

A VIDEO BASED VEHICLE DETECTION AND COUNTING SYSTEM

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ABSTRACT

Traffic Analysis has been a problem that city planners have dealt with for years. Smarter ways are being developed to analyze traffic and streamline the process. Analysis of traffic may account for the number of vehicles in an area per some arbitrary time period and the class of vehicles. People have designed such mechanism for decades now but most of them involve use of sensors to detect the vehicles i.e. a couple of proximity sensors to calculate the direction of the moving vehicle and to keep the vehicle count. Even though over the time these systems have matured and are highly effective, they are not very budget friendly. The problem is such systems require maintenance and periodic calibration. Therefore, this study has purposed a vision based vehicle counting. The system involves capturing of frames from the video to perform background subtraction in order detect and count the vehicles using background subtraction then it detects and counts the vehicles by comparing the contour areas to the assumed values.

1. INTRODUCTION

The need for efficient management and monitoring of road traffic has increased in last few decades because of the increase in the road networks, the number and most importantly the size of vehicles. Intelligent traffic surveillance systems are a very important part of modern day traffic management but the regular traffic management techniques such as wireless sensor networks, Inductive loops and EM microwave detectors are expensive, bulky, and are difficult to install without interrupting the traffic. A good alternative to these techniques can be video-based surveillance systems Video surveillance system shave become cheaper and better because of the increase in the storage capabilities, computational power and video encryption algorithms.

The videos stored by these surveillance systems are generally analyzed by humans, which is a time consuming Job. To overcome this constraint, the need of more robust, automatic video based surveillance systems has increased interest in field of computer vision. The objectives of a traffic surveillance system is to detect, track and classify the vehicles but they can be used to do complex tasks such as driver activity

recognition, lane recognition etc. The traffic surveillance systems can have applications in a range of fields such as, public security, detection of anomalous behavior, accident detection, vehicle theft detection, parking areas, and person identification. A Traffic surveillance system usually contains two parts, 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 analyses. These systems could be portable with a microcontroller attached to the camera for real-time processing and analyses or just the cameras that transmit the video feed to a centralized computer for further processing.

2.LITERATURE REVIEW

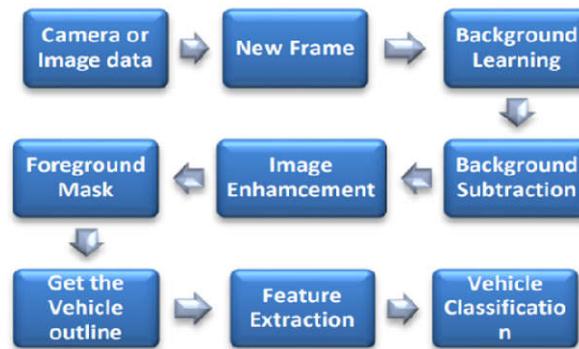
Tursun, M and Amrulla, G [4] proposed a video based real-time vehicle counting system using optimized virtual loop method. They used real time traffic surveillance cameras deployed over roads and compute how many vehicles pass the road. In this system counting is completed in three steps by tracking vehicle movements within a tracking zone called virtual loop. Another video based vehicle counting system was proposed by Lei, M., et al. [5]. In this system surveillance cameras were used and 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 [10] based on an adaptive bounding box size to detect and track vehicles in accordance with estimated distance from the camera. The Region of Interest (ROI) is identified by defining a boundary for each outbound and inbound in the image. Although the algorithm is improved to deal with some weather conditions it is unable to track vehicles when they change their directions.

3.DOMAIN INFORMATION

Deep learning is a branch of machine learning which is completely based on artificial neural networks, as neural network is going to mimic the human brain so deep learning is also a kind of mimic of human brain. In deep learning, we don't need to explicitly program everything. The concept of deep learning is not new. It has been around for a couple of years now. It's on hype nowadays because earlier we did not have that much processing power and a lot of data. As in the last 20 years, the processing power increases exponentially, deep learning and machine learning came in the picture.

4.IMPLEMENTATION

The system could be used for detection, recognition and tracking of the vehicles in the video frames and then classify the detected vehicles according to their size in three different classes. The proposed system is based on three modules which are background learning, foreground extraction and vehicle classification as shown in fig. 1. Background subtraction is a classical approach to obtain the foreground image or in other words to detect the moving objects.



Background Learning Module

This is the first module in the system whose main purpose is to learn about the background in a sense how it is different from the foreground. Furthermore as proposed system works on a video feed, this module extracts the frames from it and learns about the background. In a traffic scene captured with a static camera installed on the road side, the moving objects can be considered as the foreground and static objects as the background. Image processing algorithms are used to learn about the background using the above mentioned technique.

Foreground Extraction Module

This module consists of three steps, background subtraction, image enhancement and foreground extraction. Background is subtracted so that foreground objects are visible. This is done usually by static pixels of static objects to binary 0. After background subtraction image enhancement techniques such as noise filtering, dilation and erosion are used to get proper contours of the foreground objects. The final result obtained from this module is the foreground extraction

5.EXPERIMENTAL SETUP

Hardware requirements

- System : Pentium IV 2.4 GHz.
- Hard Disk : 40 GB.
- Floppy Drive : 1.44 Mb.
- Monitor : 14" Colour Monitor.
- Mouse : Optical Mouse.
- RAM : 4GB

Software requirements

- Operating system : Windows 7 Ultimate.
- Coding Language : Python.
- Front-End : Python

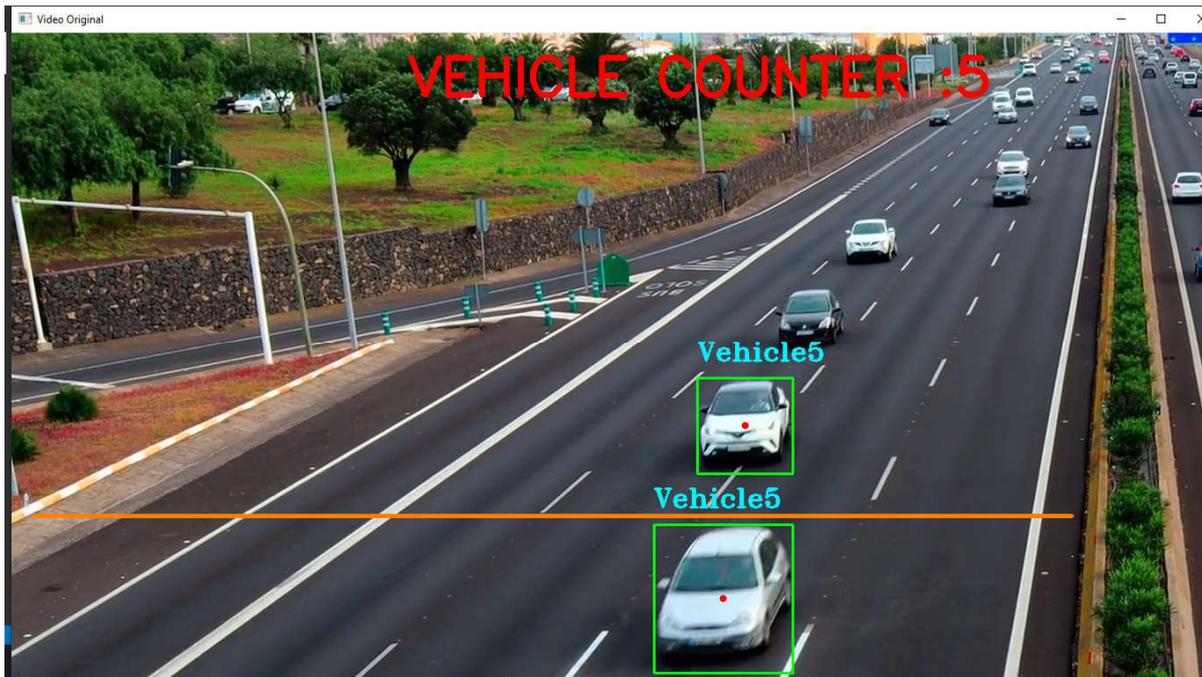


Fig 6.1

The above mentioned figure displays the result of vehicle detection and counting system.

7. CONCLUSION

The proposed solution is implemented on python, using the Open CV bindings. The traffic camera footages from variety of sources are in implementation. A simple interface is developed for the user to select the region of interest to be analyzed and then image processing techniques are applied to calculate vehicle count and classified the vehicles.

We have developed video based vehicle detection, counting for real-time traffic data collection. We have used Background Subtraction Yolo algorithm, Open CV, and python for developing the system. In the proposed system, we have considered all day and night shadowing, and different lighting situations. Also, we have considered the moving shadow of moving vehicles.

8. FUTURESCOPE

The system is not capable of detection of vehicles in the night as it needs the foreground objects to be visible for extraction of contour properties as well as features for the classification using SIFT features[31].The system could also be improved for better accuracy using the more sophisticated image segmentation and artificial intelligence operations.

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