Abstract: On the road, vehicle detection processes are utilized for vehicle tracking, vehicle counting, vehicle speed, and traffic analysis. For vehicle detection, the Tensorflow object detection API method is employed. The Object Detection API in Tensorflow is a powerful tool that allows anyone to easily design and deploy effective picture recognition applications. Another way to control traffic is to use a traffic control system. Multiple linear regression is utilized to regulate the traffic system, while the OpenCV approach is used to identify vehicle speed. A system for fine payment is also offered. It makes police officers' jobs easier. The exact results of vehicle speed and traffic control are provided.
Keywords: Vehicle detection, Tensorflow object detection API, Multiple linear regression, OpenCV, Fine payment

I. INTRODUCTION

Due to the increasing demand for private vehicles mixed with limited land resources, traffic congestion is a major issue that is expanding dramatically in urban cities. Longer travel times result in the waste of billions of human resource hours, wasted fuel, environmental degradation, rising accident rates, and a significant reduction in road service efficiency. An Intelligent Transportation System (ITS) can assist in easing traffic congestion that is putting an increasing strain on current road infrastructure. Information and communications technology (ICT) and electronic technologies are integrated with transportation infrastructures and vehicles in an ITS system. This integration has the potential to alleviate traffic congestion, improve safety, and reduce travel time and fuel consumption. Congestion-adaptive traffic light control is a critical component of improving road throughput and minimizing travel time.

The information about a vehicle is extremely useful for road surveillance and a variety of other city public security applications. Different vehicle property detection systems for road videos or photos are presented in this research. Here's how to detect a vehicle from a video of a city road, complete with its speed, count, and color. The color and speed of each passing vehicle are recognized by tracking them. Because each vehicle has its own internal structure and different elements may be painted in different colors, it is necessary to identify the vehicle's main color.

As a result, selecting the Region Of Interest (ROI) of the identified vehicle area of the image is critical. Following the selection of the ROI, a feature context based color identification method was applied. For vehicle tracking and speed detection, a novel efficient technique based on vehicle feature points has been developed. The system's performance is improved by using a frame-based vehicle counting mechanism. The proposed method's potential in an intelligent transportation system is demonstrated by efficient and thorough trials on both road picture and video data.

The majority of traffic lights operate on predetermined cycles or are manually regulated by a traffic inspector two or three times per day, depending on congestion patterns. These manual and fixed solutions are intended to solve difficulties on road segments with low traffic volumes, but they are ineffective for large portions due to rapid temporal and spatial congestion changes. Furthermore, this method introduces human evaluation flaws as well as inaccurate green time balancing. Due to the psychological stress exerted on the driver, traffic congestion can also pose a life-threatening situation.

A hasty driving act is the phenomena of red light running, which might result in an accident. This conduct is primarily motivated by the driver's frustration with unreasonably short or extended cycle lengths. To deal with excessive traffic density, authorities sometimes use a cycle length that is too short.

A short cycle length, on the other hand, frequently fails to manage traffic lineups from different surrounding roads at an intersection, resulting in more than two cycles of waiting before crossing the road junction.

We must introduce some features using machine learning to count each car on the road and detect real traffic on the road in this project. To recognize automobiles, the Tensorflow object identification API was used, as well as a multiple linear regression technique for traffic control. The project's goals are to count the number of vehicles on the road, monitor traffic flow at all times, and estimate vehicle speed.

II. RELATED WORK

Yingying Zhu et al. [1] introduced a novel text-dependent traffic symbol detection framework based on two machine learning components. They used a totally convolution network to build applicant road signage category locations that offered intriguing feature points. To improve efficiency and exact term detection, the proposed solution makes excellent use of the traffic sign capabilities. On the one hand, the two-stage plan decreases the text recognition search area and erases text around traffic signs, while on the other hand, the identification methodology minimizes the text recognition search area. The basic goal of text-dependent traffic signal identification is to obtain text data Yang et al. [3] focused on real-time traffic sign identification, such as determining which traffic sign type appears in which input source image at a fast processing speed. They proposed an exceptionally fast way to achieve the goal, which is 20 times faster than the better detection technique. This detection platform is reliant on a proposal for traffic sign extraction. Following that, an SVM classification was utilized to detect and identify false positives, with following proposals into super groups based on new color HOG functionality.

CHEN ZEZHI [4], Vehicle detection in this study is focused on categorizing and counting vehicles such as cars, buses, vans, and motorcycles. The research technique is a novel background GMM that also employs the shadow removal method. The process of vehicle detection is carried out using CCTV from the roadside, as moving vehicles are captured by the camera. For a more accurate and better result, they use both methods to update the background model correctly and efficiently, and then tracking and classification are carried out using Kalman Filter and SVM (Support Vector Machine). These are also employed in order to increase accuracy.

YIYAN WANG [5], The goal of this study is to look at the present limitations of the Video Image Vehicle Detection System (VIVDS) for traffic surveillance and propose a new VIVDS contour for monitoring intersections in urban areas. GMM (Gaussian Mixture Model) is the proposed method for vehicle detection. GMM is used for backdrop modeling, and it is utilized to render background frames quickly and reliably. Then, for segmenting and detecting vehicles in a predetermined detection region, employ highly developed vehicle detection based on color and texture. Finally, utilize an OR mask for post-processing to eliminate gaps in the detected vehicle mask using the flood-fill method. In terms of computing efficiency and detection rate, the experimental results suggest that VIVDS algorithms or methods outperform traditional VIVDS at urban intersections.

RABIU HABIBU [6], Vehicle detection is accomplished in this article using a single camera installed on a pedestrian bridge that looks at the traffic scene in real time. This is a background subtraction method for detection that performs pair-wise subtraction between the background frame and the current frame. This function detects the location of the current image that has a value larger than the threshold. When a vehicle is discovered, the next step is to track it using a well-known method called the kalman filter. If the object state employs a dynamic model, the following step is to adjust the forecast using the observed model. As a result, this approach is used to track a tagged object over the detection zone. At the end of the process, segmented cars are placed together with all of the tagged blobs, and bounded boxes are classified. The purpose of a classifier in this field is to determine the correct class of a given item based on a set of rules and features or traffic signs that are text-dependent. As a result, they plan to focus on multilingual text detection algorithms for traffic signs, which will necessitate the suggested changes to the traffic sign identification system in several nations.

Three key contributions have been made by Yuan Yuan et al [2]. The first is to improve identification efficiency by using structural data and creatively utilizing temporal variation of the indications prior to use. Second, improve monitoring efficiency and localization accuracy using non-linear monitoring. The off-line tracker, electronic detector, and movement model are all part of a modern and effective incremental structure that is designed for traffic signal recognition and tracking at the same time. Finally, a scale-dependent intra-outline combination strategy is developed to produce a progressively steady categorization result. They tested the technique on two open informational collections, and the results showed that the suggested framework may produce results that are almost equivalent to the machine learning strategy while using fewer processing assets in a continuous manner. The proposed method has been tested using open data sources and has been shown to be effective and efficient through thorough correlations and evaluation.

III. METHODOLOGY

Using TensorFlow's Object Counting API, we can detect, track, and count vehicles. The Tensorflow Object Identification API is an open-source platform based on Tensorflow that enables building, training, and deploying object detection models simply. It's a framework for building a deep learning network that handles object detection issues. The focus of this study is on vehicle detection and classification. It can distinguish between a car, a truck, a bicycle, a motorcycle, and a bus. To recognize and count vehicles, the Tensorflow object detection API function was employed.

Through picture pixel processing and calculation, OpenCV was used to construct a vehicle speed prediction system. The K-Nearest Neighbors Machine Learning Classification Algorithm was used to develop vehicle color prediction using OpenCV. Color Histogram Features that Have Been Trained. The vehicle's direction of travel on the road is detected. Estimating the size of the vehicle. As a result, it can tell what kind of car it is. The detected vehicle images are clipped from the video frame and saved as new photos. After the process for the source video file is completed, the program outputs a.csv file with "Vehicle Type/Size", "Vehicle Color", "Vehicle Movement Direction", and "Vehicle Speed (km/h)" rows. An intelligent traffic control system that detects vehicles and calculates traffic density at a traffic intersection uses computer vision and powerful machine learning algorithms. It employs a sophisticated bespoke algorithm to help control traffic lights while taking into account the density of traffic at each intersection. Throughout the day, the system actively learns about traffic and uses machine learning to precisely anticipate traffic density at any given time. The Google API's live crowd sourcing statistics are utilized to track more relevant near-real-time congestion scenarios.

A. *System Architecture*

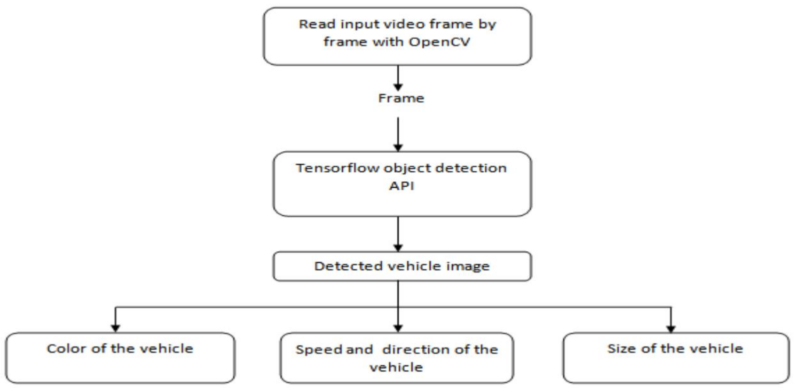

Figure 1: Architecture of vehicle detection and counting

Above figure 1: shown how vehicle detection, tracking, and counting work. First, uploading a video of a vehicle going by on the road. Using OpenCV, read the input video frame by frame. The Tensorflow object detection API is used to process these frames. Using the Tensorflow object detection API method to recognize car pictures from the input video. The color histogram is used to train KNN's color identification. It takes on the vehicle's color. Using pixel locations, predict the speed and direction. It displays the vehicle's speed and direction. The image area is used to estimate the vehicle's size.

B. *Module Description*

1) Vehicle counting module: This module covers vehicle identification, tracking, and counting using the Tensorflow object detection API. It recognizes each vehicle's video input. Using OpenCV, I was able to detect the color and speed of a car. Detecting vehicle travel directions is also possible. It displays the total number of vehicles on the route. The car counting application is started in anaconda with the command vehicle counting.py imshow. The output is displayed using the imshow command. The output of the imshow command will be written to a file using the vehicle counting.py imwrite command format. Additionally, each vehicle image is recorded separately and saved to a file.
2) *Traffic Control Module:* The traffic management system in this module employs the multiple linear regression method. It's made with ReactJS. ReactJS is an open source JavaScript library that is used to create single-page applications' user interfaces. We can also make reusable UI components with ReactJS. Yarn is a software package management system. It's designed to run ReactJS. The dashboard displays real-time traffic. A dashboard is a visual representation of all data. It's made from a manual data store. For creating live traffic, the Google static API is employed. For traffic regulation, a city for-way intersection road is used. Each road displays the number of vehicles passing by. A time series is also used to set the traffic light. The density of traffic is statistically represented.
3) *Fine System Module:* The policeman takes a photo of the vehicle and submits it to the control room in this module. They will take the vehicle number and the owner's address in the control room. Also, give fine details about their address via mail and postal service. If they do not pay the fine by the deadline, they will be fined much more and their vehicle will be impounded.

IV. RESULTANDANALYSIS

Using the Tensorflow object detection API, vehicles may be detected, tracked, and counted. It detects every vehicle on the road. It recognizes the vehicle's color. It detects the vehicle's travel direction. Calculate the vehicle's speed and estimate the vehicle's size. It calculates traffic density at a traffic intersection in the traffic control system. A Google static API was used to put up the traffic management system. A time series of traffic signals has been created. The number of vehicles going by on each road will be displayed. And displaying the traffic control density statistics over the course of a month. Enter the vehicle number in the "find a license plate" field in the smart fine payment module. Obtaining the owner's information for that vehicle number. Enter the amount of the fine for the car owner and send the fine.

On a set of videos, we used an object detection technique called Tensorflow object detection API to demonstrate the efficacy of our proposed approach. The COCO dataset is used to train all of the pre-trained models, which are available on Tensorflow detection model zoo (2019) and Tensor Nets. The counting process takes some time, and the length of time depends on the number of image frames and the system setup. Vehicle accuracy counting is utilized to assess the performance of each detection model in this study. It is calculated by counting automobiles in image frames with ROI passing the reference line. The accuracy is calculated using the equation below:

$$\text{Accuracy} = 1 - \frac{(|\text{manual count} - \text{algorithm count}|)}{\text{manual count}}$$

V. CONCLUSION

A framework for vehicle detection, tracking and counting is proposed. The system is continuously monitored for vehicle counting and traffic prediction. Tensorflow object detection API is being used to detect vehicle band classified types of vehicles. classifying the colors of the vehicles, predicting the speed of each vehicle, and direction of travel. by using OpenCV to predict vehicle color and speed. The traffic control system is shown on the dashboard. The live traffic will be predicted in very little time. Using multiple linear regression to predict the traffic on a road. Traffic control by traffic signal. It is set in a time series. The fine payment system is useful to policemen. It requires only the vehicle number to get full details of the owner. The aim behind this project is to reduce traffic waiting and control traffic in real life. This project is very useful to the government for controlling traffic in urban areas.

VI. ACKNOWLEDGEMENT

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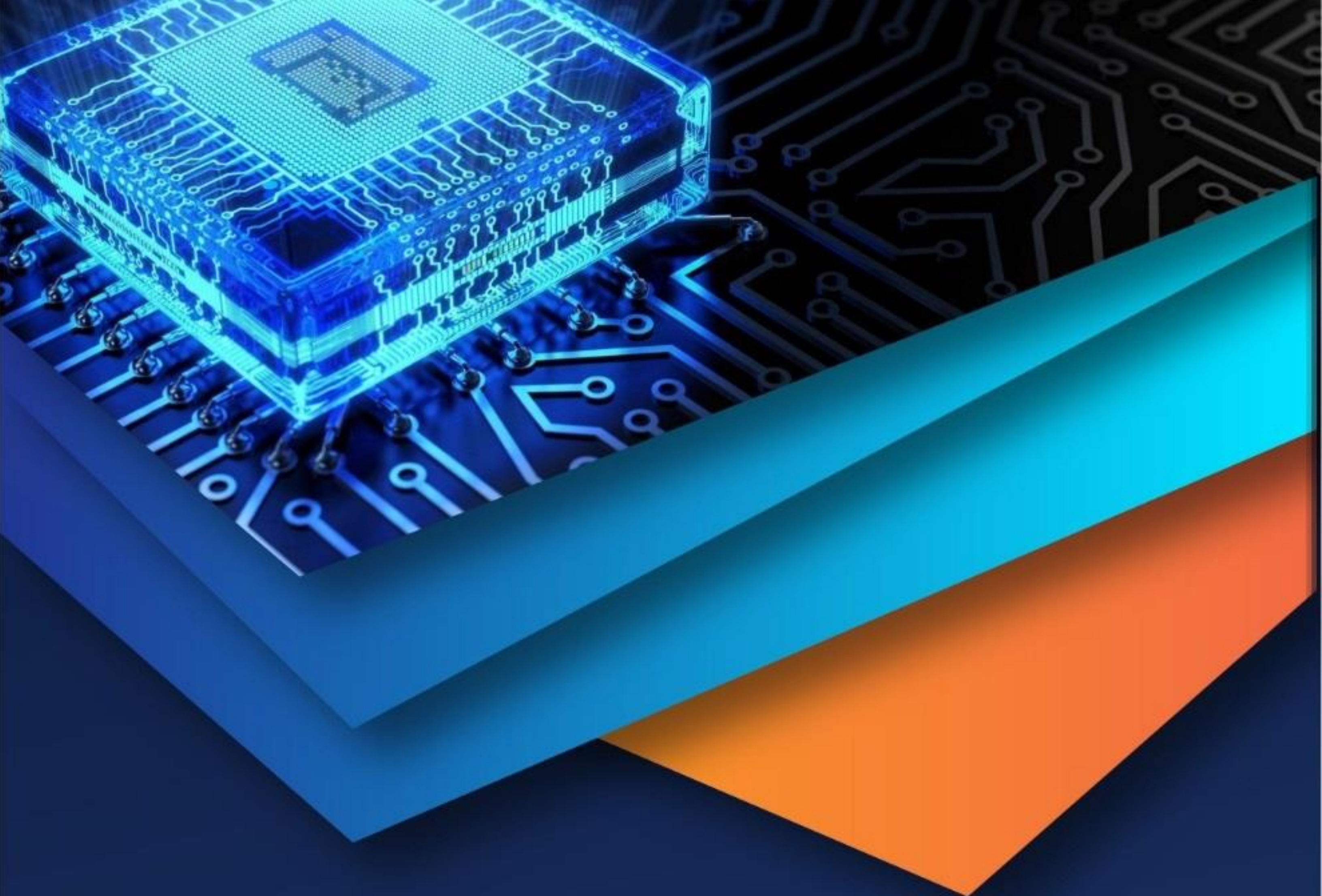
REFERENCES

[1] Yingying Zhu, Minghui Liao, Mingkun Yang and Wenyu Liu, "Cascaded Segmentation-Detection Networks for Text-Based Traffic Sign Detection," IEEE transactions on intelligent transportation systems, pp. 2019-219, Vol. 19, 2018.
[2] Yuan Yuan, Zhitong Xiong and Qi Wang, "An Incremental Framework for Video-Based Traffic Sign Detection, Tracking, and Recognition," IEEE transactions on intelligent transportation systems, pp. 1918-1929, Vol. 18, 2017.
[3] Yi Yang, Hengliang Luo, Huarong Xu and FuchaoWu, "Towards Real-Time Traffic Sign Detection and Classification," IEEE transactions on intelligent transportation systems, pp. 1-10, 2015.
[4] Zezhi Chen, Tim Ellis, Sergio A Velastin SMIEEE, "Vehicle Detection, Tracking and Classification in Urban Traffic", International IEEE Conference on Intelligent Transportation Systems 2012 IEEE
[5] Yiyan Wang, Yuexian Zou, Hang Shi, He Zhao, "Video Image Vehicle Detection System For Signaled Traffic Intersection", International Conference on Hybrid Intelligent Systems
[6] Habibu Rabiu, "Vehicle Detection And Classification For Cluttered Urban Intersection", International Journal of Computer Science, Enggineering and Application (IJCSEA) Vol.3, No.1, Febrauary 2013.



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