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Vehicle Classification And Speed Estimation Using Computer Vision Techniques

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ABSTRACT:

In this work, we build a deep vehicle classification and speed estimation system and apply it to films captured by highway traffic cameras. Using back ground foreground segmentation techniques, we can detect moving cars in this way. Evaluate various supervised classifiers(e.g., artificial neural networks) for classifying vehicles (cars, motorcycles, etc.) vehicle, as well as bus/truck). Offsets cars using a calibrating approach. Images from space. Using features tracking and neighbouring pixels, estimate vehicle speed per class.algorithms based on neighbours .This research proposes a novel vision-based approach for automating vehicle detection and perfect certainty. A cascade matching principle on Haar features is trained on frontal views of automobiles and deployed for object tracking in the suggested method. To differentiate moving vehicles from the backdrop and prune detection accuracy, a quick and accurate foreground segmentation approach is suggested. The track results from a combination of Kalman filter and Equivalent to at least assignments algorithms are combined with the refined detection models in each frame. To calculate per-frame vehicle displacements, an efficient sub-pixel matching technique is used in conjunction with a sound system framework to achieve a historical and reliable speed measurement. The presented method produces more reliable detections and more accurate outcomes, according to the experiment results.

Keywords: vehicle classification, speed estimation, Haar classification, Car detection, Lane detection, Distance detection, CV2 model.

INTRODUCTION

With both the increasing increase in urbanization, road congestion, incidents, and violations have become major issues. strategies of administration Several people are interested in an intelligent transportation system that uses a vision-based system as an information gathering module in the real world. Computer vision techniques are mostly used to assess traffic characteristics including average speed, lane changes, vehicle, and so on. These systems have also been employed in applications including parking lots, automatic toll collecting, and limited area entrance management.Technology and electronic image processing techniques can be used to evaluate and analyze vehicle - to - vehicle video systems. Computer vision and process and decreases, for example, can be used to calculate vehicle detection, counting, and categorization. Vehicle detection, counting, and categorization have all been suggested as research projects. Shifting the search window over an input image and categorising the object in the window with a classifier is a typical approach to automated object detection.

The system can be sped up without sacrificing classification efficiency by utilising the two properties listed below, which are common like most vision-based detection tasks: To begin, the vast bulk of an image's examined patterns belonged to the seen at .

LITERATURE REVIEW

Chenghuan Liu et al., “A Vision-Based Pipeline for Vehicle Counting, Speed Estimation, and Classification”. In vehicular traffic, cameras are commonly used. Many Network Services Centres still use old camera systems as manual surveillance devices, despite the fact that many technologically sophisticated camera solutions on the market can be connected with Intelligent Transportation System (ITS) for automatic identification, monitoring, and data collection .We show how to make good use of older resources in this study by using computer vision algorithms to extract traffic data from films taken by legacy cameras. To recognise vehicles, pedestrians, and cyclists from monocular movies, we use modern state-of-the-art classifier model and transmission in our proposed eyesight pipeline. We demonstrate a new use of the image-to-world homograph by weakly calibrating the camera, which allows our binocular vision system to count vehicles per lane and estimate vehicle width and length.

Jobe Johan P. Belen et al., “Vision Based Classification and Speed Estimation of Vehicles using Forward Camera”. The number of vehicles on the road nowadays is growing. This congests the roadways and makes it difficult for people to get about. Vehicle detection systems are being monitored. A good flow of traffic. To count, detect, and count again, a monitoring system must be utilised.

Vishal Mandal et al., “Artificial Intelligence Enabled Traffic Monitoring System”. Traffic Control Centres handle a plethora of cameras that are connected via a network, making manual traffic monitoring a difficult process. Introducing a amount of technology could help relieve the burden of human operators doing manual monitoring and improve proactive decision-making, reducing the impact of incidents and recurring traffic jams on highways. Using deep convolutional neural networks and a stand-alone graphical interface, this research provides a novel way for dynamically monitoring actual traffic video. The authors present the findings of their research while working on models that will serve as an integrated framework for an artificial intelligence-assisted traffic monitoring system. The suggested system employs a number of cutting-edge deep learning approaches to handle various traffic surveillance tasks.

EXISTING SYSTEM

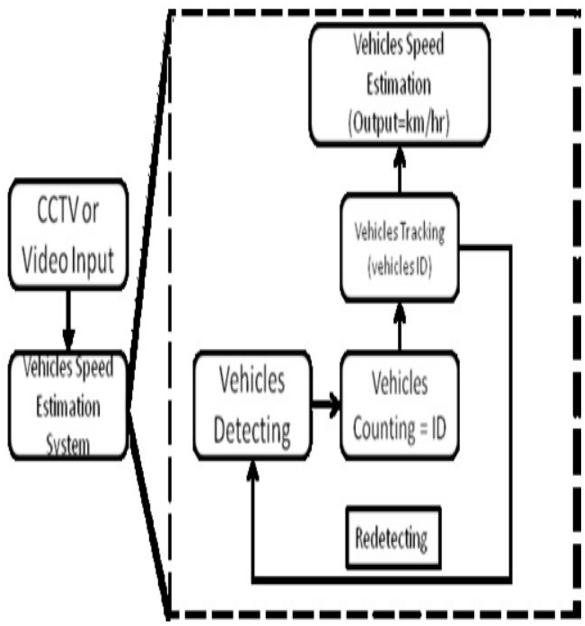
Implementation of vehicle detection algorithm on toll road as parts of self-driving car system.
Video image taken using action camera mounted on top of the vehicle, with 1280x720 resolutions.
Average speed of the vehicle is 100 km per hour. Programming language of image processing using Python 3.
Image processing method is a combination of methods of object detection, feature intuition, colour spaces, and HOG (histogram of oriented gradient). The result shows this algorithm needed to be add some method that can change the parameters during day and night adaptively.
Because constant parameters can only be used in the same lighting conditions. Overall, the implementation method in Python Language can be successfully detecting the vehicle with accuracy percent.

METHODOLOGY

PROPOSED SYSTEM

- In this work, we implement a real-time vehicle classification and speed estimation system and apply it to videos acquired from traffic cameras installed in highways. In this approach we:
- Detect moving vehicles through background foreground segmentation techniques.
- Compare different supervised classifiers (e.g., artificial neural networks) for vehicle classification.
- Apply a calibration method to georeferenced vehicles using satellite images.
- Estimate vehicles speed per class using feature tracking and nearest neighbors' algorithms.

ARCHITECTURE DIAGRAM



MODULES DESCRIPTION

Module 1: Data Collection

Datasets are a type of data collection. The datasets are gathered based on vehicle speed estimates in this case. Based on the data set, an input data set in video format can be obtained to classify the speed of the vehicles group.

Data sets can contain information such as car names, registration numbers, and vehicle speeds, among other things. Data sets can also be used to store information that is required by applications or the operating system.

Module 2: Classification of model

Vehicle Detection

A accurate detection algorithm should be used to specify the initial condition of cars in order to initiate the tracking algorithm. To this purpose, we use a cascade extractor to learn the vehicle behavior. To accomplish a sensitive and reliable detection, we must first build a large training data set that includes practically all sorts of cars found on highways. These frontal view photos were manually cropped from video streams obtained with a fixed tower erected alongside the road. The Viola-Jones cascade classifier is used as a basic module for vehicle detection. This classification has been shown to be quite effective for detecting visual objects quickly.

Distance Measurement

We use multiple cameras to measure the distance of the tracked vehicles in order to calculate their volume. In this method, two cameras with equivalent visual axes are used to acquire stereoscopic views of a scene.

Speed Measurement

We may now go on to the speed observation made, which is based on stereo imagery. It has been demonstrated that depth is inversely related to disparity between two matched spots in a pair of stereoscopic pictures using triangulation.

EXPERIMENTAL RESULTS

1. **For lane detection**

2. **Distance calculation**

3. **Speed calculation**

CONCULATION AND FUTURE SCOPE:

A new vision-based hybrid method for automatic detection and speed measurement of moving vehicles is proposed in this research. First and foremost, a comprehensive data set of automobiles used on highways is manually trimmed and collected. A cascade classifier trained on a huge database of vehicle frontal views efficiently performs the detection aspect of our solution. To achieve reliable tracking, the Equivalent to at least distribution algorithm is used to assign detection results to the monitored items in each frame.

A quick sub-pixel stereo matching method is used to increase accuracy when measuring the distance of cars in each frame from the camera tower using a vision-based framework. The suggested method's resilience despite severe partial occlusion is demonstrated by experimental results.

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