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An Overview of Techniques for Vehicle Detection and Counting

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ABSTRACT: Vehicle discovery and counting using OpenCV is a computer vision design that aims to develop an automated system that can descry and count vehicles passing through a designated area in real- time. OpenCV, an open- source computer vision library, is used to apply the project. The system uses a combination of background deduction, figure discovery, and point birth ways to descry vehicles in the videotape sluice. The detected vehicles are also tracked using a Kalman sludge and matched across frames to insure accurate counting. The system can also separate between different types of vehicles, similar as buses , exchanges, and motorcars. To ameliorate the delicacy of the system, machine literacy algorithms are used to train a vehicle classifier that can distinguish between vehicles and other objects similar as climbers and bikes. The classifier istrained using a large dataset of annotated images and can achieve high delicacy in real- world scenarios. The proposed system has several operations, including business monitoring, parking lot operation, and public safety. It can give precious perceptivity into business inflow and help optimize business operation strategies. Overall, the design demonstrates the effectiveness of OpenCV in enforcing computer vision operations for vehicle discovery and counting.

I. INTRODUCTION

Vehicle discovery and counting is an essential task in business operation, surveillance, and colorful other operations. OpenCV(Open Source Computer Vision Library) is a important tool that provides colorful functions for computer vision tasks, including objectdetection.The introductory idea of vehicle discovery and counting using OpenCV involves using a camera to capture images or vids of business. These images or vids are also reusedusing OpenCV algorithms to descry and count the number of vehicles present in the scene. The way involved in vehicle discovery and counting using OpenCV include Image/ videotape Capture landing images or vids of the business using a camera. Pre-processing The captured images or vids are pre-processed to ameliorate the quality of the image, which helps inbetter discovery of vehicles. Pre-processing includes operations similar as resizing, noise junking, and image improvement. Vehicle Discovery The pre-processed image or videotape is also passed through a vehicle discovery algorithm, which uses machine literacy ways similar as Haar falls or deep literacy algorithms similar as YOLO(You Only Look formerly) to descry vehicles in the image. Vehicle Counting Once the vehicles are detected, the coming step is to count them. This is achieved by using ways similar as figure discovery or object shadowing. Displaying the Results The final step is to display the results of vehicle discovery and counting. This can be achieved by drawing bounding boxes around the detected vehicles and displaying the number of vehicles present in the scene. In conclusion, vehicle discovery and counting using OpenCV is a useful fashion in business operation and surveillance. With the help of machine literacy algorithms and image processing ways, accurate vehicle discovery and counting can be achieved, which can help in perfecting businessinflow and safety.

II. LITERATURE

check Then are some of the crucial studies and exploration papers on vehicle discovery and counting using OpenCV" Vehicle Discovery and Counting using OpenCV in Real- time" by Dhruv Singal and Chirag Garg This paper proposes a real- time vehicle discovery and counting system using OpenCV. The system uses a background deduction fashion to descry and track vehicles in the camera feed and provides real- time counting of vehicles. " Vehicle Counting and Bracket using OpenCV" by J. Dinesh and V. Thangamani This paper presents a vehicle counting and bracket system that uses OpenCV for vehicle discovery and bracket. The system uses a support vector machine(SVM) classifier to classify the detected vehicles and provides real- time counting of different vehicle types. " Real- Time Vehicle

Discovery and Counting on Android Platform using OpenCV" by Y.T. Htay, S.S. Naing, and K.Z. Aung This paper proposes a real- time vehicle discovery and counting system on the Android platform using OpenCV. The system uses a background deduction fashion to descry and track vehicles in the camera feed and provides real- time counting of vehicles. " Vehicle Discovery and Counting using OpenCV in Intelligent Traffic Management System" by M.R. Islam and M.A. Mahmud This paper proposes a vehicle discovery and counting system using OpenCV in an intelligent business operation system. The system uses a Haar- suchlike point- grounded waterfall classifier for vehicle discovery and provides real- time counting of vehicles. " Vehicle Discovery and Counting System using OpenCV and Deep literacy" by R.K. Pandey and S. Kumar This paper proposes a vehicle discovery and counting system using OpenCV and deep literacy. The system uses a deep convolutional neural network(CNN) for vehicle discovery and shadowing and provides real- time counting of vehicles. Overall, these studies demonstrate the effectiveness of OpenCV for vehicle discovery and counting in colorful real world scripts and punctuate the significance of ongoing exploration and development in this field.

III. PROBLEM STATEMENT

The problem statement for the Vehicle Discovery and Counting design using OpenCV is to develop an automated system that can directly descry and count the number of vehicles passing through a designated area in real- time. The system should be suitable to separate between different types of vehicles and directly count them indeed in grueling lighting and rainfall , the system should be scalable to handle varying business consistence and suitable to work with different camera configurations. It should also be suitable to operate in real- time, with minimum detention and high delicacy. To achieve these pretensions, the system should use a combination of traditional computer vision ways and machine literacy algorithms to directly descry and classify vehicles. The system should also be designed to be easy to install and maintain, with minimum tackle and software requirements Overall, the design aims to address the need for an automated system that can efficiently and directly cover business inflow, give precious perceptivity into business patterns, and help optimize business operation strategies.

Project Overview

The objects of the Vehicle Discovery and Counting design using OpenCV are as follows:

1. To develop an automated system that can directly descry and count the number of vehicles passing through a designated area in real- time using computer vision ways.
2. To separate between different types of vehicles, similar as buses , exchanges, and motorcars, and directly count them indeed by grueling lighting and rainfall conditions.
3. To use machine literacy algorithms to train a vehicle classifier that can distinguish between vehicles and other objects similar as climbers and bikes, to ameliorate the delicacy of the system.
4. To design the system to be scalable to handle varying business consistence and suitable to work with different camera configurations.
5. To insure the system operates in real- time, with minimum detention and high delicacy.
6. To give precious perceptivity into business patterns and help optimize business operation strategies.
7. To produce a stoner-friendly interface that allows easy installation and conservation of the system, with minimum tackle and software conditions.

Overall, the design aims to address the need for an effective and accurate system to cover business inflow, give precious perceptivity, and optimize business operation strategies, using computer vision ways and machine literacy algorithms.

Research Scope

The exploration compass for vehicle discovery and counting using OpenCV can include a wide range of motifs and areas of disquisition. Some implicit exploration areas include

1. Algorithm development Developing and optimizing computer vision algorithms for vehicle discovery and counting in different lighting conditions, camera placements, and business scripts.

2. Detector emulsion Integrating multiple detectors similar as cameras, lidar, and radar to ameliorate the delicacy and trustability of vehicle discovery and counting systems.
3. Machine literacy probing the use of machine literacy ways similar as deep literacy to ameliorate the delicacy and speed of vehicle discovery and counting algorithms.
4. Real- time processing Developing and optimizing algorithms and tackle for real- time processing of videotape aqueducts for accurate and effective vehicle discovery and counting.
5. Performance evaluation assessing the performance of vehicle discovery and counting systems under different conditions, similar as different business scripts, lighting conditions, and camera placements.
6. Deployment and integration probing the deployment and integration of vehicle discovery and counting systems with being business operation structure, similar as business lights and road detectors.
7. sequestration and security Addressing sequestration and security enterprises related to the collection and storehouse of vehicle data, and developing styles to cover sensitive information.

Overall, the exploration compass for vehicle discovery and counting using OpenCV is broad and multidisciplinary, and offers openings for invention and enhancement in a range of areas.

IV. METHODOLOGIES

The following methodologies can be used for the Vehicle Discovery and Counting design using OpenCV 1. Image Acquisition The videotape sluice of the designated area can be acquired using cameras, drones, or other sources. 2. Pre-processing The acquired videotape data can be pre reused to remove noise and reduce the goods of lighting and rainfall conditions using ways similar as thresholding, background deduction, and morphological operations. 3. Object Discovery Traditional computer vision ways similar as figure discovery, blob discovery, and point birth can be used to descry and detect vehicles in the pre-processed videotape frames. 4. Object Tracking A Kalman sludge can be used to track the detected vehicles across frames to insure accurate counting and reduce false findings. 5. Vehicle Bracket Machine literacy algorithms similar as Support Vector Machines(SVM) or Convolutional Neural Networks(CNN) can be used to train a classifier to separate between different types of vehicles and distinguish them from other objects similar as climbers and bikes. 6. Counting The system can count the number of vehicles passing through the designated area by keeping track of the detected and tracked vehicles over time. 7. stoner Interface A stoner-friendly interface can be developed to display the real- time videotape sluice, vehicle discovery, and counting results. Overall, the methodology for the Vehicle Discovery and Counting design using OpenCV involves a combination of traditional computer vision ways and machine literacy algorithms to directly descry, track, and classify vehicles passing through a designated area in real- time

Features

The features of the Vehicle Discovery and Counting design using OpenCV can include 1. Real- time vehicle discovery and counting The system can directly descry and count the number of vehicles passing through a designated area in real- time. 2. Vehicle bracket The system can separate between different types of vehicles, similar as buses , exchanges, and motorcars, and distinguish them from other objects similar as climbers and bikes. 3. Accurate shadowing A Kalman sludge can be used to directly track vehicles across frames and reduce false findings. 4. Scalability The system can be designed to be scalable to handle varying business consistence and suitable to work with different camera configurations. 5. minimum tackle and software conditions The system can be designed to work with minimum tackle and software conditions, making it easy to install and maintain. 6. stoner-friendly interface A stoner- friendly interface can be developed to display the real- time videotape sluice, vehicle discovery, and counting results, making it easy to use. 7. Valuable perceptivity The system can give precious perceptivity into business patterns and help optimize business operation strategies. Overall, the Vehicle Discovery and Counting design using OpenCV offers features that can give accurate, effective, and scalable business monitoring, furnishing precious perceptivity into business patterns and optimizing business operation strategies.

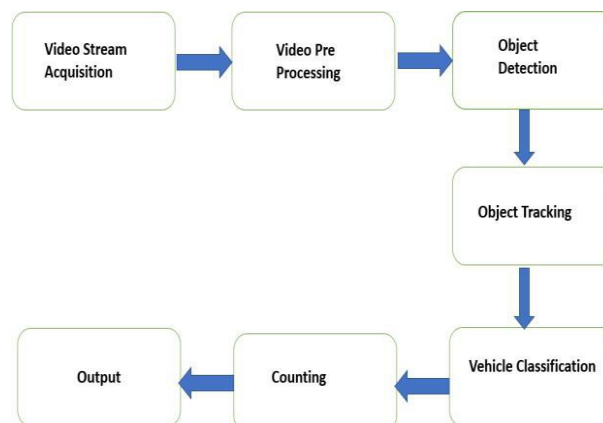
V. CHALLENGES AND LIMITATIONS

There are several challenges and limitations associated with vehicle discovery and counting using OpenCV, including .

1. Lighting conditions Vehicle discovery and counting systems may face challenges when operating under different lighting conditions, similar as low- light conditions or light from the sun. These conditions can affect the delicacy of vehicle discovery and counting.
2. Occlusion Vehicles may be incompletely or completely clotted by other vehicles or objects, which can make it delicate for the system to directly descry and count them.
3. Vehicle speed High- speed vehicles can be challenging to descry and count, as they may only be in view of the camera for a short period of time.
4. Camera placement The placement of cameras can impact the delicacy of vehicle discovery and counting, as cameras placed at angles or heights that don't give a clear view of the road may miss vehicles or count them incorrectly.
5. Vehicle size and shape Vehicles come in different sizes and shapes, which can make it challenging for the system to directly descry and count them.
6. Real- time processing Real- time processing of videotape aqueducts can be resource-ferocious, and may bear high performance tackle to achieve accurate vehicle discovery and counting.
7. Environmental factors Weather conditions similar as rain, fog, or snow can affect the delicacy of vehicle discovery and counting, as can other environmental factors similar as dust or debris on the road.

Despite these challenges and limitations, OpenCV- grounded vehicle discovery and counting systems can still give precious perceptivity into business patterns and vehicle geste , and can beuseful for a range of operations, including business operation and safety

VI. DATA FLOW DIAGRAM



VII. CONCLUSION

In conclusion, vehicle discovery and counting using OpenCV is a precious technology that can give important perceptivity into business patterns and vehicle geste

By using computer vision ways, OpenCV- grounded systems can directly descry and count vehicles in real- time, furnishing precious data for a variety of operations, including business operation, safety, and planning. still, there are several challenges and limitations associated with this technology, including lighting conditions, occlusion, camera placement, vehicle speed and size, real- time processing, and environmental factors. These limitations must be taken into account when designing and enforcing OpenCV- grounded vehicle discovery and counting systems. Despite these challenges, OpenCV- grounded vehicle discovery and counting systems continue to be an important tool for business operation and safety, and ongoing exploration and development in this field will probably lead to farther advancements in delicacy, trustability, and effectiveness.



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