VIDEO BASED SURVEILLANCE SYSTEM FOR VEHICLE DETECTION AND TRAFFIC MONITORING

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Abstract **-Looking at past few years ago, where for security purpose persons used to be employed for observing and controlling traffic. In such security systems the person has to seat all time at the basement of the traffic signal to monitor and control traffic. As the systems were human observation based there were many disadvantages. As time goes by Expressways, highways and roads are getting overcrowded due to increase in number of vehicles. So it is very important for civilian, military and government applications such as traffic monitoring, traffic planning and toll collection to detect, track, count and classify vehicles passing through the stretch of road. For the traffic management, vehicles detection is the critical step. Computer Vision based techniques are more suitable because these systems do not disturb traffic while installation and they are easy to modify. In our proposed system we are trying to present portable, suitable, cheap and computer vision based system for moving vehicle detection and counting. The proposed algorithm captures video from camera and images from video sequence are taken to detect moving vehicles. Background extraction technique is used to extract background and to detect moving vehicles. We are using OpenCV Library for implementation of this algorithm. The proposed algorithm can be used in On-line (Real time) and Off-line video processing.**

Keywords- **OpenCV, avi file, Vehicle Detection, Traffic Monitoring, Background Subtraction, Shadow Removal.**

I. INTRODUCTION

Traffic signal light can be optimized using vehicle flow statistics obtained by Smart Video Surveillance Software (SVSS). This research focuses on efficient traffic control system by detecting and counting the vehicle numbers at various times and locations. At present, one of the biggest problems in most of the cities over worldwide is the traffic jam. Mostly it is seen during office hours and office break hours. Sometimes it can be seen that the traffic signal green light is still ON even though there is no vehicles are coming. Similarly, it is also observed that long queues of vehicles are waiting even though the road is empty due to traffic signal light selection without proper investigation on vehicle flow. This can be handled by adjusting the vehicle passing time implementing by our developed SVSS.A number of experiment results of vehicle flows are discussed in this research graphically in order to test the feasibility of the developed system. Finally, adoptive background model is proposed in SVSS in order to successfully detect target objects such as car, motor bike, bus, etc.

Now days, it is seen that surveillance cameras are already prevalent in commercial establishments, with camera output being recorded to tapes that are either rewritten periodically or stored in video logs. To obtain the maximum benefit from this recorded digital data, detection of any moving object from the scene is needed without engaging any human eye to monitor things continuously. Real-time segmentation of moving regions in image sequences is a fundamental step in many vision systems. A classical method is background subtraction as described in [3]. Image background and foreground are needed to be separated, processed and analysed. The data found from it is then used further to detect motion. In this work the tough routine for accurately detecting moving objects have been developed and analysed. The traditional real time problems are taken under consideration including shadow while detecting motion.

The method chosen to obtain the goal, the problems faced during the implementation and the primary idea of the solution is discussed, along with the proposed algorithm with its describe implementation of algorithm, conclusions and the future work.

A. Object Path Detection

The path of moving object detection includes consequent images captured by video surveillance cameras. The motion of object is capability of surveillance cameras to capture the event and detect object. Software based monitoring algorithm is used in motion detection which will indicate the cameras to

begin capturing the event when it detect the motion. A camera fixed at the base of the traffic signal or in expecting area where it capture the motion of object with any level of tolerance. The captured video further made useful to segment video stream into moving and background component as described in [3]. The segmented video focus on attention for recognition, classification and activity analysis. For detection of object background subtraction method used further which provide complete future data but it is extremely sensitive to dynamic scene changes due to lighting and changing weather conditions. One more method is optical flow can be used to detect moving object independently.

B. Real time environment problems

Video motion detection is fundamental in many autonomous video surveillance strategies. However, in outdoor scenes where changeable lighting and insignificant, but distracting, background movement is present, it is a challenging problem. In real time environment where scene is not under control situation is much noisy and worse. Light may change anytime which cause system output less meaningful to deal with. Recent research has produced several background modelling methods, based on image differencing, that exhibit real-time performance and high accuracy for certain classes of scene. Where the weather introduces unpredictable variations in both lighting and background movement.

II. RELATED WORK

For many years tracking moving vehicles in video streams has been an active area of research in computer vision. In real time system described in [5] uses a feature based method along with occlusion reasoning for tracking vehicles in congested traffic scenes. In order to handle obstructions, instead of tracking entire vehicles, vehicle sub-features are tracked. A moving object recognition method described in [6], uses an adaptive background subtraction technique to separate vehicles from the background. The background is modeled as a slow time varying image sequence, which allows it to adapt to changes in lighting and weather conditions. Other popular video based traffic counting systems use high-angle cameras to count traffic by detecting vehicles passing digital sensors. As a pattern passes over the digital detector, the change is recognized and a vehicle is counted. The length of time that this change takes place can be translated into speed estimates.

When driving in the dark environment, drivers normally turn on the headlights to obtain a clear vision on the road. These headlamps produce illumination on the ground and this region will be classified as moving object. This headlight detection method includes high intensity region detection and classification for cars and bikes is described in [7].

III. ALGORITHM DESCRIPTION

The proposed algorithm can process the Real-Time and offline (pre-recorded) video as shown in Figure 2.

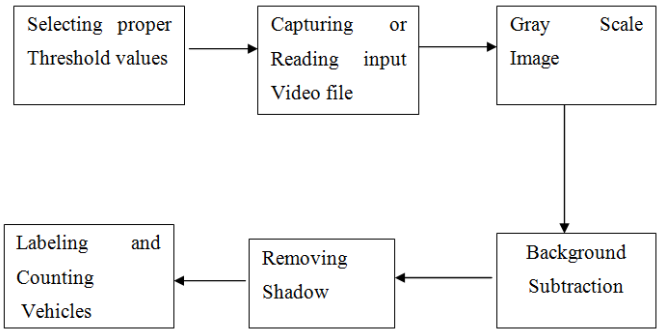

Fig.2 Proposed Algorithm

The very first step of our algorithm is to select proper threshold value. Threshold value can be different for various input video. The next step is to select to read input video file. Then each frame is converted into gray scale images and then subtracting background from sequential frames for foreground detection as described in [3][4]. After detection of moving objects, shadow removing process has done for proper calculation of area of the moving object. Then morphological operations are applied and moving objects are shown with a rectangular box in the output.

A. Threshold Values

Thresholding is the simplest method of image segmentation. Segmentation separate out regions of an image corresponding to objects which we want to analyze. This separation is based on the variation of intensity between the object pixels and the background pixels. OpenCV offers the function threshold to perform thresholding operations. Proper threshold values have to be chosen for background, standard deviation and area of the moving objects.

B. Video Input

OpenCV provides several functions for loading and playing video files. In order to capture frames (i.e., single images) from a video file, it is mandatory to use the command line CvCapture*cvCreateFileCapture(constchar*filename); first.It provides a pointer to a CvCapture structure (returnsNULL if something went wrong). Once there is a valid CvCapture object, it is feasible to start grabbing frames using the function IplImage*cvQueryFrame(CvCapture capture). Our proposed algorithm takes avi video file as an input.

C. Grayscale image

Graycsale images have black ,white and various shades of gray present in the image. The pixels range of grayscale images are 0(black) to 255(white). RGB color image is converted into grayscale image to reduce the noise and complexity while applying other operations like shadow removal on images.In our proposed system we are using ColordImage.Convert<Gray, Byte>() method is used to convert color image into gray scale image.

D. Background Subtraction

Background from each subsequent video frame is subtracted to obtain foreground. By subtracting background from every frame it becomes easy to detect moving object in image. The background is updated in each and every frame as described in [3][4].background

E. Shadow removal

Shadow removal operation is carried out by performing the operation using a function on each frame by 8*8 block wise and result is compared with the variance threshold. If the result is less than the variance threshold, it assumes as shadow and it takes logic 0 otherwise it takes logic 1 as described in [2].

F. Labeling and counting vehicle

After performing the morphological operations, the area of the moving object is calculated and labelling the moving objects with red color rectangle in the output. Then detected vehicles are counted by their types.

IV. CONCLUSION

Due to increase in expressway, highways and traffic congestion, there is a huge amount of potential applications of vehicle detection and tracking on expressway and highways. In this paper we have demonstrated vision based system for effective detection and counting of vehicles running on roads.

The main aim of our system is to detect the moments of vehicles by analyzing camera pictures with the help of computer vision. Vehicle counting process accepts the video from single camera & detects the moving vehicles and counts them. Vehicle detection and counting system on highway is developed using OpenCV image development kits.

A. Future work

Future work will be directed towards achieving the following issues:

1. Classifications of different types of vehicles
2. Not only for Vehicle Detection but also can be used in real time human motion detection.
3. Automatic Vehicle accident detection and tracking vehicles.
4. Better camera control to enable smooth object tracking at incase, high zoom, video is vibrating Video stabilization algorithm is required.

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