

Road Traffic Monitoring Using Image Processing at Signalized Intersection for Mixed Traffic Conditions

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Abstract:

In present days detection and tracking of touching items are fetching additional essential to traffic control engineers to assess the traffic volume on roads especially in mixed traffic conditions with no or little lane discipline. Estimating the traffic volume at intersections is again is an important assignment for the traffic engineers. Image processing is one of the best tools to evaluate the volume, speed and density of vehicles on roads. The present study provides an algorithm to count the number of vehicles on the road at Musheerabad junction signalized intersection in Hyderabad city. The traffic volume is determined by using the Image Processing tool, whereas the average speed of all the vehicles analyzed by using Traffic Data Extractor software. Then the density of vehicles present on the road including the pedestrians is determined. The traffic volume is also counted manually by observing video footage. Then the data of counting vehicles from Image processing and the manual count is compared. It is found that the Image processing tool is best suitable to count the traffic volume in urban areas under mixed traffic conditions accurately and is cost- effective.

Keywords: Musheerabad, intersections, the traffic engineers.

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INTRODUCTION:

Including the No. of substance is an essential division of image processing, significant the No. of substance here in the picture can be helpful for the prospect study in extensive series of application. In this paper, propose an easy technique for robotically formative the No. of substance in an image. Once the No. of substance is resolute the substance for each unit area or the density and also be predictable. Conventional methods engage including base happening the region of substance, color of objects, applying edge detection techniques, etc. Some application that engages a huge number of hardware mechanisms for including that outlook add toward the expenditure as well as preservation which is monotonous employment. The future schemes involve changing the input picture keen on an arrangement such that the No. of substances can be designed based on the associated mechanisms

current in the improved picture. This proposed concept is too planning at formative the accurate values of concentration by clearing the objects touching the borders of the image. In this project, three applications are taken into account and using MATLAB with image processing toolbox the count and density values are calculated for each.

The software used to find traffic density is Traffic Data Extractor (TDE) and Matrix Laboratory (MATLAB). By using TDE vehicle count, speed and vehicle trajectory can be studied, MATLAB is used for the image processing to count the velocity for a specified period and detect the object/vehicle.

SIGNIFICANCE

Safety on roads is a major concern in the developing world. So the increasing population, these traffic hazards have enlarged particularly in rising countries like India because the system is not capable to

control the rising traffic on roads. So new ideas and concepts should be given to reduce traffic volume or to make the traffic system more efficient. To get an idea of traffic we need to study everything related to traffic volume. By following TDE and MATLAB software vehicle details like speed, trajectory and count can be easily extracted. To control the road accidents conflict points should be studied.

STUDY AREA

Hyderabad is a metropolitan city with heavy traffic flow. Musheerabad is signalized and controlled intersection located in Hyderabad, located at the central part of Hyderabad having heavy traffic and is a four road junction. Traffic flow videos are taken from those intersections to reduce traffic congestions.

LITERATURE SURVEY

Neem Abbas et al.,[4] conducted their research on traffic density count by collecting a traffic video and studying it in MATLAB. They followed image acquisition, image cropping, and object detection and density count methods to analyze the video. Initially, the video is divided into frames and the target area is selected and then cropping, object detection methods are executed. Finally, they concluded that finding the traffic density of a lane by using image processing can be done easily in MATLAB. Prof. Rajiv Kumar Nath et al.[9] experimented on templates in object detection. They followed many methods to detect the objectives using different template. They finally concluded that vigorous and reliable vehicle detection is crucial step of vehicle recognition. They also concluded that vehicle detection using a template is a critical process but it is accurate in MATLAB tools. Al-Sayed Ahmed AlSobky et al.[13] introduced a novel appliance to determine traffic density as well as velocity by using two cars and two smart phones with observers to calculate the automobiles connecting the two cars. This calculates is utilizing through follow information toward provide calculated density along with designed speed. The

journey speeds in addition to physical traffic count were used to derive calculated density. Sujatha et al.[14] worked on monitoring the traffic congestion using real time image processing techniques. And informing the waiting time to the public, through a mobile application has been proposed in this work. This application clearly intimates the people that which route is best and thus helps the public to get prior knowledge regarding the traffic juncture waiting time in their respective routes. Sofia Janet et al.[15] worked on MATLAB environment using background, Otsu's threshold, and morphological filters to detect the vehicles on highways at signalized intersections. To reducing the noise to use the 2-D median filter in the individual pictures.

Traffic Data Extractor is used to count the speed of the vehicles. TDE is developed by Professor Tom V. Mathew and Caleb Ronald Munigetty[3] from the Indian Institute of Technology, Bombay. TDE extracts the traffic volume, speed and automobiles path information since the videocassette recording. The standard velocity of all the automobiles within the study area is computed. Finally, the density of the road is determined in vehicles/kilometer/lane.

PROPOSED WORK

This present technique is fashioned to a movement base arrangement for sensing as well as path several moving substances and for displaying results in urban areas at the signalized intersection for mixed traffic conditions. The tracking of vehicles in this technique is exclusively base scheduled movement through the supposition that all substances goes in a in a straight line through steady speed. To detect the stirring substances as well as to pathway the vehicles transversely the video borders two players are used one toward show the videotape as well as the other for the center mask. The forefront detector is use toward section affecting substance starting the environment. It output a binary front, somewhere the pixels charges of 1 correspond toward the forefront as well as the worth of 0 correspond to the environment. Related group of forefront pixels are expected to match to affecting substance. The blob

study scheme thing is use to locate such group as well as to calculate their distinctiveness, such as locale, centroid, along with the bound box.

Morphological operations are applied toward take away noise along with fill up in holes. Perform blob investigation to locate associated apparatus. The Kalman filter is use to calculate the centroid of every path in the present structure, as well as to revise its bound box consequently. The “fill in assign paths” purposes update every assign path through the equivalent detection. It calls the accurate technique of revelation. Kalman Filter use toward accurate the site estimation. After that, it provisions the novel bound box as well as enlarges the period of the path as well as the sum observable calculate by 1. Finally, the function set the undetectable count up to 0. Correct the evaluation of the substance position with the novel recognition. Replace calculate bound box through detect bound box. Subsequently efficient track’s period. Afterward efficient visibility. Efficient Unassigned path spot every unassigned path as undetectable, as well as improved its period through 1.

Then the “Delete Lost Tracks” function is applied to delete tracks that have been invisible for too many consecutive frames. It also deletes recently created tracks that have been invisible for too many frames overall. Later new tracks Creates from unassigned detections. It is assumed that any unassigned detection is the start of a new track. In practice, it can be used for other cues to eliminate noisy detections, such as size, location, or appearance. Kalman filter object used to display Tracking Results.

RESULTS AND DISCUSSIONS

Input to MATLAB should be in the form of a video. Initially, the code or algorithm prepared to detect the multiple moving objects has to be inserted into the MATLAB software. The algorithm is written in the Image Processing tool to track and count the number of vehicles moving on the lane in one direction only throughout the width and length of road visible in video footage.

The video footage data is collected from the Hyderabad Traffic Control Room. Musheerabad junction is observed as highly vehicular populated area with all types of vehicles including heavy commercial vehicles in off-peak hours. The video footage are having data from morning 8:00 am to evening 5:00pm. Two hours data between 8:30 to 10:30 is observed as peak hours and the same are selected to determine the traffic present on the road. The video is divided into 8 parts, thus each video length is 15 minutes to get the accurate counts. The vehicles are also counted manually by cropping the video footages at the junction. It is observed that in peak hours the vehicles are moving with little lateral gap with less or no lane discipline. The algorithm written in MATLAB is shown in fig. 1. After providing the algorithm, the video from which data must be extracted is selected by clicking on the Run option.

After the code is provided in the MATLAB, it studies the video and converts it into frames. MATLAB counts the moving objects depending upon the motion. Motion can be detected by comparing the two frames. To observe the motion clearly it converts image into grey scale excluding all other colors. After converting the videos into RGB or grayscale it starts counting the moving objects including pedestrians. The number of pedestrians counted by MATLAB is deleted after counting the vehicles manually, to consider only the vehicular traffic. The vehicles counting is shown by taking a snapshot as shown in fig.2

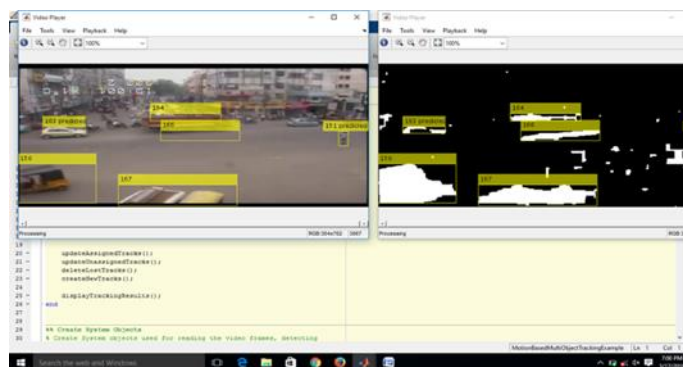


Fig.1: Vehicles counting

The number of vehicles counted in each frame will be displayed on one side in tabular form as shown in Fig.3

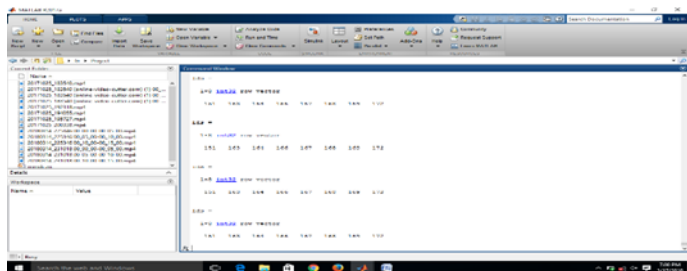


Fig. 2: Number of vehicles counted in each frame

The density of the road can be determined by measuring flow and speed of the vehicles. Flow and speed of the vehicles are extracted from the videos using TDE. The maximum and minimum speed of the different vehicles is observed to find the average speed. The density is given by the relation, Density = Flow/Speed. The study area stretch to find out the average speed of all the vehicles is shown in fig.4



Fig. 3: Speed of vehicles using Traffic data Extractor

The No. of automobiles detect based on the present technique as well as the No. of automobile base happening physical calculate depict in the Table 1. The fault in calculate traffic run range among the 0.45% as well as 4.89% through a standard rate of 2.11%. The precision range starting 95.1% as well as 99.5% through a standard rate of 97.8%. This fault can be tolerating in favor of numerous application, particularly in the deficiency of concrete count below varied traffic circumstances. The experiential

error and proportion accuracy are calculated by the subsequent equations.

$$\text{Observed Error} = \frac{\text{Actual flow} - \text{Measured flow}}{\text{Actual flow}} \times 100$$

$$\text{Accuracy} = \frac{\text{Measured flow}}{\text{Actual flow}} \times 100$$

Table1: Comparison of measured and actual traffic flow

Duration (Min)	Measured Flow (Algorithm counts, veh/min)	Actual Flow (manual counts, veh/min)	Observed Error in %	Accuracy in %	Average Speed m/sec	Actual Density veh/km/lane
8:30-8:45	427	438	2.51	97.4	10.67	46.91
8:45-9:00	379	392	3.31	96.6	13.52	33.13
9:00-9:15	437	441	0.90	99.0	9.94	50.70
9:15-9:30	360	366	1.63	98.3	12.41	33.70

9:30-9:45	441	443	0.45	99.5	9.81	51.60
9:45-10:00	370	379	2.37	97.6	11.43	37.89
10:00-10:15	356	359	0.83	99.1	12.98	31.60
10:15-10:30	427	449	4.89	95.1	9.81	52.30

CONCLUSION:

The present paper facilitates toward manage the traffic jam during highway. These efforts present the study of vehicle through peak hours along with in standard time which can be incredibly helpful toward organize the traffic. The present technique is theoretically practicable to execute through low price along with with finest accurateness. It is extremely significant to distinguish the category of a detect thing (motor vehicle, *etc*) in toward path as well as examine its behavior properly.

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