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VEHICLE DETECTION AND COUNTING SYSTEM

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Abstract: In this project, the main focus is on detecting vehicles and counting, particularly in traffic control. Vehicle detecting and also counting are becoming growing important in the area of highway regulators. However, because of the various structure of vehicles, their detections remain challenging which directly influence in the accuracy of a vehicle count. This project address video-based techniques for vehicle recognition and counting based on OpenCV technologies. Vehicle detection and counting system plays an important role in an intelligent transportation system, especially for traffic management and parking management. The proposed method uses the background subtraction technique to find foreground objects in a video sequence. In order to detect moving vehicles more accurately, several computer vision techniques, hole filling, and adaptive morphology operations, are then applied. Finally, vehicle counting is done by using a virtual detection zone.

Keywords: Vehicle detection, video sequence, OpenCV, Vehicle tracking, intelligent transportation system.

I. INTRODUCTION

The result of the increase in vehicle traffic, many problems have appeared. For example, traffic accidents, traffic congestion, traffic induced air pollution 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

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vehicle detection at a wide-area. Automatic detecting vehicles in video surveillance data is a very challenging problem in computer vision with important practical applications, such as traffic analysis and security. Vehicle detection and counting is important in computing traffic congestion on highways. The main goal Vehicle detection and counting in traffic video project is to develop methodology for automatic vehicle detection and its counting on highways. A system has been developed to detect and count dynamic vehicles efficiently. Intelligent visual surveillance for road vehicles is a key component for developing autonomous intelligent transportation systems. The entropy mask method does not require any prior knowledge of road feature extraction on static images. 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 highways. Automatic detecting and tracking vehicles in video surveillance data is a very challenging problem in computer vision with important practical applications, such as traffic analysis and security. Video cameras are a relatively inexpensive surveillance tool. Manually reviewing the large amount of data.

Thus, algorithms for analysing video Vehicle detection and counting in traffic video on highway Dept. of CS&E Page 2 which require little or no human input is a good solution. Video surveillance systems are focused on background modelling, moving vehicle classification and tracking. The increasing availability of video sensors and high-performance video processing hardware opens up exciting possibilities for tackling many video understanding problems, among which vehicle tracking and target classification are very important. A vehicle tracking and classification system is described as one that can categorize moving vehicles and further classifies the vehicles into various classes. Traffic management and information systems depend mainly on sensors for estimating the traffic parameters. In addition to vehicle counts, a much larger set of traffic parameters like vehicle classifications, lanechanges, etc., can be computed. Vehicle detection and counting uses a single camera mounted usuallyon a pole or other tall structure, looking down on the traffic scene. The system requires only the camera

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calibration parameters and direction of traffic for initialization.

II. LITERATURE SURVEY

Current approaches of monitoring traffic include manual counting of vehicles, or counting vehicles using magnetic loops on the road. The main drawback of these approaches, besides the fact that they are expensive, is that these systems only count. The current image processing method uses temporal differencing method this fail in complete extraction of shapes of vehicle, in feature-based tracking method extracted image is blur, active contour method is very difficult to implement and in region-based tracking is very time consuming, so in this project Adaptive Background subtraction method for detection and ostu's method to overcome these all problems. In order to evaluate if the project can be done in the given time frame, we are using the TELevaluation methods, where we cover the feasibility of the project from a technological, economical and legal perspective. Those perspectives would help us have a broad vision on the requirements and implications related to the project. We also discuss in this section the methodology used in conducting the project.

Gupte S., Masoud O et al. proposed ―Detection and Classification Vehicles‖ in the March, 2002, 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 use.

Toufiq P et al, proposed ―A Framework for Feature Selection for Background Subtraction‖, in 2006. Background subtraction is a widely used 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 Vehicle detection and counting in traffic video on highway Dept. of CS&E Page 4 proposed for modelling a given scene background. However, there is no theoretical framework for choosing which

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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.

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III. PROPOSED SYSTEM

The proposed system utilizes an adaptive background subtraction technology to recognize moving vehicles in a video also uses the classification algorithm which is used to define the kind of vehicle is being detected. And also uses the morphology operations to eliminate noise and shadow. There are three major components in the system those are detector, tracker and counter.

OpenCV: The OpenCV full form is Open Source Computer Vision Library. OpenCV is a Python library that allows you to perform image processing and computer vision tasks. It provides a wide range of features, including object detection, face recognition, and tracking. The library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-the-art computer

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vision and machine learning algorithms. These algorithms can be used to detect and recognize faces, identify objects, track camera movements, track moving objects etc. From this opencv module we used background subtraction algorithm for detection of vehicles. This algorithm extracts the foreground objects from dynamic videos sequence i.e. moving objects. We also used morphology operations which are present in this module used for hole filling and noise removal.

Numpy: NumPy, which stands for Numerical Python, is a library consisting of multidimensional array objects and a collection of routines for processing those arrays. Using NumPy, mathematical and logical operations on arrays can be performed. In particular, NumPy arrays provide an efficient way of storing and manipulating data. NumPy also includes a number of functions that make it easy to perform mathematical operations on arrays. This can be really useful for scientific or engineering applications. In our project we used this NumPy array to detect the vehicle and also to store the information about the vehicle that is being detected for further tracking. Based on this information the vehicle counter is increased efficiently.

Design consideration

In the design consideration the high-level design of our project it includes four modules, for this architecture pattern is as follows. Software design is a process of envisioning and defining software solutions to one or more set of solutions one of the main component software designs is the software requirement analysis. Architecture Design The figure5.1, gives an overview of the moving vehicle detection in a video sequence. The system makes use of an existing video sequence. The first frame is considered as the reference frame. The subsequent frames are taken as the input frames. They are compared and the background is eliminated. If a vehicle is present in the input frame, it'll be retained. The detected vehicle is thus tracked by various techniques, namely, adaptive background method and blob analysis method.

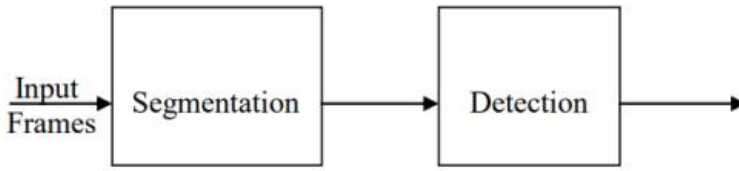

Fig.1 overview of vehicle detection and counting system

In the adaptive background subtraction algorithm, assume that the first frame is background for the video clips considered. The architecture of the proposed algorithm is shown in Figure5.1. In the next stage

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these differences are compared, and in the third stage pixels having the same values in the frame difference are eliminated. The fourth phase is the post processing stage executed on the image obtained in third stage and the fifth phase is the vehicle detection .and vehicle tuning .And final stage is counting vehicles.

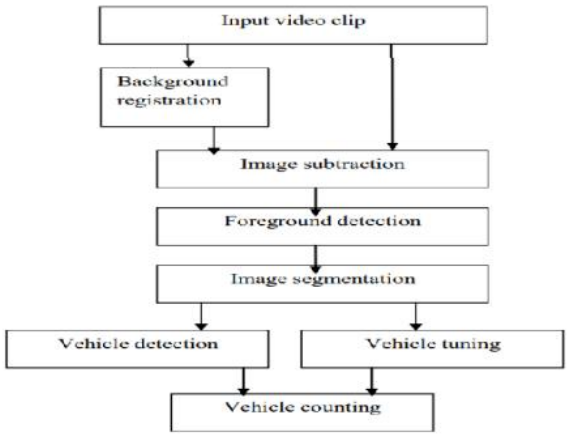

Fig.2 Architecture Vehicle detection and count

Often the vehicle may be of the same color as the background, or may be some portion of it may be aged with the background, due to which detecting the vehicle becomes difficult. This leads to an erroneous vehicle count

Foreground Detection

Detecting information can use to refine the vehicle type and also to correct errors which are caused due to occlusions. After registering the static vehicles, the background image is subtracted from the video frames to obtain the foreground dynamic vehicles. Post processing is performed on the foreground dynamic vehicles to reduce the noise interference.

Image Segmentation

Image segmentation steps as follows:

- The segmentation of vehicle regions of interest. In this step, regions which may contain unknown object have to be detected.
- Next step focuses on the extraction of suitable features and then extraction of vehicles. The main purpose of feature extraction is to reduce data by means of measuring certain features that distinguish the input patterns.
- The final is classification. It assigns a label to a vehicle based on the information provided by its descriptors. The investigation is made on the mathematical morphology operators for segmentation of a gray-scale image.

Vehicle Tuning

The irregular vehicle motion, there always exist some noise regions both in the vehicle and background region. Moreover, the vehicle boundaries are also not very smooth, hence a post processing technique is applied on the foreground image. Filters termed median filters are used, whose response is based on ordering (ranking) the

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pixels contained in the image area encompassed by the filter. The final output of the vehicle tuning phase is a binary image of the vehicle detected is termed as mask1. Vehicle detection and counting in traffic video on highway.

Vehicle Counting

The tracked binary image mask1 forms the input image for counting. This image is scanned from top to bottom for detecting the presence of vehicle. One variable is maintained that is count that keeps track of the number of vehicles. When a new vehicle is encountered, it is first checked to see whether it is already registered in the buffer, if the vehicle is not registered then it is assumed to be a new vehicle and count is incremented, otherwise it is treated as a part of an already existing vehicle and the presence of the vehicle is neglected. This concept is applied for the entire image and the final count of vehicle is present in variable count. A fairly good accuracy of count is achieved. Sometimes due to occlusions two vehicles are merged together and treated as a single entity

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IV. RESULTS

Test Case	Input Frame	Expected Result	Output Frame	Remark
1		Moving vehicle tracking.		Test passed
2				Test passed
3				Test passed

Fig.3 Experimental Result

V. CONCLUSION

This study established a high-definition vehicle object dataset from the perspective of surveillance cameras and proposed an object detection and tracking method for highway surveillance video scenes. A more effective ROI area was obtained by the extraction of the road surface area of the highway. The YOLOv3 object detection algorithm obtained the end-to-end highway

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vehicle detection model based on the annotated highway vehicle object dataset. To address the problem of the small object detection and the multi-scale variation of the object, the road surface area was defined as a remote area and a proximal area. The two road areas of each frame were sequentially detected to obtain good vehicle detection results in the monitoring field. The position of the object in the image was predicted by the ORB feature extraction algorithm based on the object detection result. Then, the vehicle trajectory could be obtained by tracking the ORB features of multiple objects. Finally, the vehicle trajectories were analysed to collect the data under the current highway traffic scene, such as driving direction, vehicle type, and vehicle number. The experimental results verified that the proposed vehicle detection and tracking method for highway surveillance video scenes has good performance and practicability. Compared with the traditional method of monitoring vehicle traffic by hardware, the method of this paper is low in cost and high in stability and does not require large-scale construction or installation work on existing monitoring equipment. According to the research reported in this paper, the surveillance camera can be further calibrated to obtain the internal and external parameters of the camera. The position information of the vehicle trajectory is thereby converted from the image coordinate system to the world coordinate system. The vehicle speed can be calculated based on the calibration result of the camera. Combined with the presented vehicle detection and tracking methods, abnormal parking events and traffic jam events can be detected to obtain more abundant traffic information.

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