Electronic Toll Collection System Based On Computer Vision

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Abstract— India is a nation where we get the chance to watch most broad National parkways. The private office required in the assembling of the foundation is allowed to charge residents. The conditions of clog and wastefulness incited government to plan and actualize Electronic Toll Collection (ETC) framework which can expel out these issues and encourage accommodation for all who required during the time spent toll gathering straightforwardly or in a roundabout way. And so forth frameworks are planned and created to coordinate in the operations of toll administration using innovation. These frameworks accumulate information on the premise of movement, and after that they will arrange the vehicles and gather the normal measure of charge. Interstates, roadways and streets are getting packed because of increment in number of vehicles. Vehicle discovery, following, order and checking is vital for military, non military personnel and government applications, for example, parkway observing, movement arranging, toll gathering and activity stream. For the activity administration, vehicle discovery is the basic stride. Some of these incorporate Manual toll accumulation, RF labels, Barcodes, Number plate acknowledgment. Every one of these frameworks have disservices that prompt a few blunders in the relating framework. The proposed framework plans to outline and build up another proficient toll gathering framework which will be a decent minimal effort elective among every single other framework. PC vision is an imperative field of counterfeit consciousness where choice about true scene having high dimensional information is taken. The general strides utilized as a part of this procedure are procuring, handling and investigating the picture and change over it into numerical or typical frame. It is utilized to comprehend the scene electronically and the procedure is identical to the capacity of human vision.

Keywords— Toll Collection System; Vehicle Detection; Computer Vision; Open CV; Background Subtraction; Kalman Filter

1. INTRODUCTION

India is a nation where we get the opportunity to watch most broad National interstates. Government designs different stages to finish the undertakings under development. The administration consents to arrangement with the privately owned businesses who manufacture the framework like street, port and other stuff for a specific traverse of time by and large in years. The contributed sum is charged from the vehicles passing on that recently constructed parkway. This charged sum is called as toll impose. Individuals must choose between limited options to pay for toll charge for utilizing the foundation. The private organization required in the assembling of the foundation is allowed to charge subjects. PC vision is an imperative field of counterfeit consciousness where choice about true scene having high dimensional information is taken. The general strides utilized as a part of this procedure are procuring, handling and investigating the picture and change over it into numerical or typical frame. It is utilized to comprehend the scene electronically and the procedure is identical to the capacity of human vision.

The numerical or typical data of a scene is chosen in light of the suitable model developed with the help of protest geometry, material science, measurement, and learning hypothesis. The scene under thought is changed over into the image(s) or the video(s), involving many pictures, utilizing camera(s) concentrated from various areas on a scene. The different vision related ranges, for example, seen recreation, occasion discovery, video following, question acknowledgment, protest posture estimation and picture reclamation are considered as subareas of PC vision. Additionally, different fields, for example, picture handling, picture investigation and
machine vision are likewise firmly identified with PC vision. The systems and uses of different above said zones cover with each other. In addition, the strategies utilized as a part of every one of these zones are pretty much indistinguishable. The distinction in names just lies on the applications where the methods are connected.

Picture preparing and picture examination the two manages 2D pictures. In picture handling a picture is changed into another by applying a few operations, for example, differentiate upgrade, edge location, commotion expulsion and geometrical changes. The picture substance are not translated in picture preparing while in PC vision the elucidation of pictures is made in view of the properties of the substance they contain. PC vision may incorporate examination of 3D pictures from 2D.

I. LITERATURE SURVEY

Dhanya et al [2] built up a PC vision framework for identifying and following the moving vehicle at day time and evening. To begin with the recordings are changed over into edges and foundation and forefront of the picture are recognized. The fog light and the taillight of the vehicle is utilized for recognizing and distinguishing the vehicle, after that picture division and example examination strategies are connected. A quick splendid question is recognized and characterized spatial grouping.

Mishra et al [3] build up a calculation for recognition and characterization of vehicle in heterogeneous activity. The whole procedure is partitioned into four stages i.e. camera alignment, vehicle identification, speed estimation, and arrangement. Vehicle identification is conveyed utilizing foundation subtraction and blob following strategies. Speed of the vehicle is ascertained by utilizing begin and stop marker and adjustment parameter. Characterization of vehicles relies on the different elements of the recognized vehicles. These components give the contribution to SVM for grouping. A non-straight piece is utilized as the classifier.

Chaoyang et al [4] perceives logos in video stream continuously. Another system is created that joins both coarse format coordinating methodology and combine savvy learning strategy together. The logo acknowledgment ends up plainly viable and effective by wiping out the false alerts and further refines the acknowledgment comes about. Picture arrangement for layout coordinating enhances the dependability of the coarse stage. Exploratory outcomes demonstrate that this approach beat the DOT coordinating methodology and conventional numerous classifiers mix.

Daigavane et al [5] built up an application in light of neural system for vehicle discovery and grouping. This framework recognizes and orders the vehicles with their prosperity rate 90%. Vehicle are followed by utilizing blob following technique and neural systems arrange these vehicles on the premise of length and tallness There have been situations where the framework can’t do the characterization accurately. At the point when numerous vehicles move together, with roughly a similar speed, they have a tendency to get assembled together as one vehicle. Likewise, the nearness of shadows can make the framework characterize vehicles erroneously.

Chen et al [6] examine the viability of cutting edge grouping calculations to sort street vehicles for an urban movement checking framework utilizing a multi-shape descriptor. The examination is connected to monocular video gained from a static post mounted street side CCTV camera on a bustling road. These are utilized to characterize the articles into four fundamental vehicle classes i.e. auto, van, transport and bike. Picture investigation for vehicle grouping can be by and large ordered into three standard methodologies: demonstrate based characterization, Feature based arrangement and Measurement based grouping. Various trials have been directed to think about help vector machines (SVM) and irregular woodlands (RF) classifiers.

M et al [8] built up a framework SCOCA, for tallying and ordering vehicles consequently. The point is to gather information for factual reason. The activity information are extractor by introducing CCTV cameras on a pool. Subsequent to recognizing the scene, the second step is protest parameter extractor. The philosophy utilized for following a question is show based, locale based, form based and include based. The question properties decided are class, speed and way. The model based characterization is utilized. The SCOCA framework works continuously at 25 outlines for every second. A different test has been conductor to quantify the execution of second mark cycle, cruiser classifier in light of SVM (Support Vector Machine) classifier systems (189 vehicles, 45 bikes, 144 bikes separated from two video groupings. The classifier gives a normal blunder rate 6.7%.

Betke et al [10] portrayed a continuous vision framework that breaks down shading recordings taken from a forward-looking camcorder in an auto driving on a thruway. The framework is a mix of shading, edge, and movement data to perceive and track the street limits, path markings and different vehicles out and about. Autos are perceived by coordinating layouts that are trimmed from the information on the web and by recognizing interstate scene includes and assessing the way they identify with each other. Autos are additionally recognized by transient differing and by following movement parameters that are run of the mill for autos. The framework perceives and tracks street limits and path markings utilizing a recursive slightest squares channel. Trial comes about show powerful, constant auto location and following more than a great many picture outlines. The information incorporates video taken under troublesome perceivability conditions.

II. VIDEO ANALYSIS / VIDEO INTERPRETATION
This miniaturized scale show comprises of a water compartment, an electronic circuit, an Arduino board, an Access Point, a portable PC, and an advanced mobile phone. It is helpful to utilize a programmed level estimation and remote information transmission, associate the gadget to a server. Video investigation is the procedure in which a video is naturally examined to recognize and decide the transient and spatial occasions. In video examination a few calculations are actualized as programming on general machine or as equipment in video handling units. In video investigation the video movement discovery, video following, foundation deliberation, conduct examination and circumstance mindfulness are the principle factors. Video elucidation is a video media transmission benefit that utilizations gadgets, for example, camcorders or videophones to give communication via gestures or talked dialect deciphering dialect. This is done through the remote or offsite translator, keeping in mind the end goal to speak with whom there is a correspondence hindrance. Video translator encourages correspondence between the members who are found together at the other site. They are conveying by utilizing earphones or mouthpiece. Question distinguishing proof is a procedure where personality of a protest under thought in a scene is made. It might incorporate the distinguishing proof of an individual, creature, winged animal, vehicle, tree, waterway and so on. The given scene is changed over into a picture utilizing picture catching gadget and some pre-preparing systems are connected on it to change over it to covet shape. If there should arise an occurrence of substance based translation littler districts of interests (ROI) are separated from pictures utilizing straightforward and quick figuring methods. These ROI are additionally examined by more computationally requesting systems to deliver a right translation.

Vehicle identification and classification system (VICS)

The VICS system for identification and classification of The VICS framework for distinguishing proof and characterization of moving vehicles out and about from the recordings is an awesome significance today. In India the activity related data are accumulated physically. One of the easy approach to trade data identified with movement between various PCs by utilizing system which is useful for settling on numerous sort of choice identified with activity administration. A VICS framework can recognize and arrange vehicles on the premise of street side recordings. AVICS framework is useful for activity control and gathering measurements information identified with vehicles which are useful for taking numerous choice. Various vehicle ID and characterization frameworks have been produced by different conspicuous creators however 100% precision is not accessible. In VICS framework, vehicle distinguishing proof and order should be possible in two ways on the web and disconnected. In disconnected framework, the recognizable proof and arrangement of vehicles is done from the recordings identified with the activity though in online framework, the pictures are caught by CCTV camera introduced out and about side and the framework distinguishes and groups the vehicles specifically from that video(s).

Vehicle recognizable proof and order framework (VICS) is wise vehicle acknowledgment framework used to oversee activity on streets. There is desperate need of observing and controlling activity on street utilizing proficient and viable practical strategy. In VICS the pictures of the vehicles are caught utilizing a camcorder introduced on street side. In VICS the choice might be made on the premise of a solitary camera on one side or numerous cameras introduced at various areas at specific edge contingent on the necessity and level of refinement of the framework. The video are changed over into shots and edges, at that point highlights extraction and order strategy are connected to distinguish and group the vehicles. General strides in video based vehicle distinguishing proof and grouping framework, and related applications.

III. EXISTING SYSTEM

Manual Toll Collection

This is not fitting technique for toll gathering as it exceptionally tedious. This strategy causes moderately long measure of holding up time at toll corner. Vehicles need to stop until the point that their turn comes. It requires toll gatherer for working. Authority arranges vehicles, produces receipts with printer and after that gives that receipt to vehicle proprietor. In this procedure takes noteworthy measure of time as there is a great deal of human mediation included.

Other ETCs

And so forth remains for Electronic Toll Collection. Presently a-days different ETC methods are coming in picture. They are utilizing distinctive advancements to support better toll gathering. They are essentially attempting to maintain a strategic distance from manual
mediation at toll square. Some of them depend on complex picture handling calculations like programmed number plate acknowledgment. Some are utilizing Barcodes, RFID labels and so on discovery and it extremely helpful for continuous picture preparing.

**Type Classification and Toll Estimation**

Sort characterization depends on parameters that are separated from discovery and relying on their qualities vehicle is arranged conceivable parameters for usage are length of vehicle, remove between two wheels of vehicle, range possessed by vehicle in picture. The more exact parameter can be utilized for execution with relating to its requirements.

**V. PROPOSED SYSTEM**

Proposed framework depends on vehicle identification Uses Open CV libraries with inserted Linux stage for execution. Reaction time is speedy and it is more affordable, more handy, and more proficient than some other framework. What's more, with this usage it is likewise conceivable to tally number of vehicles going through toll corner. Contingent upon the zone involved by the vehicle, grouping of vehicles as Light and overwhelming is finished. Facilitate this data is passed to the Raspberry pi which is having web server set up on it. At the point when raspberry pi comes to know the vehicle, at that point it get to the web server data and as per the sort of the vehicle, proper toll is charged.

**A. Embedded Linux**

Quantities of business OSs are accessible, yet utilizing Embedded Linux is more useful as it is open source, steady and dependable, with expansive equipment support and direct necessity of assets. It likewise has fantastic advancement instruments, group bolsters. Linux is getting enormous fame since it's open source and some different components like security, versatility, cost, heartiness, rate of improvement. These elements can be utilized as a part of implanted application to make great quality and ease item. There are loads of advancement sheets accessible out there in inserted advertise. Raspberry Pi is one of the famous implanted Linux based improvement sheets.

**B. Raspberry pi**

The Raspberry Pi is a Mastercard estimated single-board PC created in the UK by the Raspberry Pi Foundation with the aim of advancing the educating of essential software engineering in schools. It is the center of the entire framework. The employment of Raspberry pi in this framework is handling expansive amounts of information and furthermore it will keep nitty gritty log of vehicles which are in the framework. The Raspberry Pi is a decent decision for a web server that won't get excessively activity and just uses around 5 Watts of energy.

**C. Monitor**

Raspberry pi has one HDMI port with the goal that we can associate it to the screen which is having HDMI link. It is utilized to show Graphical User Interface (GUI) of raspberry pi. Likewise it is utilized to check the data rundown of toll gathered vehicles. It will help manager to check whether toll assess is entered effectively or not.

**D. Camera**

In this venture we need to utilize high picture catching computerized camera to get the reasonable pictures of vehicles. For functional reason, we have utilized after camera only for show.

**E. Video Subsystem Design**

Vehicles identification must be appropriate to various ecological conditions like light, brilliance, movement status evolving and so on. In our proposed framework, while performing tests we have made a constant situation. The vehicles are proceeding onward the thruway and a camera introduced on a toll stall survey is looking down on the activity scene. This camera catches pictures of vehicles and gives to the framework. These pictures are only the edges changed over from the video by the framework.

Further, the framework comprises of three phases:

1) System Initialization: In the main stage, framework gets introduced by camera set up. Camera records nonstop stream of video information and sends persistent edges to the framework for examination.

2) Background Subtraction: Background Subtraction is performed on the picture outlines by utilizing Kalman channel calculation. In picture handling, Kalman channel can be actualized in different courses for various picture preparing applications..

3) Vehicle Detection: In last stage, some morphological operations are performed on the outcome to get the vehicles recognized and followed effectively.
The proposed framework works continuously camera mode. Constant camera mode application acknowledges the video from the camera and tracks the vehicles. This framework can likewise make the most of to moving vehicles from pre-recorded recordings or put away recordings by utilizing a similar calculation.

An arrangement framework like the one proposed here can give essential data for a specific outline situation. This framework utilizes a solitary camera mounted on a post, looking down on the activity scene at toll corner. It can be utilized for identifying and ordering vehicles in other diverse situation like various paths and for any course of movement stream. For such execution, we simply need to give settings, for example, camera alignment parameters and bearing of activity for instatement.

IV. CONCLUSION

The procedure which is utilized for usage is extremely effective and more achievable than some other techniques for toll estimation. With respect to improvement Embedded Linux framework is utilized, preparing velocity will be quick. Also, reaction time is less which is the uncommon parameter about the framework. Then again, OpenCV assumes exceptionally critical part for vehicle discovery. It has got libraries which can be utilized for vehicle recognition and further one can stretch out its utilization as indicated by prerequisites. At the toll gathering stall, real undertaking of toll accumulation will be finished with less human endeavors. This thought gives more affordable toll accumulation framework idea. Additionally the framework is straightforward to proper toll accumulation and gives unwavering quality that it can work in unfavorable climatic conditions too.

This innovation will be utilized effectively on various toll stall. The real issues like blockage of movement, measure of time at toll square will be decreased essentially. The more work ought to be done on time of execution of introduced framework.

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