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Multiple Car Detection, Recognition and Tracking in Traffic

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Abstract— **Multiple Car detection, recognition and tracking is one of the most rapidly growing system in image processing used for video surveillance system. This has been designed with an intention to reduce the traffic congestion in highways, decrease street misshape, Identify people in crime scène, reduce road accidents, vehicle theft detection, living zone etc. Detecting the shape of an moving car in a video sequence is very difficult in the present environmental conditions. In order to overcome the effect of this problem, The paper proposed number of methods like video is converted into frames in segmentation then followed by preprocessing and tracking of multiple cars. This paper provides a brief about multiple car detection, recognition and tracking of approaches.**

Keywords— Multiple car, detection, recognition, tracking, background subtraction, foreground, frame differencing, feature extraction, temporal differencing and optical flow, current frames.

I. INTRODUCTION

Information and technology has not only play a significant role in the modern civilization but also created a threat in the field of modern transport system such as increase in number of roads, highways and traffic in each developing nation. The major technique introduced for this purpose is the traffic monitoring and controlling system by a image processing designed to implement the multiple car detection and tracking in traffic. The static camera which is operational for the purpose of traffic surveillance system. It is useful in finding out the variations in effect of illumination, shades and presence of shadow of a moving car. The process of finding multiple cars in a video which is divided into number of frames .The aim of moving car detection, recognition and tracking is the process of determining the foreground image from a background image. Cars are detected by its shapes and recognized it by tracking multiple cars. The various methods proposed forthwith the object of detection and tracking in relation to video surveillance system. They are Image sequence, motion segmentation, preprocessing, background subtraction, clear objects and tracking. All the modules referred to above have been explained clearly in the subsequent text proposed.

II. LITERATURE SURVEY

Sheeraz Memon et al[1]. This paper is designed to implement on python using openCV bindings. This system involves recognition, detection of categorizing the various vehicles in accordance with video frames and differentiate as per the size .In the process of background subtraction which is determined by counting and detecting the vehicles by using Gaussian Mixture Model(GMM).Foreground Extraction method by which background image is subtracted there by clear image of foreground can be obtained and then image enhancement technique which are essential for filtering, dilation and erosion in order to obtain a clear foreground objects. classification is done by two methods. They are Contour Comparison (CC) and Bag of Features (BoF), Support Vector Machine(SVM).

Hongsheng He et.al[2]. This system is a process of obtaining an image through traffic camera in a metropolitan cities. The view points and variations of lighting conditions at a given traffic area which images are captured by cameras are differentiated and rectified as model detectors. In the initial stage, the frame work of cars are first detected and extracted by using part-based model .These model consists of Model initialization, Deformation detector model, root detector and component detector. Feature region rectification is done taking into account of License-plate anchor and Headlamp anchor and finally, vertical and horizontal histograms of texture features. Photometric Feature Extraction is further classified as Illumination Normalization by two columns ,namely first column is obtained in different shades and weather conditions. second column is demonstrated by shadow compensations and histogram equalization. The Car Model Recognition is determined by neural network classifiers.

Ahmad Arinaldi et al[3]. The system has been technically designed for implementation of effective traffic of real time management and also to gather important statics, regarding lane usage monitoring, taking into account ,the classification such as counting ,speed and type of vehicle. This will generally help the regulator and policy makers to quickly respond to traffic situation. In this system two methods are proposed. A pipeline model consists of Gaussian background subtraction in which moving vehicles are detected in video frames. From there area of detection, abounding base of image is formed to classify the type of vehicle. Vehicle classification though this method are cars, delivery cars, trucks, large trucks and buses. The second one is Region Conventional Neural Network(RCNN) is used to classify, bounding box detection are captured in a video frames and tracking can be done on the position of the detected vehicle to get the speed and lane position of the vehicle .

Poonam A. et al[4]. Main proposal put, forth in this paper is to enumerate the importance of accurate and effective moving vehicle by detection methods, projected in a different environmental conditions. The process of detection is subject, to two main applications, appearance based and

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motion based techniques. Visibility such as shape, color and texture of vehicles comprise in appear based technique, whereas motion based technique is the moving characteristics of vehicles from the stationary background image. The system which contains two frames, enabling to differentiate in static and moving positions. Frame differencing is also detecting form the existing object and that, of a moving object in its position. After identifying the two different position in frames. This is to further identify and define the position of objects and its movements. The author is contended that, the outcome of results, after the experimental frame differencing method as draw back because of its changes in contour.

Shiva kamkar et.al[5. A vehicle detection is generally performed based on video monitoring system. By using active base model(ABM)which identified by the candidates in a video frames. These model benefits obtained in form of edge information and candidate template matching and verify it by reflection symmetric metrics, rotating it in a clockwise and anticlockwise direction and its symmetric value. If the condition is correct then, it is treated as accepted or otherwise it rejects. Counting and classification of vehicles are streamlined by using only single counting line. There are two consecutive frames, in which center of each vehicle frame is before and after the line simultaneously and the counting of vehicle is done at this stage. The procedure for a random trained method is used for classification of vehicles. Taking into account, the images of vehicles is calculated and correlated in TSI and that of GLCM matrix are used to train in a RF classification and categorizing as small, medium and large.

A.P.Shukla et.al[6]: An analysis in various techniques of On-Road vehicle System is the main part on motion model technique. Tracking of vehicle detection is applied in the area such as traffic analysis and incident detection and approaches in relation to detection, segmentation and tracking of vehicles. The flow of traffic is considered as very important, for analysis along with background conditions such as road signals, people ,animal, weather conditions etc for a clear cut understanding with a minimal traffic congestion problems. object detection is categories under homogeneous and heterogeneous. The first one is termed as hypothetical synchronized flow of traffic following speed and time, where as second one is termed as unsynchronized and unregulated. Main approaches are put, forth in the detection and segmentation of vehicles are as: background subtraction, feature based method, frame differencing and motion based method. Vehicle tracking is a challenging task to identify the vehicle in its dynamic scene in videos. In order to overcome these obstacle the following tracking methods are proposed. They are region based ,3D model-based, feature based, color and pattern-based method.

Ma'moun Al-Smadi et al[7]. This paper introduces the review of various techniques relating to tracking of vehicles, recognition and its detections used in video based surveillance and monitoring system. Detection based methods are consists of two techniques they are motion based and appearance based techniques. Both these techniques varies with each frames, through the process of adaptive median filter for modeling and feature extracting. classification of appearance type provides a detailed summary of vehicle color, logo ,license plate along with vehicle shape etc. Tracking can be done in three ways model based(multi-view or deformable),region based(shape and contour) and feature based tracking. Finally algorithm techniques are used such as kalam and particle filtering in terms of correspondence matching, filtering estimation and dynamic models.

Margrit Betke et.al[8]The system of movements of vehicles involves, recognizing and matching of cars templates from the input data on live computer. Detecting highways scenes with related comparisons. By using temporal differencing method, cars are detected through motion parameters which are very suitable for this purpose. Boundaries of roads like lane matching are evaluated by using a recursive least filter, in which tracking of vehicles obtained in its various difficulties conditions. Vision system introduced here does not, require manipulation, as tracking and recognizing of cars are done automatically. Process of car detector, boundaries of roads and Coordinator which are the main modules for multiple vehicle detection on the road.

Dipali Shahare et al[9] Moving object detection in the field of modern surveillance system play an important role in detecting the object in video frame based on which automatic analysis is a difficult task in the process of object detection. Optimized process of detecting the moving object has resulted in formulating the improvement of object detection with the model of vehicles in its related speed and rank . Video sequence obtained through a moving camera for the purpose of foreground object ,that of stationery background effect to background subtraction algorithm, are used in monitoring the automatic detection of moving objects in the processing of detecting background, foreground modeling and validation data. In a subtraction method , the color and edge channels are to be separately obtained before the result. The survey conducted in various field revealed that, changes against illumination cannot identified the stationery background objects such as swinging leaves, shadows, rain snows etc., this paper therefore proposes a single process of optimization in which accurate results of identifying the moving object detection.

Dangarwal et al[10]. Main task of moving object detection is to deal with in the of application of wide range of surveillance system, analysis of human motion, traffic analysis security etc., and also discover foreground moving objects in its first appearance or in every video frames. Traditional methods are used for moving objects detections, resulted in background subtraction of obtaining a pixel from the current frame by color map and then if it gets more difference in the threshold value is further considered fore ground model. In order to find out the frame differencing method, the image of moving object is required to be subtracted from previous image frame from the present image frame simultaneously. Temporal differencing method is to detect a clear cut image of a moving object by applying a pixel wise differencing between two frames simultaneously. The method used for optical flow provides complete information about moving object and determine moving object from the background.

Kinjal A Joshi et al[11Tracking mechanism in which detection of an object in the first appearance of the video. Object detection method makes use of temporal information in the form of frame differencing, that high lights the region in consecutive frames the object in the image is the trackers task to perform object from one frame to another. Important methods used for objects detection are as follows.

Background subtraction, foreground detection, pixel level post processing, detecting connected regions and region level pos processing. The techniques used to detect the moving object by the above mentioned methods are background subtraction with the alpha, statistical method, temporal differencing and eigen background subtraction. Different methods adopted here are mainly concerned with tracking of point ,kernel and Silhouette . first one is used estimate the target object by statistical filtering method. second techniques used to mean – shift tracking and filtering in order get a clear target object and finally Silhouette is used evolve the contours by two different methods state space and minimization of energy function.

III. PROPOSED METHODOLOGY

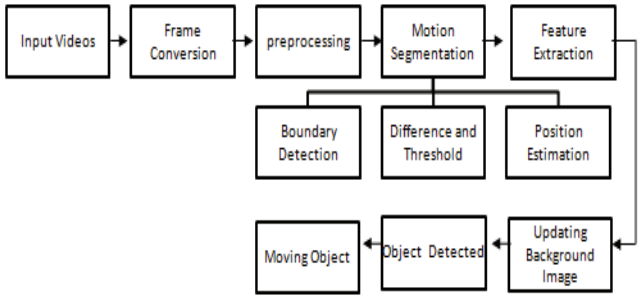

Fig. 1. Architecture diagram for multiple car detection, recognition and tracking

Fig.1.The architecture diagram envisages the importance of multiple car detection, recognition and tracking**.** Input Videos: Sequence of image obtained through a still camera is the input system. when the video is of low resolution, the system does not accept. The image must be a clear and of minimum resolution of 240*320 for the system. Frame Conversion: The video coverage is consists of number of frames. Specifications of the static images in each frame of the video is shown in Fig.2. The identification of object in each frame is done later. A set of fixed frames is processed and obtained dependency on the length of the video.

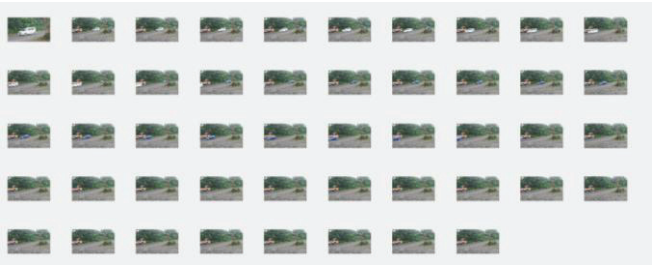

Fig. 2. Frame Conversion

After frame conversion preprocessing is done by using median filter which it reads the frames and all the frames are converted to gray scale images showen in Fig.3.RGB colors are(That is Red,Green and Blue)are defined in order to identify the colors.Axes are formed and handled for the objects.

Fig. 3. Preprocessed Frame.

Motion segmentation represents separating the object of moving car in an image from a static background. Moving object from non moving background, value of pixel play an important role to determine the dynamic movements of images from frame to frame and the movement across the outline of the changed value of the frame for the purpose of segmentation. Motion segmentation can be classified as three different steps. They are Boundary detection, Difference and Threshold and Position Estimation. Boundary Detection: It is the process of finding out the shape of a car and to recognize the edges of a moving car. Difference: Difference between current frames and background frame is taken into account a slightest bit of difference in the region of the moving object. Threshold: It is used to reducing the grey levels in the image and it provides the difference intensities or colors in the foreground and background regions of an image. Position Estimation of a moving car represents the direction in which the car is moving. A technique is used in the background subtraction in the process of image to get an extracted foreground image. The object of interest is considered as foremost important by eliminating the background image. Foreground objects are required to be filtered in order to get a correct impression of differentiation among background and foreground objects shown in Fig.4. and Fig.5.depicts the algorithm for boundary detection .

Feature Extraction: Distinct feature of moving object are in sequence of frames which extracted by shape. Edge detection is considered as very important to identify the car, by its boundaries in image intensities. The color of a vehicle is primarily distinguished between two physical factors namely illuminated and distribution of power and reflection of the properties of an object . The region and area of the image is identified using the blob analysis and noises are removed in order to get a clear foreground objects in Fig6. Here ,the car boundary is clearly detected by removing the extra region around the object.

Fig. 4. Estimated Objects.

```
Step1: Boundary detection(x, y, TraverseList);
Step2: Add the current pixel to Traverse List.
       The current position of pixel is (x, y).
Step3: NewTraverseList=TraverseList+current position(x, y)
       If  pixel at (x-1, y-1) then
       Check if it is not in Traverse List
       Boundary detection(x-1,  y-1,NewTraverseList);
       End  if


       If pixel at (x-1, y) then
       Check if it is not in Traverse List
       Boundary detection(x-1,y+1,NewTraverseList);
       End if

       If  pixel at (x, y+1) then
        Check if it is not in Traverse List
        Boundary detection(x,  y+1, NewTraverseList);
        End if
Step4:Return
```

Fig. 5. Algorithm For Boundary Detection

Fig. 6. Object Detected.

Object Recognition and Tracking is the process of recognizing the moving objects in a sequence of frames and identified the background image by an overlay image and fig7: depicts the algorithm used for recognizing and tracking of cars.

In the initial stage, a background is preprocessed to get the first frame where there is no motion at all. This is further processed by using grayscale filter and a pixelate filter. pixels count are reduced in the process of pixelate filter and to get color distribution of an image. In order to get ,the initial background, an image dimensions are extracted through further process .

A frame is obtained through the above process is called the current frames structure and format of the background image is the same as that of current frame. Identified object that, shows a morph filter in combination of background on overlay images along with the current frame to reduce the background difference, is considered as final in updating the background object. The process of connected component labeling algorithm, is used to get the labeled pixels, which are so arranged in a region of the image to form into an object. Moving of car is appeared in various frames. First frame is retained and considered as original frame, in which a reference is drawn in all subsequent frames and classification of vehicles also appeared simultaneously .As the car moves, tracking of car is do an appearing in a series of frames where the word vehicle is appeared in the classification of screen is considered as object is detected and recognized, till the car moves completely. A clear image of car is thus obtained in a boundary box where, region and area is calculated in the rectangle, based on the vehicle. Then in tracking the type of the object is identified as car and color of the car is finally appeared on the screen shown in Fig.8.

```
Step1: Function Object Recognition (in Image I, in model
 feature data [xM, lM], in distance threshold td, in recognition
 threshold tr, out object position p).
Step2: detect all feature candidates in scene image I : xS, lS
       for i= 1 to number of model features
       for k = 1 to number of scene features
         if  lM, i= lS, k then // features have the same label
           insert new node n (i, k) into graph
         end if
       for a = 1 to number of nodes-1
       for b = a + 1 to number of nodes
Step3: distance between model features of nodes na and nb
dM(a, b)
xM,i(a)
−xM,i(b)
Step4: distance between scene features of nodes na and nb
dS(a, b)
xS,k(a)
 xS,k(b)
       if|dM(a, b) dS(a, b)| ≤ td
         then // dist below threshold connect nodes
         na and nb by an edge e(a, b)
        End if
Step5: find largest clique c in graph G = (N, E)
 nc← number of nodes in c
   if nc≤ tr
     then // sufficient features could be matched perform
     minimization of position deviations
      p← argmin(Ec(p)) // minimization of position deviation
      else
      p← invalid value// object not found
    End if
```

Fig. 7. Algorithm For Recognition and Tracking

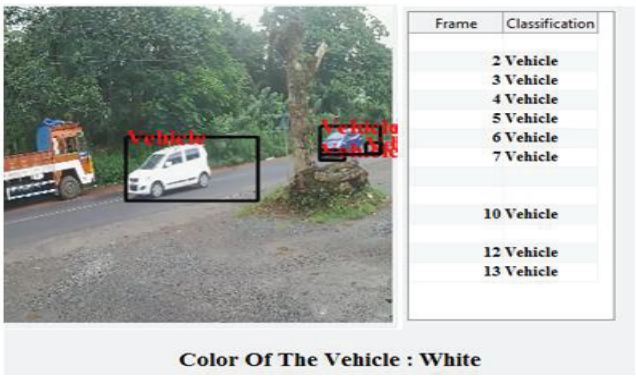

Fig. 8. Tracking

IV. CONCLUSION

Techniques used in this paper is designed to process the tracking of cars, mainly based on the different modules namely conversion of frames, preprocessing, motion segmentation, feature extraction and clear objects and tracking. In the beginning videos is taken as an input to the system which is further converted into a number of frames, then preprocessing is performed by employing a method of gray scale image in order to rectify the color of RGB image,

In the next process, the background subtraction technique is used to get the foreground image. By using blob analysis ,the region and area of the image are identified in clear object ,so that extra noises are removed in foreground object. Location of moving object is done through tracking. Further target objects is obtained by consecutive video frame. Here the type of the object is identified as car and object detection in each frame are displayed.

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