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Vehicle Counting System

Prof. Hiranawale. S. B[1], Shivarkar Rashi[2], Gadade Shweta[3], Mergal Kishori[4], Navale Bharati[5]
[1, 2, 3, 4, 5]*Department of Computer Engineering, HSBPVT's Parikrama college of Engineering, Kashti*

Summary: ***Object detection is a computer technology related to computer vision and image processing concerned with detecting instances of semantic objects of a certain class in digital images and videos. Machine learning can be used to detect and classify objects in images and videos. Vehicle detection, also known as computer object recognition, is essentially scientific methods and means of seeing machines, not human eyes. Vehicle detection is one of the features most used by businesses and organizations today. We can use computer vision to detect different types of media on video or in real time through the camera. Vehicle detection and tracking is used in traffic control, car tracking, parking sensor creation, and more.***
Keywords: TensorFlow, flask, discovery, OpenCV

I. INTRODUCTION

An image is a visual representation of something. In information technology, the term has a number of uses. An image is an image that has been created or copied and stored in electronic form. An image can be depicted as a vector graphic or a raster graphic. Digital image processing refers to the processing of digital images by digital computers. It is a subfield of signals and systems but is particularly focused on images. DIP focuses on developing a computer system capable of performing processing on an image. The input of this system is a digital image and the system processes this image using efficient algorithms and outputs the output image. It allows a wide range of algorithms to be applied to the input image, and problems such as noise accumulation and signal distortion during processing can be avoided. An image can be classified into the following three categories. The objective of the given program to detect the object of interest (Car) in the video image and keep tracking it. Here is an example of vehicle detection in Python With the rapid development of intelligent video analytics, traffic monitoring has become an important technique for gathering information about traffic conditions. Using traditional sensors like loop detectors, ultrasonic sensors can damage the pavement. At the same time, many of these sensors must be installed in urban areas, the cost of which is very high. CCTV is a commonly used sensor in traffic monitoring, which can provide a video feed for vehicle detection and counting. Vehicle counting provides pertinent information on traffic volume, vehicle accident occurrences and rush hour traffic on roads. An acceptable technique for achieving these goals is the use of digital pavement image processing methods. Our project describes the method used for image processing or video processing to count traffic with real-time video using a programming language.

The task of finding the target object in an image or video sequence can be done by object recognition. There are 2 methods in object recognition, which are appearance based method and feature based method. There 5 techniques in appearance based method. They are edge matching, divide and conquer search, grayscale maching, gradient matching and large model bases.

II. LITERATURE SURVEY

A. Moving Object Detection

Each application that benefits from smart video processing have different needs, thus requires different handling objects. However, they hold something in common like moving objects. In each and every vision system, detecting moving objects are common such as people and vehicles in the video. Moving object detection steps consists of preprocessing, feature extraction, classification, detection, and tracking.

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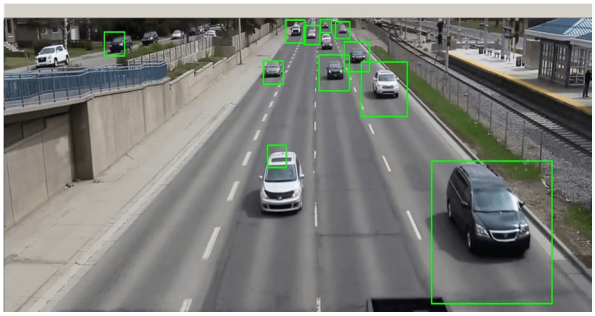
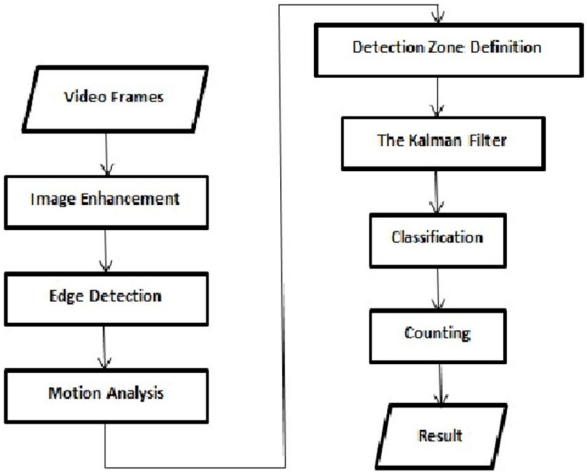
III. BACKGROUND SUBTRACTION

The background subtraction technique is widely used for motion segmentation in many applications. It finds the moving regions in images by subtracting the initial image of
pixels from a referenced background image which is formed by averaging images. If the subtracted pixel value is greater than the threshold then it is defined as foreground. To enhance detected regions post-processing operations like dilation, erosion, and closing are performed to reduce the noise level. Many approaches for background subtraction technique are performed in terms of foreground detection, background maintenance, and post processing. Heikkila and Sliven used the simplest version where is marked as foreground by a pixel at location in the current image and the predefined threshold
[1]. The (IIR) Infinite Impulse Response filter was used to update the background image
By eliminating small-sized regions and morphological closing was used to create foreground pixel maps. Though background subtraction techniques are effective, they lack in performance with dynamic changes such as stationary objects uncover the backgrounds (e.g., a parked bus moves out of the parking) or sudden light changes



A. Statistical Methods

The statistical models have evolved to solve the limitations of fundamental background subtraction techniques. In the statistical method, the characteristic of individual pixel or group of pixels are considered to construct the background frame and statistics of background can automatically update during processing. This technique provides more reliable and effective in several scenarios like illumination changes, distortion caused by low resolution, roadside trees, and shadows. In this system, pixels are represented by its intensity values (M) minimum and (N) maximum intensity values and (D) maximum intensity difference between any succeeding frames noticed at the initial stage where the scene has stationary objects.



The traffic flow statistical technology based on vehicle detection and tracking is an important component in the field of intelligent transportation. The method is characterized in that a vehicle in an image is detected by using an image processing technology, then the characteristic extraction is carried out on the peripheral area of the vehicle so as to realize the detection and tracking of the vehicle, further, the position judgment is carried out on the tracked target vehicle so as to count the number of the vehicles in a video, and finally, the counted traffic flow information is transmitted to a traffic department in real time so as to adjust the driving road of the vehicle according to the counting result of the traffic flow.

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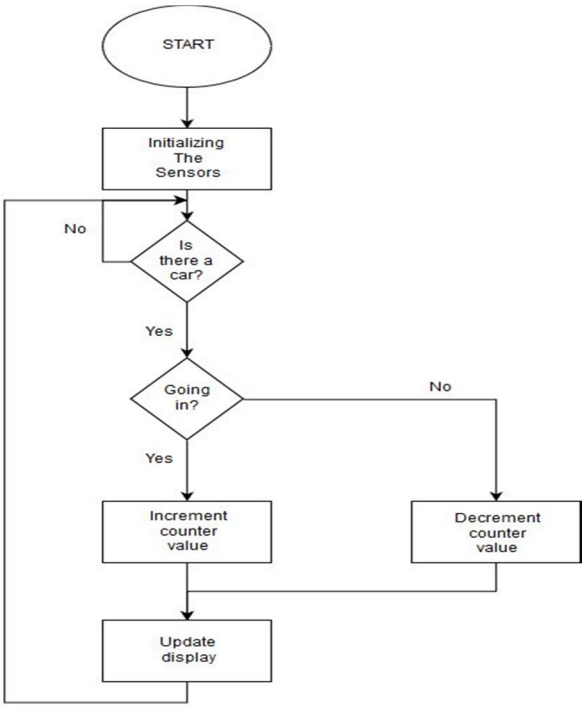


Fig (1)

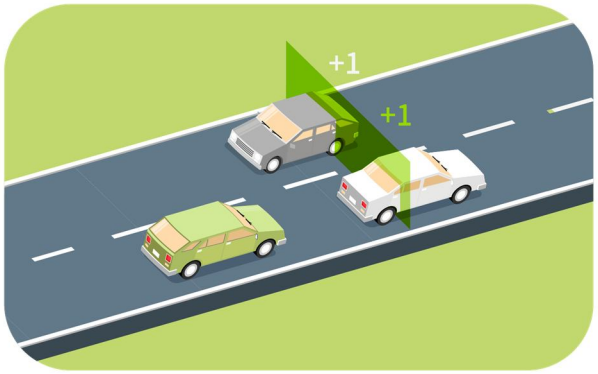
IV. RESEARCH METHODS

A. Data Collection

The image dataset was collected from a combination of media image databases, reference sets and extracted images.

B. Model And Analysis

The system uses an existing video sequence. Recorded video data or real-time video data is required as input. It is then divided into frames. Haar Cascade Classifier is a method used to detect an object. In the object detection value was obtained, the value of the Haar type feature was calculated using the integral image. Region of interest is a specific region extracted from the given frame. Background subtraction performs the subtraction between the current image and the background pattern to determine the foreground mask. Next, thresholding and scaling are applied to the output of Background Subtraction.4. Vehicle tracking involves identifying detected vehicles continuously in a video sequence. The system detects each moving vehicle and the detected vehicle is surrounded by a rectangle. The size of rectangle refers to the area of the detected vehicle.5. Each vehicle object passing within the ROI is tracked based on its location. The count line has been entered into the system. When the vehicle is detected to pass the count line, it will be counted, otherwise it will not. Vehicle counting is a key strategy of traffic analytics and can be used on highway and urban roads under different weather and traffic conditions. A vehicle counting system can be permanently installed using already or newly installed surveillance cameras.



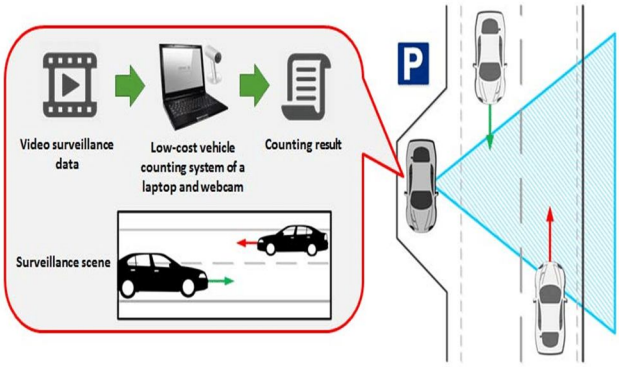
V. RESULTS AND DISCUSSION

Vehicle traffic data from this app can be used to count and classify vehicles on busy roads. When this application is used to collect data of vehicle types

An open source computer vision library (OpenCV) and the Python programming language are used to implement the developed method. The system in this regard includes the calculation of the number of vehicles passing on the road. It is based on the detection of vehicles crossing a virtual road.

A. Applications

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.



Intelligent vehicle counting plays an important role in the transportation systems of smart cities. Computationally efficient and reliable deep learning algorithms can classify the type of vehicle and count them in real-time using the video of conventional surveillance cameras. Vehicle counting is a key strategy of traffic analytics and can be used on highway and urban roads under different weather and traffic conditions. A vehicle counting system can be permanently installed using already or newly installed surveillance cameras.

VI. CONCLUSION

Vehicle traffic data from this application can be used to count and classify vehicles on busy roads. Once this application is used to collect data of various types of vehicles. Open Source Computer Vision Library (OpenCV) and Python Programming language is used to implement the method developed. The system in this is to calculate the number of vehicles passing on the road. It was based on the detection of vehicles that cross a virtual line.

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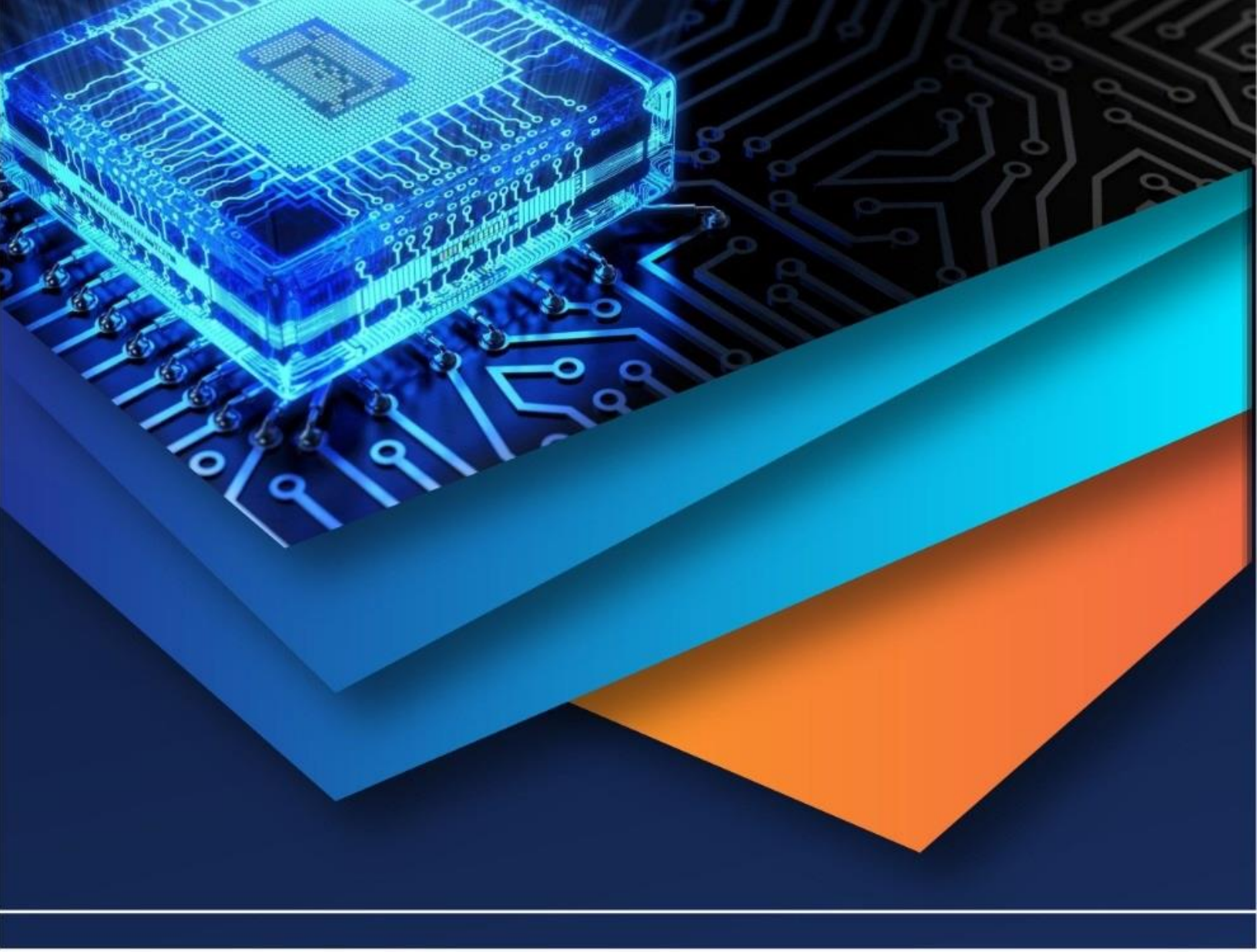

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