Area Speeding Check Using Image Processing

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Abstract - ***This paper deals with the estimation of the speeds of moving vehicles from video sequences are presented using image processing. The software pre-processes video images using gray scale. There is a sequence of real-time video given of traffic images. The images are converted to double precision images. Then edges are extracted and quantified the resulting images to classify the objects. After detecting the vehicles, they can be tracked in different frames and their speed can be estimated by calculating the position of the vehicle object in different frames and compare it to a ground truth. The main aim of this document is to represent a new way of finding speed of vehicle. This method does not need camera calibration and does not need any extra equipments other than a video camera recordings and can be used by traffic police to monitoring vehicles on roads, and can be combined with a system to detect the license plate number to create a complete system to issue an automatic speed ticket for drivers who exceeds the speed limits. This approach is implemented in MATLAB by using image processing functions. Estimating speed of vehicle in traffic surveillance helps in preventing accidental cases, congestion control at junction and traffic discipline within city.***

Keywords - ***Image processing, video sequences, vehicle detection, speed detection, ticket generation***

I. INTRODUCTION

The process of altering an existing image in manner to obtain desired results is called as image processing. We find instances of image processing occurring all the time in our daily lives. Probably the most powerful image processing system is the human brain together with the eye. The system receives processes and stores images at higher rates of speed. The objective of image processing is to visually enhance or statistically evaluate some aspect of an image not readily apparent in its original form. The operations carried out in image processing principle will only be assisting and it does not add any information content to it. Image processing makes use of the computer algorithms so that they can perform processing on digital images. Image processing is in its general form applicable to the alteration and analysis of pictorial information. Image Processing is an immensely evolving domain with a major growth of applications in the field of Science and Engineering.

Recognizing and monitoring for traffic surveillance by moving vehicles in traffic scenes will ease down the work load. An emerging research area for Intelligent Systems is traffic control and road traffic information monitoring. The vision-based technologies has become a popular solutions for traffic monitoring and control systems as there is progress in the growth in computing power of the hardware and its reducing cost. Visual vehicle monitoring videos are widely used by the police for criminal investigation, by the traffic monitoring systems and for detection of abnormal activities and events like accidents. To find a vehicle from these videos because of car crashes, speeding, a truck in a no heavy vehicle zone or a particular type of vehicle that the user may be interested in is a common case. Video and image processing has been applied widely to traffic analysis. The field of traffic research is very wide and it has many goals that include queue detection, incident detection, vehicle classification and vehicle counting. This is used to make an attempt to estimate the speed of a moving car. It measures the vehicle speed and combines it with a system capture and recognize the image containing the license plate number of the over speeding vehicles, it can issue an automatic speeding ticket.

The problem being addressed here is about estimation the speed of moving vehicle and the solution is provided by using simple, concise and very effective software written in MATLAB programming language. A new approach is presented for extracting vehicular speed information, given a traffic video that is taken from a MATLAB to capture the images of that road when the vehicle passes through and the images are then processed by the program. This is the exact job that Automated Over-speed Detection System i.e. AOD System is performing.

II. LITERATURE SURVEY

An appropriate amount of money is being spent on applications in IT sector. So providing them with genuine solutions is mandatory. This paper presents a review of relevant literature, focusing especially on automated speed detection of vehicles. A number of studies have been initiated in the past to address the over-speeding vehicle detection problem. The recent availability of sophisticated semi conductor digital devices and compact powerful computers, coupled with advances in image processing algorithms, has brought digital image processing to the fore front. A broad spectrum in applications is held by digital image processing, such as satellite in remote sensing along with other spacecraft image transmission, also as storage for business

applications, medical processing, radar sonar and acoustic image processing, robotics and automated inspection of industrial parts. There are various features provided by system to edit an existing image, which is as follows Image scaling, includes zooming and shrinking images. We can use enlarging to zoom in on the art of an image for closer examination. Saving disk space can be done by using image shrinking that is where fitting a large image into smaller display is possible along with pasting several images into one image of the same size. Image compression tool is an application, which works with BMP (bit map pattern File Format) gray scale images. Images are sent by users and according to their specification they are modified. Image rotation tool is used to rotate the image by the specified angle. Resembling is used to increase the size of each pixel by a certain factor. They have used various filtering techniques like lightening, darkening, embossing, sharpening, softening etc. Object boundaries are characterized by edges and are therefore are useful for segmenting, registering, and identifying. The system allows the user to detect the edges in a given image. They have developed a program, which can be used o n compressed or uncompressed BMP, JPG, and GIF file formats to perform any of the above-mentioned functions

Using image stitching and image steganography security can be provided to any image which has to be sent over the network or transferred using any electronic mode [1]. -PASM, a large-scale multi-microprocessor system being designed at Purdue University for image processing and pattern recognition [2]. As one of the most successful applications of image analysis and understanding face recognition has recently gained significant attention especially during the past several years [3]. The application is an image processing system, which works on the basis of medical palmistry. The images of human palm form input to the system [4]. Digital image processing is the use of computer algorithms to perform image processing on digital images [5]. Peer-to-peer live streaming and video on demand design issues and its challenges [6].

III. SYSTEM ARCHITECTURE AND MODELING

The main idea behind this project is to monitor the moving vehicles and to detect the over-speeding vehicles among them. While monitoring the video that is streamed on to the system, the speed of each moving vehicle is calculated and the ones exceeding the speed limit of that specific area are tagged as over-speeding vehicles. Then a ticket is generated in the form of fine-ticket for those over-speeding vehicles. This provides a good surveillance for the road traffic.
The following are the three definitions required for a correct and simple understanding of AOD System.

1. **Video Analysis:** The process of developing algorithms for the purpose of processing digital video data with the objective of extracting the information conveyed by the data is known as video analysis. This feature is used in multiple domains which include health care, entertainment, safety and security, retail and transport. Implementation of algorithms for video analysis may be possible as hardware on processing units specialized for handling video sequences or as software on computers for general purpose.

2. **Object Detection:** Object detection is a computer technology related to computer vision and image processing that attempts to associate a region of interest in the image or video with a potential object (such as cars, vegetation, humans, buildings). Well-researched domains of object detection include face detection and vehicle detection. Object detection has applications of computer vision which include image retrieval and video surveillance or monitoring.

3. **Video Tracking:** Video tracking is the task of estimating over time the position of objects of interest in a video sequence. It has a variety of uses such as security and monitoring, human computer interaction, video communication and compression along with shrinking, traffic control, medical imaging and video editing.

Below is an illustration of process with some discussions of each phase. MATLAB function is used for determining the speed of the object. There are various steps involve in this process which are as given:

a) **Read the Video:** A recorded video is passed into the MATLAB workspace. This video must be read using (vision.VideoFileReader) function which read the video from MATLAB workspace. The past function doesn't display the video in any form; its only work is to prepare the video for the next steps.

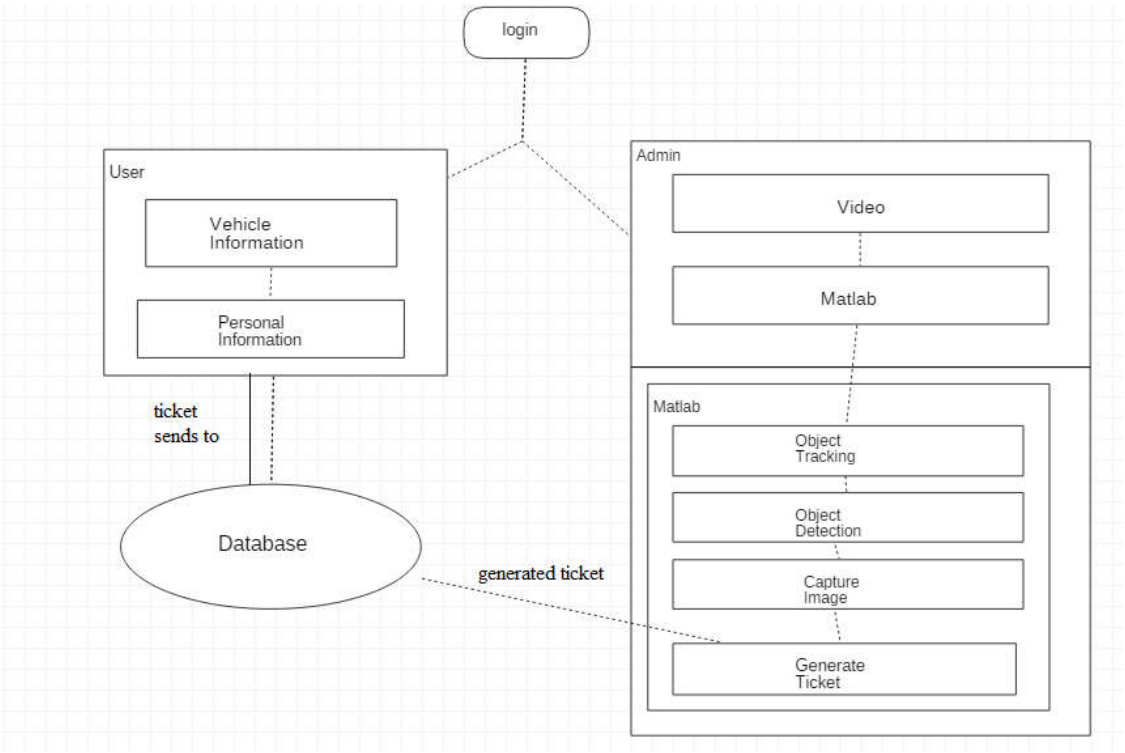

Fig. 1 System Architecture for AOD System

b) **Taking Reference image:** There must be a reference image present which we can compare to each of the frame of the video for a featured extraction. The moving object detection in streaming videos is said to be a significantly difficult research problem. Aside from the essential usefulness of being able to segment video streams into moving and background components, detecting moving blobs provides a focus of attention for recognition, classification, and activity analysis, making these later processes more efficient since only "moving" pixels need be considered. The consecutive frames must establish a correspondence among objects or their parts in object tracking. It extracts the temporal information such as trajectory, posture, speed and direction of the object. Tracking detected objects frame by frame, in video is a significant and difficult task. It is an important part of being a surveillance system which has to be smart. This is because without object tracking, the system could not extract cohesive temporal information about objects. In such cases, higher level behaviour analysis steps would not be possible. Tracking is made difficult when there is inaccurate segmentation of object due to shadows, reflectance and occlusions. The following is the activity diagram for the AOD system explaining the flow of activity.

If the pixel is not moving so we have to neglect it since there is a higher probability of being a stationary pixel. Also the probability of a stationary pixel being a part of an object is so low. On the other hand, the probability of another pixel which is in motion might to be a part of object has a higher probability. Ignoring other pixels will cause some loss of information, and will lead to un-connected objects. Thus such pixels need to be avoided.

After finding the location of the object the next step is to calculate the displacement of the object in two consecutive frames. The Euclidean distance between (x1, y1) and (x2, y2) is:

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad \text{———————}$$

Fig. 2 Calculation of displacement

When predefined fixed distance is travelled by a vehicle, then the number of frames that are necessary to travel that distance in the image is calculated. It is compared to a ground truth which is the number of frames that is necessary to vehicle to travel the same distance in order to achieve certain speed.

After finding the displacement of the object we can multiply it with the total number of frames to give total displacement in the whole time, and then we can divide it with the total time of the video to give total displacement covered in on sec, which is nothing but the speed of the object.

$$Speed = \frac{Distance}{Time} \qquad \text{———————}$$

Fig. 3 Calculation of Speed

After calculation of speed, if the vehicle is exceeding the speed limit then they are tagged as over-speeding vehicles. Once over-speeding is spotted, the AOD system generates a ticket of that offender. Whereas is the object/vehicle spotted in the steaming video is not exceeding the speed limit, then it simply ignores that object and continues tracking other objects.

The activity flow diagram of the entire system is given below:

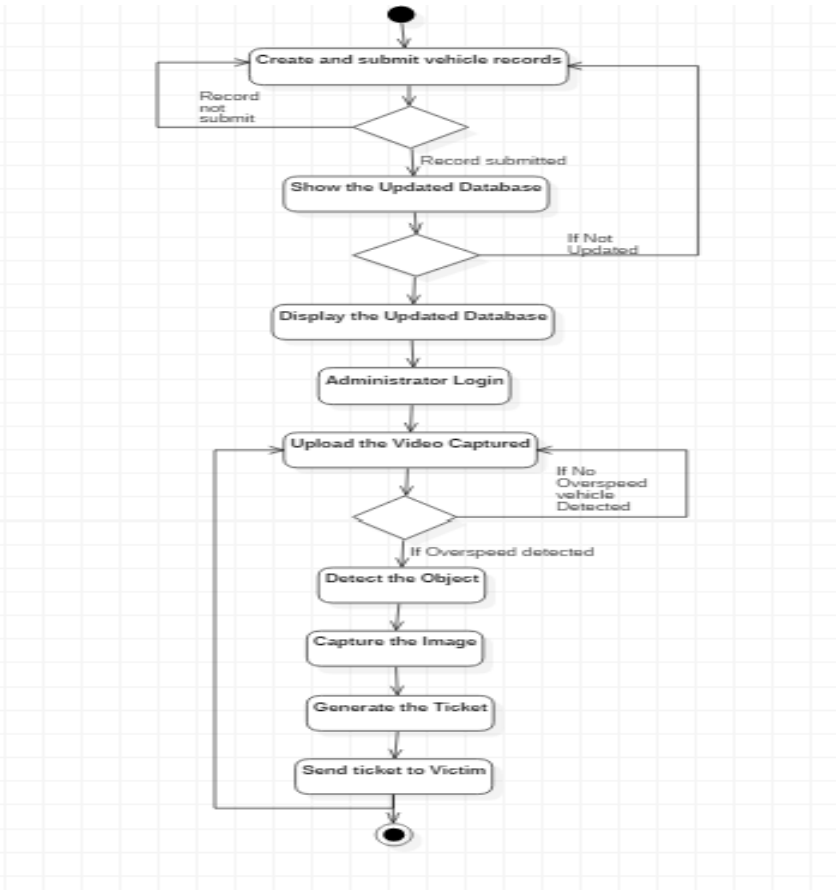

Fig. 4 Activity diagram for AOD System

IV. APPLICATIONS

This technique of using MATLAB code can be used for various purpose which are given below:

- For traffic management.
- Calculating the speed of vehicles.
- Vehicle tracking.
- Automatic speeding tickets and many more.

V. CONCLUSIONS

The goal of this project is to develop an intelligent speed estimating system which is capable of operating in real-time, as well as with pre-recorded video sequences, with a good performance rate. This proposed system provides an efficient and interesting object-based video indexing and retrieval approach also traffic monitoring. All concepts are implemented on MATLAB using our own written codes, with only a minimalistic use of in-built functions. This image processing technique of speed estimation and monitoring is a very good, efficient and essential technique for speed recognition. We can track the car and calculate its speed using simple MATLAB code. This technique can also be use with real time application in traffic management and other purpose, and it is having high scope of research and development in future. AOD system is a cheap alternative system to the traditional radar system. It doesn't need professional persons to deal with it as it has a simple interface and good design.

VI. REFERENCES

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