ISSN XXXX XXXX © 2016 IJESC

Research Article Volume 6 Issue No. 10

Vehicle Detection using Soft Computing Method in Matlab

Rajnikant Sonwane[1], Abhishek Misal[2]
Department of Electronics and Telecommunication Engineering
Chhatrapati Shivaji Institute of Technology, Durg, India

Abstract:
Vehicle detection and tracking application play an significant character for inhabitant and military applications such as in highway traffic observation control, management and urban traffic scheduling. Vehicle detection process on road are used for automobile tracking, counts, average pace of each individual vehicle, traffic analysis and vehicle categorizing objectives and may be implemented under dissimilar environments changes. In this paper, we present a general idea of an image processing methods and study tools which are used in building these previous mentioned applications that occupied developing the traffic observation systems. More accurately and in contrast with other reviews, we classified the dispensation methods under three categories for more clarification to explain the traffic systems

Keywords: Vehicle detection, Occlusion, Tracking, Traffic surveillance, Shadow & Classification

I. INTRODUCTION

One of the important applications of video-based administration systems is the traffic surveillance. So, for many years the researches have founded in the Vision-Based Intelligent Transportation System (ITS), traffic engineering applications and transportation planning to take out useful and precise traffic information for transfer image analysis and traffic flow direct like vehicle count, vehicle trajectory, vehicle tracking, vehicle flow, license plate recognition, etc. In the past, the vehicle detection, segmentation and tracking systems, which are used to find out the charge for various kinds of vehicles for automation toll levy system. Vehicle identification system is used to detect (the vehicles) or perceive the traffic lanes or organize the type of vehicle class on highway roads like cars, motor vans, heavy goods vehicles (HGVs), buses and etc. However, the conventional vehicle systems may be declines and not documented well due to the vehicles are occluded by other vehicles or by environment obstacles such as road signals, trees, weather circumstances, and etc., and the presentation of these systems depend on a good traffic image psychoanalysis approaches to detect, track and categorize the vehicles.

II. ANALYSIS OF TRAFFIC IMAGE

In this paper, the traffic image psychoanalysis comprises of three parts:

(1) Motion Vehicle Detection and Segmentation Approaches

(2) Vehicle Tracking Approaches

(3) Camera Calibration Approaches and

(4) MOTION VEHICLE DETECTION AND SEGMENTATION APPROACHES

The recognition of moving object's regions of change in the same image sequence which captured at dissimilar intervals is one of interested field in computer vision. An important large number of applications in miscellaneous disciplines are employed the modify detection in its work, such as video surveillance, medical analysis and treatment, underwater sensing, remote sensing, and civil communications. One of the video surveillance branches is the traffic image analysis which included the motion vehicle detection and segmentation approaches. Even though a variety of research papers have been showed for poignant vehicle detection (background subtraction, frame differencing and motion based methods) but still a rough task to detect and segment the vehicles in the self-motivated scenes. It comprises of three approaches to sense and segment the vehicle, as mentioned below:

1. Background Subtraction Methods.

2. Feature Based techniques.

3. Frame Differencing and Motion Based methods.

1.Background Subtraction Methods - The process of removing and shifting foreground objects (input image) from stored background image (static image) or generated background frame from the image series is called background subtraction, after that, the extracted information (moving objects) is resulted as the doorsill of image differencing. This technique is one of widely change uncovering methods used in vehicle regions detection. The non-adaptively is a disadvantage which is raised due to the altering in the lighting and the climate situation. So, several researchers work to decide this drawback by proposed methods on this field.

2. Feature Based Methods - Another movement which the researchers examined and motivated on sub-features like the limits and corners of vehicles, the moving substance segmented from backdrop image by collecting and analyzing the set of these facial appearance from the pressure group between the succeeding frames. Furthermore, the characteristic based method ropes the occlusion handling

flanked by the overlapping vehicles and compared with environment subtraction method represents a less level from the computational intricacy view.

3. Frame Differencing and Motion Based Methods -The frame differencing is the process of subtracting two successive frames in image succession to segment the forefront object (moving object) from the conditions frame image. Also, the motion segmentation process is another original step in detecting vehicle in image series which is done by isolating the touching objects (blobs) through analyzed and project sets of pixels to different lessons of objects which based on orientations and momentum of their movements from the setting of the motion scene image sequence. An intraframe, interframe and tracking levels are suggested structure to recognize and influence occlusion vehicles. This paper showed by quantitative assessment that the interframe and interframe could be used to administer and control mostly of partial occlusions imagery, and tracking level could be used to administer and manipulate full occlusions images efficiently. A multimodal temporal panorama (MTP) method for real time vehicle detection and reconstruction have suggested. This method accurately used a inaccessible multimodal (audio/video) monitoring organization to extract and recreate vehicles in real-time movement scenes. A multimodal move toward in addition to discovery and motion estimations has helped during the rebuilding process of vehicles, which uninvolved the occlusion, motion blurring and differences in standpoint views.

4. Vehicle Tracking Approaches - The object tracking in cassette processing is an significant step to tracking the touching objects in visual-based observation systems and represents a demanding task for researchers. To track the physical manifestation of poignant matter such as the vehicles and recognize it in dynamic scene, it has to locate the location, estimation the motion of these blobs and go behind these arrangements between two of uninterrupted frames in video scene . Several vehicle tracking methods have been illustrated and planned by several researchers for dissimilar issues, it consists of:

1. Region-Based Tracking Methods
2. Contour Tracking Methods
3. Feature-Based Tracking Methods
4. 3D Model-Based Tracking Methods
5. Color and Pattern-Based Methods

III. PROBLEM IDENTIFICATION

Foreground object detection is the biggest support of most video surveillance applications. Foreground objects detection is mostly concerned with detecting objects of interest in an image sequence. If we slightly modify the parameters, we might be able to get further objects detected, but this would also increase false positives due to quasi-stationary backgrounds such as waving trees, rain, snow, and artifacts owing to specular reflection. There is also a problem of shadows for outdoor scenes. Researchers have developed several methods to pact with foreground object detection. The easiest one is taking consecutive frame differences. It works well when the background is motionless, which is not the case of video surveillance.

Vehicle classification is an inherently difficult problem. The tracked vehicles are classified into two categories: cars and non-cars. The classification is based on vehicle dimensions and is implemented at a extremely coarse granularity – it can only differentiate cars from non-cars. The basic idea is to compute the length and height of a vehicle, according to which a vehicle is classified as a car or non-car. In order to achieve a finer-level classification of vehicles, we want to have a more sophisticated method that can sense the inflexible characteristics for each vehicle category considered. Towards this goal, a method is developed which used a PCA-based vehicle classification framework. They implemented two classification algorithms – Eigen vehicle and PCA-SVM to classify vehicle objects into trucks, passenger cars, vans, and pick-ups.

Both the methods make use of the distinguishing power of Principal Component Analysis (PCA) at different granularities with different learning mechanisms. Though the procedures themselves are interesting, the results fail to achieve high accuracy. The performance of those algorithms also depends on the exactness of vehicle normalization; such methods cannot classify the vehicles robustly.

The accuracy of the system was impressive, but they only used lateral views of the vehicles for testing. Their results are very good, but they also limited their testing to lateral views. They have produced impressive results, but the question of retrieving the “linearity” feature in frontal view remains unanswered. The algorithms have difficulty handling shadows, large vehicles (e.g., trucks, and trailers) and occlusions, all of which causes multiple vehicle to emerge as a single region.

The algorithms provide efficient descriptions of objects compared to blob tracking. However, these algorithms have drawbacks, such as they do not work well in the presence of occlusion and their tracking precision is limited by a lack of precision in the location of the contour. The recovery of the 3D pose of an thing from its curve in the image plane is a demanding problem. A further difficulty is that active contour-based algorithms are extremely responsive to the initialization of the tracking, making it difficult to start the tracking automatically. Nevertheless, they also have some disadvantages, such as the requirement for 3D models, high computational cost, etc.

The accuracy decreases by a factor of two when the sequence is not processed in reverse, thus building the algorithm inappropriate for on-line processing when time-critical results are required. Overall, these algorithms claim to have low computational cost compared to other tracking algorithms. However, they too have a number of drawbacks. The recognition rate of vehicles using two-dimensional image characteristics is low, because of the nonlinear distortion owing to perspective projection, and the image differences due to movement relative to the camera. Also, they generally are unable to recover the 3D pose of vehicles.

IV. PROPOSED METHODOLOGY

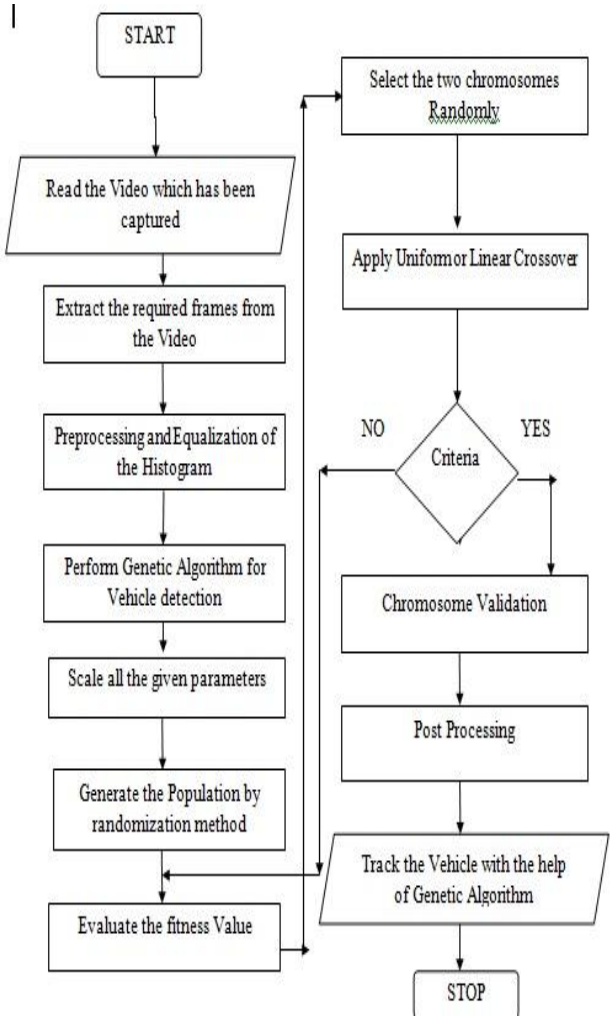

Figure 1 Flowchart of the Methodology

Step 1:- Read the Video which has been captured

- Upload the Video from the system in .mp4 format.
- The Function strictly supports the .mp4 format, which we are using in the given methodology.

Step 2:- Extract the required frames from the Video.

- There are lot of frames in the video as the video itself is a collection of frames, so in this step, extraction of each of the frame is done.
- The extraction process is done by Gaussian method.
- Using the algorithm of Function of Gaussian, which is predefined in the Matlab tool, the frames are easily fragmented.

Step 3:- Pre-processing of the Image which has been fragmented by the Gaussian method.

- Pre-processing includes thinning of the image, canny edge detection and alteration of image into gray scale image.
- First of all the image gets converted to Gray scale image.
- By using Canny Edge detection technique, the edges of the frames of the image are detected by dotted lines.
- Now the image undergoes thinning process.
- The process of Thinning involves the drawing of an outline on the image and it is compared to the previous main image.
- If the outlines of the image match, then it indicates that there is no movement in the image, whereas if the frames mismatch, then it indicates that there is some movement in the image.

Step 4:- Equalisation of the Histogram

- The Histogram is drawn by considering a threshold value of the image as 0.5.
- According to it, the region where the object is placed is always denser, and rest of the background is rarer as compared to the denser region.
- So, as soon as the numerical value of the image goes beyond 0.5, the image becomes denser, and that portion becomes white coloured, making rest of the image black coloured.
- Now after this process, the Pre – processing is again carried out which includes Edge detection by canny edge detection method and thinning process as discussed in the step 3.

Step 5: Perform Genetic Algorithm for Vehicle detection.

- A genetic algorithm (GA) is a method for solving both unconstrained and constrained minimization problems based on a natural selection process.
- The algorithm frequently changes a population of individual solutions to get best result.
- It generates solutions to optimization issues using methods inspired by natural evolution, such as inheritance, mutation, selection and crossover.

Step 6:- Scale all the given parameters.

- Initialize the parameters of genetic algorithm
- Parameter Scaling includes the process of defining the characteristics i.e. how many chromosomes should be taken into consideration, how many times it should be illustrated, and the number of genes which are to be taken.

Step 7:- Generate the Population

- Initialize the chromosome generation by randomization method.
- The population is generated as defined previously in the algorithm.
- Considering the number of chromosomes 10, the number of genes 4, and illustrating it 20 times to define the best fit mutation.

Step 8:- Evaluate the fitness Value

- Analyze whether the considered chromosome is best fit or not.

- It checks whether the chromosome is idol or in movement.

Step 9:- Select the two chromosomes randomly.

- From the population the values of the chromosomes are selected randomly. It is a natural process known as Metaheuristic Process.
- It is a higher-level procedure or heuristic designed to find, generate, or select a heuristic that may offer a adequately good solution to an optimization problem.
- Metaheuristic is experimental in nature, describing observed outcome based on computer experiments with the algorithms
- Stochastic optimization techniques are optimization techniques that generate and utilize random variables.
- The random variables appear in the formulation of the optimization challenge itself, which engage random objective functions or random constraints.
- Some stochastic optimization techniques use random variables to solve stochastic problems.
- Combination of both Method known as Stochastic Optimization.

Step 10:- Apply Uniform or Linear Crossover

- In genetic algorithms, crossover is a genetic operator used to vary the programming of a chromosome
- It Produces Chromosomes from one generation to the next.
- 1 Point crossover and 2 point crossover are used in this process.

Step 11:- Chromosome Validation

- Apply mutation on the chromosomes and match the criteria , if yes terminate the loop else continue the same procedure.
- Select the Best chromosome Validation

Step 12:- Post Processing

- In The Post – Processing, the best frame solution is obtained.

Step 13:- Track the Vehicle with the help of Genetic Algorithm

- With the help of Genetic Algorithm the Vehicle has been tracked which is shown in the green colored box.

V. CONCLUSIONS

This paper provides a shortening study on the technique which has been proposed to have worn in traffic video. It completely focuses in the areas, namely vehicle recognition, tracking, and classification using the Genetic algorithm.. Also, we present and organize the traffic surveillance systems to three types based on specific methods which used for increasing it. These types shows the detailed in sequence about how the traffic surveillance systems used the image dispensation methods and examination tools for detect, segment, and track the vehicles. In addition, it is expected to perform the two cross overs i.e. 1-point cross over and 2-point crossover to recognize the vehicle in a proper manner. More particularly, this method gives better thoughtful and highlights the issues and its solutions for traffic examination systems.

VI. REFERENCES

[1] A. H. S. Lai, et al., "Vehicle type classification from visual-based dimension estimation," in Intelligent Transportation Systems, 2001. Proceedings. 2001 IEEE, 2001, pp. 201-206.

[2] Z. Zhigang, et al., "A real-time vision system for automatic traffic monitoring based on 2D spatiotemporal images," in Applications of Computer Vision, 1996. WACV '96., Proceedings 3rd IEEE Workshop on, 1996, pp. 162-167

[3] K. H. Lim, et al., "Lane-Vehicle Detection and Tracking," Proceedings of the International MultiConference of Engineers and Computer Scientists (IMECS 2009), vol. 2, pp. 5–10, 2009.

[4] J. M. Ferryman, et al., "A generic deformable model for vehicle recognition," presented at the Proceedings of the 1995 British conference on Machine vision (Vol. 1), Birmingham, United Kingdom, 1995.

[5] N. K. Kanhere, "Vision-based detection, tracking and classification of vehicles using stable features with automatic camera calibration," ed, 2008, p. 105.

[6] A. H. S. Lai, et al., "Vehicle type classification from visual-based dimension estimation," in Intelligent Transportation Systems, 2001. Proceedings. 2001 IEEE, 2001, pp. 201-206.

[7] F. M. Kazemi, et al., "Vehicle Recognition Using Curvelet Transform and SVM," in Information Technology, 2007. ITNG '07. Fourth International Conference on, 2007, pp. 516-521.

[8] B. Han, et al., "Motion-segmentation-based change detection," SPIE Defence & Security Symposium 2007, pp. 65680Q-65680Q, 2007. [17] S. Gupte, et al., "Detection and classification of vehicles," Intelligent Transportation Systems, IEEE Transactions on, vol. 3, pp. 37-47, 2002.

[9] C. R. Wren, et al., "Pfinder: real-time tracking of the human body," Pattern Analysis and Machine Intelligence, IEEE Transactions on, vol. 19, pp. 780-785, 1997.

[10] T. E. Boult, et al., "Frame-rate omni directional surveillance and tracking of camouflaged and occluded targets," in Visual Surveillance, 1999. Second IEEE Workshop on, (VS'99), 1999, pp. 48- 55.