Report of Industrial Training

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Submitted by

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BACHELOR OF TECHNOLOGY
IN
ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
MANIPAL INSTITUTE OF TECHNOLOGY
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CERTIFICATE

This is to certify that the industrial training report submitted is a record of the bonafide work done by **SUYASH BHATT** (*Reg. No. 170906140*) in partial fulfilment of the requirements for the award of the Degree of Bachelor of Technology in Electrical and Electronics Engineering of Manipal Institute of Technology Manipal, Karnataka, (A Constituent College of Manipal Academy of Higher Education).

Coordinator Industrial Training

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ABSTRACT

Video surveillance systems offer fast practical data leading to smooth traffic flow and increased safety.These system center around background modelling ,moving object classification and its tracking.The target is to spot and count number of vehicles on the road in order to reduce complexity at traffic intersections.It will facilitate sleuthing congestions,traffic signaling and diverting according to number of vehicles.

The present formula of counting vehicles in an image sequence for traffic are captured by a stationary camera.Initially a videoclip is scanned and decomposed into number of frames and hence,a background image is formed.Then we have got to spot the foreground dynamic objects.Then the frame consisting of solely dynamic objects is obtained and born again into a binary image.The presence of an object is indicated in white color using morphological techniques.A counting algorithm to count the number of vehicles.The entire programming is carried out in MATLAB.

A system has been developed to sight and count dynamic vehicle on the highway with efficiency.The system effectively combines straightforward domain information about classes of vehicle with time domain applied mathematic measures to spot target vehicles within the presence of partial occlusion and ambiguous poses,and also background cluttering is effectively neglected.The experimental results show the accuracy of vehicle counting was over 90 percent though vehicle detection was nearly 100 percent that is attributed towards partial occlusion.Since the success of the project rely upon providing a correct line of sight for the camera view ,placing the camera on the overhead bridge directly above the flow of traffic route was necessary to attenuate the vehicle occlusion.

Several future enhancement are often created and added to the system.Detection,pursuit and counting of vehicles is often extended to realtime live video feeds.Apart from detection and extraction, recognition of vehicle can also be done.By using recognition techniques,the vehicle in question are often classified.Recognition technique would need a further info to match the given vehicle.The system is meant for detection and pursuit also counting of multiple moving vehicles.

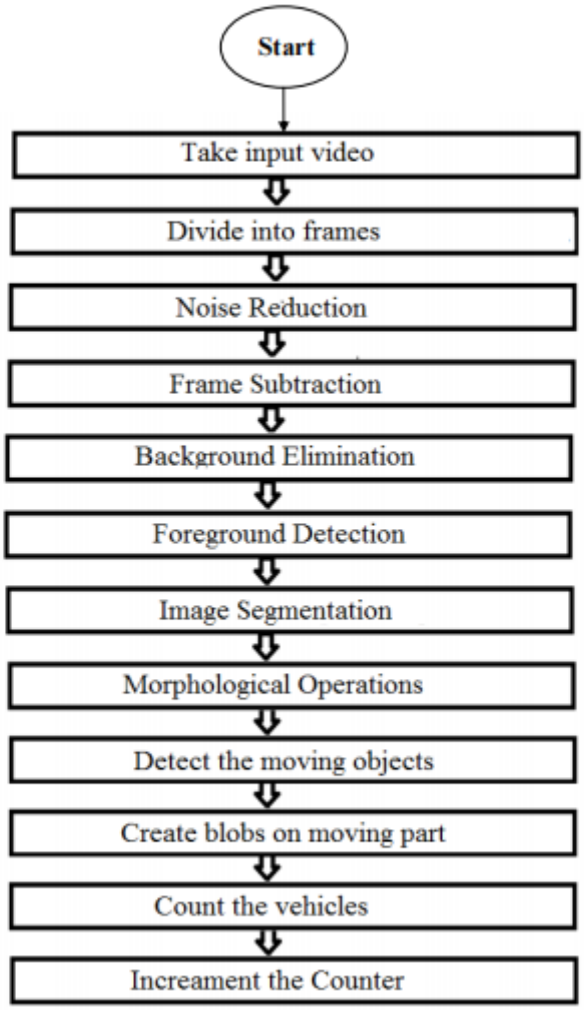
1.INTRODUCTION

1.1 *INTRODUCTION*

Traffic management system now a days uses traditional sensors to detect traffic parameters .As of now ,magnetic loop detectors are used in order to detect vehicles passing over them .Here we are working on a vision based system which has infinite advantages.Along with counting of vehicles,another large set of data can also be derived and it is easier to install when compared to magnetic sensors.Many problems arise as a result of increased vehicle traffic.Traffic accidents,congestion,traffic induced air pollution are just a tip of the ice berg .We have begun to realize that just increase of preliminary transport infrastructure ,wide roads and more pavements have not proved to be effective against congestion.Vehicle detection and investigation is very important in computing tie up on highways. The main goal Vehicle detection and investigation in traffic video project is to develop methodology for automatic vehicle detection and its hoping on highways. A system has been developed to notice and count dynamic vehicles with efficiency. Intelligent visual police work for road vehicles may be a key part for developing autonomous intelligent transportation systems.The entropy mask methodology doesn't need any previous data of road feature extraction on static pictures detection and pursuit vehicles in police work video that uses segmentation with initial background subtraction victimization morphological operator to see salient regions in a sequence of video frames. Edges ar be investigation that shows what number aras are of particular size then specific to automobile areas is find the points and investigation the vehicles within the domain of traffic observation over highways.

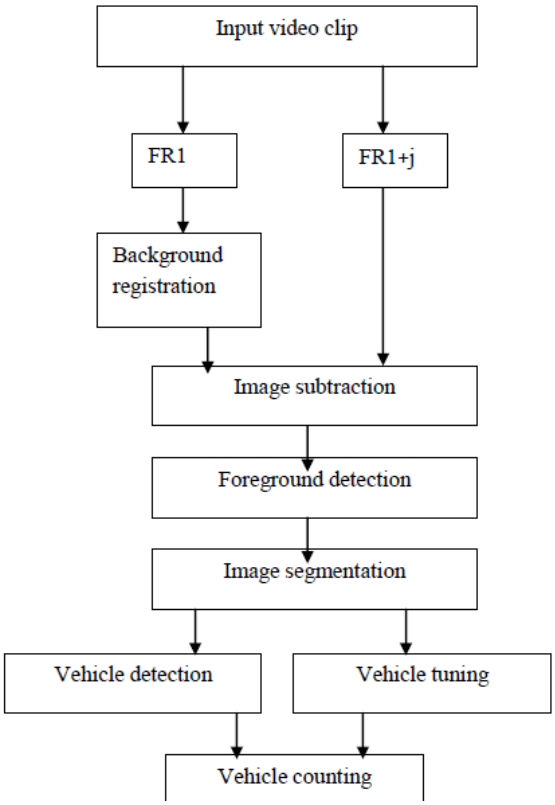
Automatic police investigation and pursuit vehicles in video police work information could be a terribly difficult problem in pc vision with necessary sensible applications, like traffic analysis and security. Video cameras area unit a comparatively cheap police work tool. Manually reviewing the large amount of knowledge they generate is usually impractical. Thus, algorithms for analyzing video which need very little or no human input could be a smart resolution. Video police work systems area unit centered on background modeling, moving vehicle classification and pursuit. The increasing availableness of video sensors and high performance video process hardware release exciting potentialities for grappling several video understanding issues, among that vehicle pursuit and target classification area unit vital. A vehicle pursuit and system is delineated together that can reason moving vehicles and more classifies the vehicles into varied categories.

FLOWCHART



Traffic management and data systems rely chiefly on sensors for estimating the traffic parameters. additionally to vehicle counts, a way larger set of traffic parameters like vehicle classifications, lane changes, etc., will be computed.Vehicle detection and count uses a single camera mounted typically on a pole or alternative tall structure, trying down on the traffic scene. The system needs solely the camera standardisation parameters and direction of traffic for initialization.An correct estimation of car densities is taken into account as a major issue for managing traffic operations in urban zones. Traffic info includes vehicle enumeration, speed measurements, determination of peak hours, number of pedestrians, etc.. massive cities typically don't have issues deed such info, as a result of they need Associate in Nursing adequate infrastructure to get it like police work cameras throughout the town, speed check points and continuous vehicle enumeration. However, in smaller cities, while not such infrastructure or perhaps Associate in Nursing allotted budget, traffic information ought to be earned during a manual manner or by adapting accessible technology. Typically, vehicle enumeration is achieved by exploitation completely different techniques, like manual counts, gas tubes, magnetic sensors, inductive loops, electricity sensors, acoustic detectors, passive infrared, physicist and radiolocation microwave sensors .

However, device measurements exhibit estimation errors, and typically, gift difficulties to install and/or stay mounted. For optimizing vehicle enumeration,
automatic video-based pursuit systems square measure recommended . The system detects and tracks vehicles whereas they submit to the camera, providing info such as
vehicle count, average speed, or traffic congestions . to attain it, Associate in Nursing formula should be created that segments and tracks the vehicle movements at
intervals the video . Although automatic vehicle enumeration code exist already, and a few of them use the Kalman filter , their price is elevated, and in some cases,
could also be preventive . another vehicle enumeration tool for low budget conditions is projected, that involves video-image process with the Kalman filter in Matlab.



1.1 Algorithm

In this project we will try to see what goes behind vehicle detection and its counting and mathematics involved in it.
Imread() reads a grayscale or color image from the file given by the string computer filename. If the file isn't within the current folder, or during a folder on the MATLAB path, specify the complete pathname.In this module we have a tendency to get 2 input image one is that the image with vehicles and therefore the different could be a background image while not vehicles in it. Rgb2gray() converts each picture or the photograph to grey images. Convert each the images into grey level by victimisation double exactitude. Set threshold value=11, notice the distinction between the 2 pictures by victimisation abs() [absolute], abs will facilitate notice absolutely the between the 2 images. If the distinction between the 2 pictures is larger than the

threshold price of eleven then those are displayed as blobs at the output. imageadjust(imadjust()) accustomed change the image intensity values to the color map. graythresh() accustomed set an acceptable grey threshold price for the output image. Add mathematician noise to the output image and filter it victimisation wiener filter. Convert image to binary and fill holes if necessary. Open blobs of area larger than 5000, this may facilitate notice vehicles. Count the no of blobs by victimisation the quantity of blobs gives the quantity of vehicles gift within the image. From the count the density of traffic will be calculable.

2. METHODOLOGY

2.1 BACKGROUND DETECTION

To extract stable background image, adaptive background detection technique was used. This method uses average of pixels
inside a variety of frames to observe the background. If the variance of a given component is below a predefined threshold,
then the component is taken into account to be stable. The background image is updated in line with the equation given below.

$$B_{t+1} = B_t + S_t \times M_t$$

Here, Bt is previous background image, St may be a mask which varies between zero and one looking on the variance and Mt is average of pixels.

2.1 Foreground Detection

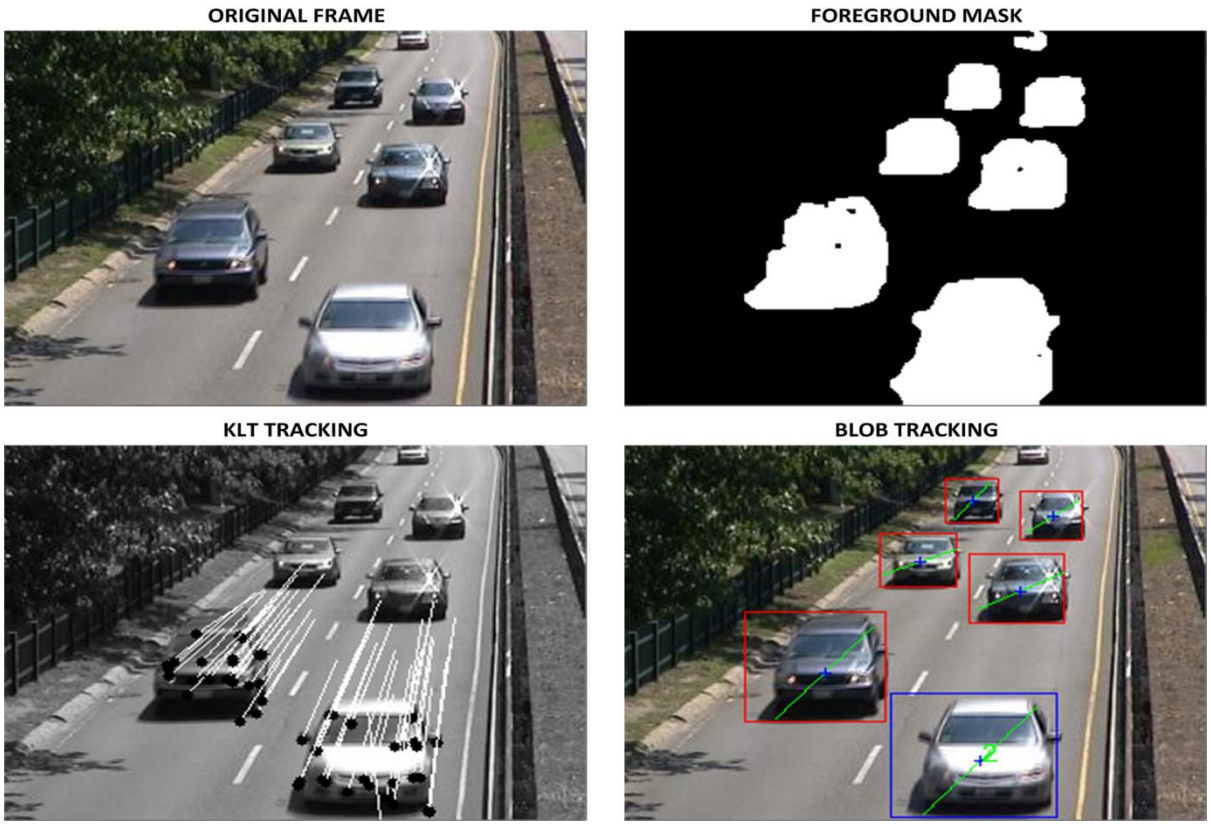
(a) Input image

(b) Foreground image

(c) Occlusion image

Moving vehicle detection is in video analysis. It is employed in several regions like video police investigation, traffic watching and other people following. there square measure 3 common motion segmentation techniques, that square measure frame distinction, entropy mask and optical flow methodology. Frame distinction methodology has less machine complexness, and it's straightforward to implement, but generally will a poor job of extracting the entire shapes

of sure kinds of moving vehicles. Adaptive background subtraction uses this frame and also the reference image. Difference between this frame and also the organisation is higher than the brink is considered as moving vehicle. Optical flow methodology will discover the moving vehicle even once the camera moves, however it wants longer for its machine complexness, and it's terribly sensitive to the noise. The motion space typically seems quite screaming in real pictures and optical flow estimation involves solely native computation. that the optical flow methodology cannot discover the precise contour of the moving vehicle. From the on top of estimations, it's clear that there square measure some shortcomings in the traditional moving vehicle detection strategies Frame distinction cannot find the precise contour of the moving vehicle. Optical flow methodology is sensitive to the noise.



2.2 MORPHOLOGICAL IMAGE

2.2 CAMERA CALIBRATION

Camera activity plays a very important role within the identification method. Camera activity is carried out to remodel the image coordinates to world coordinates [5].

this can be essential for the vehicle classification.

it's conjointly necessary if one desires to extract the speed of the vehicles.

during this work following assumptions were taken.

Road is straight Road is flat X axis of the road house correspond to the direction perpendicular to the traffic flow and the Y axis is parallel to the traffic flow.

The transformation that has been allotted from the image house to world house is that the projection transformation.

Assume that the breadth and therefore the length of the chosen space in road house (which ar known) ar w and h severally.

The equation to find the projective transformation matrix that maps the image house coordinates (ax,ay; bx,by; cx,cy; dx,dy)

to their corresponding road house coordinates-

$$\begin{bmatrix} A & B & C \\ D & E & F \\ G & H & I \end{bmatrix} \begin{bmatrix} ax & bx & cx & dx \\ ay & by & cy & dy \\ 1 & 1 & 1 & 1 \end{bmatrix} = \begin{bmatrix} 0 & w & w & 0 \\ 0 & 0 & h & h \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

To optimize the results of projection transformation matrix, technique|statistical procedure} optimisation method was used.

$$\sum_{i=1}^{n} \left(\frac{Axi + Byi + C}{Gxi + Hyi + 1} - ui \right)^2 + \left(\frac{Dxi + Eyi + F}{Gxi + Hyi + 1} - Vi \right)^2$$

2.3 LANE CALIBRATION

Since the goal of the project is to spot the vehicles in every lane singly, the lanes should be defined and therefore the centreline of every lane should be identified. User is allowed to pick out the region of interest by choosing the centre of lanes initial and then the beginning and ending points on every lane to define the chase region. The screen house coordinates were initial remodeled into road house coordinates and so projected onto the lane line.

2.3 LINE CALIBRATION

Vehicles are tracked along the centerline on each lane.

2.4 FOREGROUND DETECTION AND IMAGE SEGMENTATION

Detecting data will use to refine the vehicle sort and conjointly to correct errors that are caused thanks to occlusions. once registering the static vehicles the background image is subtracted from the video frames to get the foreground dynamic vehicles. Post process is performed on the foreground dynamic vehicles to cut back the noise interference

Image segmentation steps as follows:

The segmentation of car regions of interest. during this step, regions which can contain unknown object ought to be detected.

Next step focuses on the extraction of appropriate options then extraction of vehicles. the most purpose of feature extraction is to cut back knowledge by means that of measuring bound options that distinguish the input patterns. the ultimate is classification. It assigns a label to AN vehicle supported the data provided by its descriptors. The investigation is created on the mathematical morphology operators for segmentation of a gray-scale image.

2.5 VEHICLE COUNTING

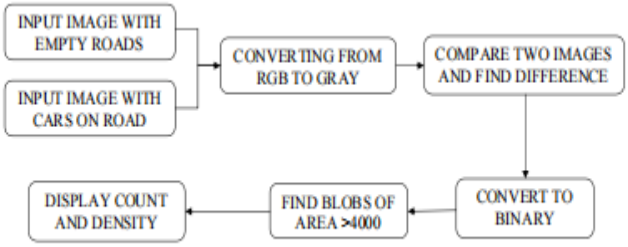
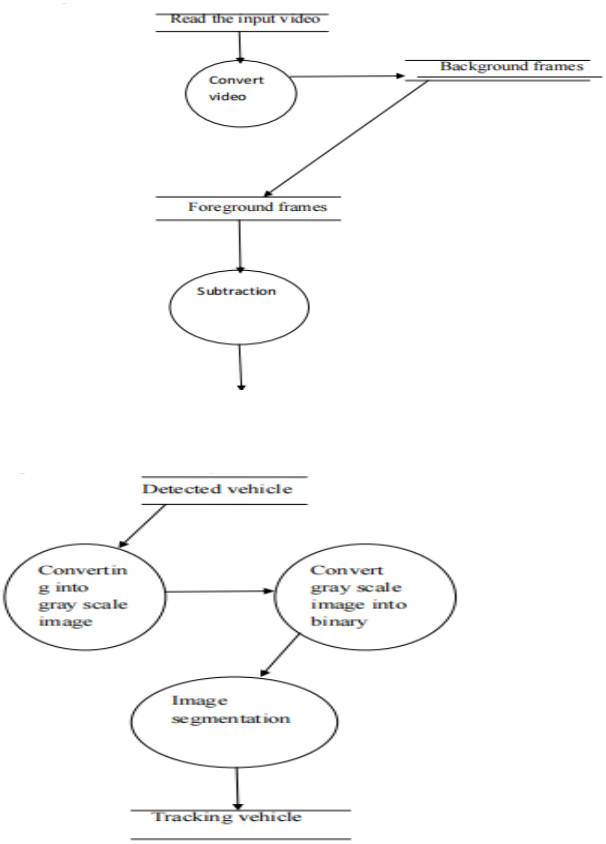


Fig 3.3 Block diagram of the vehicle count

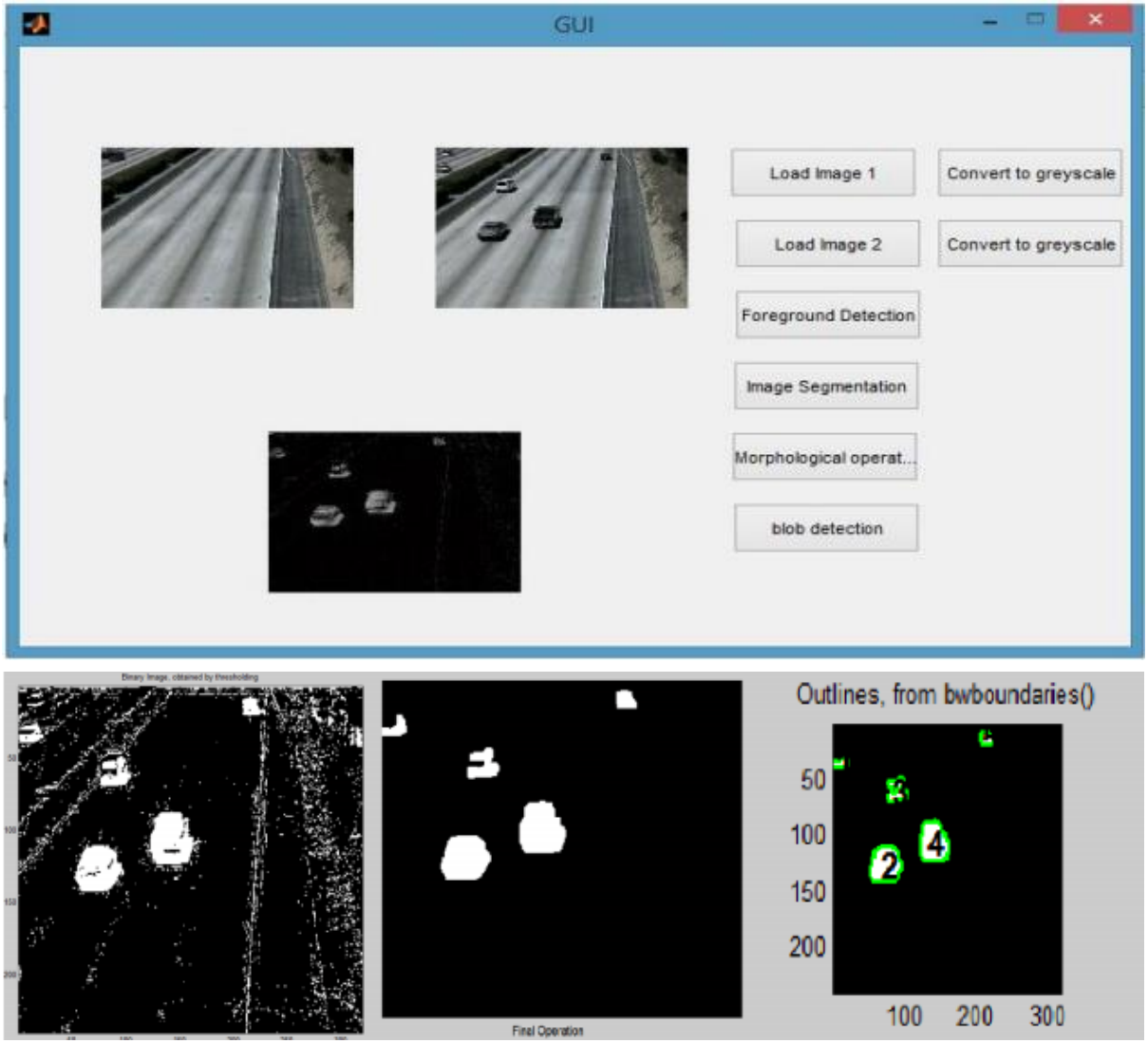
If we look into the video input frame by frame, vehicle investigation 2 input pictures area unit given, one while not cars and the different with cars in it. The input image is then born-again from rgb to grey. Now compare the 2 pictures and notice the distinction. Then the image is converted to binary. The blobs within the image area unit opened once the blob space is greater than 4000. Finally the count and therefore the density area unit displayed.



2.3 FLOWCHART

3. RESULTS

The project uses image processing technique and digital signal processing which is quite unique in itself .This paper can be used Rasberry pie or PIC depending on the requirement of the user.Apart from many other uses,this can be used in catching criminals by tracking down their vehicles using number plate detection,scope of which is outside of this paper.Steps of detection are shown below.



3.1GUI

Number of blobs =5

BLOB	MEAN INTENSITY	AREA	PERIMETER	DIAMETER
1	1.0	179	63.0	15.0
2	1.0	565	130.0	31.0
3	1.0	427	115.0	21.0
4	1.0	1369	149.0	44.0
5	1.0	170	49.0	14.0

AREA USED FOR VEHICLE CLASSIFICATION

Vehicle	Area (pixels)
Small	100-400
Medium	401-700
Big	701-1000

3.2 Vehicle classification

4.SUMMARY AND CONCLUSION

In this project ,I have tried to establish a simple way of counting objects in an image using techniques learned in Application of Digital Signal Processing .The number of objects or blots are obtained which can be used to determine vehicle count.When counting vehicles,the algorithm here can detect number of vehicles accurately including two-wheelers without using any hardware component.An economical alternative to obtain traffic data is using Kalman filter function within Matlab.The algorithm can be adapted according to the requirement of the users also camera positions.I have ,at this stage,processed a video less than 90 seconds to avoid any failure of processor.A more advanced algorithm can help eliminate different kinds of shadows depending upon time of day.A more robust multi core programming allows us to achieve real time performances without any hardware.

Preliminary reports for developing an augmented system for counting and classification of vehicles in motion based on image processing techniques are presented in this paper.The system thus developed was able to track and classify the objects with good accuracy depending on the frame rate of the video. Code is useful for peak hour traffic as only one person needs to execute it. Same program can also be extended to find the correct vehicle count even if the blots are overlapping each other using image segmentation.Same method is used to segregate car,truck bus etc. It is suggested to use a single or maximum three lanes with the camera placed perpendicular to the road.This project can be useful in different domain outputs.The results obtained through the developed system show that with any enhancements it will be used in period of time to count and classify vehicles on busy traffic routes. Especially, if a blocked read of the traffic movement will be obtained, the system can perform quite accurately.

This system has been developed to observe and count dynamic vehicles on highways with efficiency. The system effectively combines straightforward domain information regarding vehicle categories with time domain applied math measures to spot target vehicles within the presence of partial occlusions and ambiguous poses,and therefore the background litter is effectively rejected. The experimental results show that the accuracy of tally vehicles was ninety six, though the vehicle detection was 100 percent which maybe because of partial occlusions. The machine quality of our program is linear within the size of a video frame and

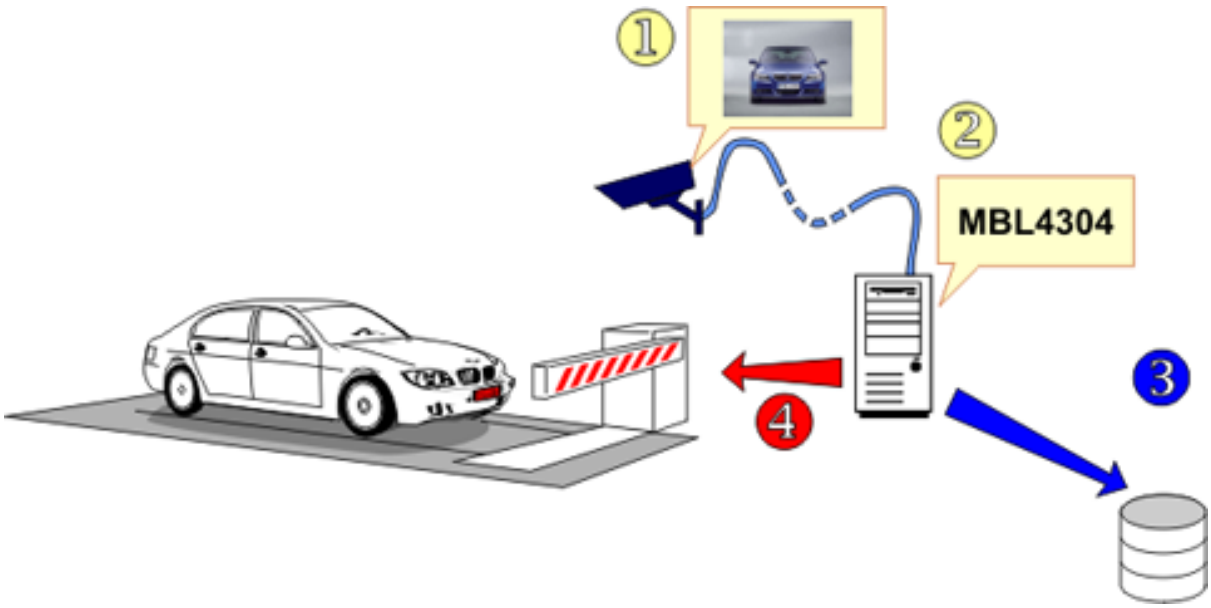
therefore the number of vehicles detected. As we've thought-about traffic on highways there's no doubt of shadow of any solid like trees however generally because of occlusions 2 vehicles are integrated together and treated as one entity.

Counting and classifying vehicles on the highway management and toll collection,it can efficiently calculate traffic conjunction on a busy traffic roads for better monitoring although some work still needs to be done to reduce occlusion in the image. In this case Matlab was used as the preferred software but the same counting application can be made in a simpler manner using image processing software like Python ImageJ etc.

There may be some limitations and drawbacks as no system is perfect .Although this system works with remarkable accuracy ,there may be some limitations to it.For example while reading the blobs,the vehicle closer to the camera may appear to be of larger size when compared to same vehicle when it is far from the camera .This is a challenge as this hinders the accuracy of classification of vehicle .Also it should be noted that camera should be placed perpendicular to the road at a suitable height and not parallel to the road as the algorithm would not work in that case.

5.FUTURE SCOPE OF WORK

Automatic number plate detection is a similar topic which utilises optical character recognition so that vehicle registration plates can be read and vehicle location data can be observed.It will use existing television, road-rule social control cameras, or cameras specifically designed for the task. ANPR is employed by police forces round the world for enforcement functions, together with to examine if a vehicle is registered or licenced. it's additionally used for electronic toll assortment on pay-per-use roads and as a technique of cataloguing the movements of traffic, as an example by highways agencies. Automatic number-plate recognition are often accustomed store the photographs captured by the cameras in addition because the text from the registration code, with some configurable to store a photograph of the driving force. Systems usually use infrared lighting to permit the camera to require the image at any time of day or night. ANPR technology should take into consideration plate variations from place to put. Privacy problems have caused considerations regarding ANPR, like government following citizens' movements, misidentification, high error rates, and multiplied government defrayal. Critics have represented it as a style of mass police work.



5.1 Smart Car Parking

Following is an example of Smart car parking which is an application of ANPR.In the future ,we can witness something truly incredible,a setup outside an office or government building which does not require any security guards,id card etc.When the car enters,the setup detects

number plate and allows or disallows the vehicle and opens the gate accordingly.

5.2 Barricades in the future

Computer Vision and image processing can be further applied for speed measurement along with counting .This system can be made much more robust in varying weather conditions and can work irrespective of time of day.A person sitting in a control room can manage everything without having to physically do anything . Also Artificial Neural Networks can be applied to increase the efficiency of the algorithm.

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