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Original Article

Vehicle Speed Tracking Detection using Gaussian Mixture Models

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Abstract *- Vehicle speed detection is used to estimate the velocity of the moving vehicle using image and video processing techniques. Video is captured and analyzed for speed in real-time without any camera calibrations. By employing frame subtraction and masking techniques, moving vehicles are segmented out. Speed is calculated using the time taken between frames and segmented objects traversed in that frames. Finally, frame masking is used to differentiate between one or more vehicles. With an average error of +/- 2 km/h, speed detection was achieved for different video sequences.*

Keywords *- Introduction, Related work, Product Architecture, Sample screens, Conclusion.*

1. Introduction

Vehicle speed detection is there; with the increase in the urban population in many cities, amounts of vehicles have also drastically increased. In a recent study, over-speeding caused most accidents, followed by drunken driving. Over-speeding of two-wheedler and freewheels is one of the major reasons for accidents. To support traffic management systems in our country, we need to build economical traffic monitoring systems. In recent times image and video processing have been applied to the field of the traffic management system. This paper explicitly concentrates on the speed of the vehicles, which is one of the important parameters to make roads safe.d to estimate the velocity of the moving vehicle using image and video processing techniques. Video is captured and analyzed for speed in real-time without any camera calibrations. By employing frame subtraction and masking techniques, moving vehicles are segmented out. Speed is calculated using the time taken between frames and segmented objects traversed in that frames. Finally, frame masking is used to differentiate between one or more vehicles. With an average error of +/- 2 km/h, speed detection was achieved for different video sequences.

1.1. Objective

To Develop Machine Learning Algorithms, Vehicle Speed Detection Is Used To Estimate The Velocity Of The Moving Vehicle Using Image And Video Processing Techniques.

1.2. Motivation

This explicitly concentrates on the speed of the vehicles, which is one of the important parameters to making roads safe. Estimate the velocity of the moving vehicle using image and video processing techniques. Video is captured and analyzed for speed in real-time without camera calibrations. By employing frame subtraction and masking techniques, moving vehicles are segmented out.

2. Related Work

Few efforts have been attempted to measure speed using video images from uncalibrated cameras. Similarly, several other papers suggest estimating speed by placing two detection lines (separated by a known distance) and then measuring travel times between the lines. This paper provides a low-cost and versatile vehicle speed detection using a computer vision-based approach. In this setting, the speed is detected using video cameras commonly available. Techniques-A system for the vehicle over speed detection with SMS alert is presented[1]. It consists of a controller designed using Arduino Mega to monitor the location and speed of the vehicle obtained using a GPRS+GPS Quadband Module (SIM908), GSM antenna, GPS antenna, and SIM card. If the vehicle presents in any defined regions, then the controller compares the vehicle's speed with the maximum allowable speed in that area. If over-speeding is detected, a buzzer sound is generated from an active buzzer used in this system to alert the driver regarding exceeding
the over speed.

2.1. Existing Work

Doppler radar is one of the technologies our law enforcement department uses to measure the speed of a moving vehicle. It beams a radio wave at a vehicle and then estimates the vehicle’s speed by measuring a change in reflected wave frequency.

It is a fixed or hand-held device and is reliable when a moving object is in the field of view, and no other moving objects are nearby. Some of the previous works using the image and video processing applied for vehicle detection, and speed measurements are vehicle detection based on frame difference, calibrated camera, motion trajectories, Optics, and digital aerial images.

2.1.1. Demerits

blurred images were used to find the vehicle speed, high-end camera motion detection for automated speed measurements, and feature point tracking for vehicle speed measurements.

Currently, highly reliable GPS systems track vehicle speeds in the US. Cost-effectiveness is a concern in such a case.

2.2. Proposed Work

A video signal is a term used to describe any sequence of time-varying images. A still image is a spatial distribution of intensities that remain constant with time, while a time-varying image has a spatial intensity distribution that varies with time.

This video is converted into frames. Since the video had 30 frames per second, extracting all the frames would lead to unwanted redundancy, increasing the delay time to execute the program. Hence we sampled the frames so that we get 3 frames per second, which serves the need. Further above reference frames, which are consecutive, are selected and converted into grayscale. Conversion to grayscale further reduces the amount of computation.

Fig. 1 Frames extraction from the video

A. Frame 600

B. Frame 00

C&D.Frames numbering 600 and 675 are subtracted from the background

Fig. 2 left to right and top to bottom

Further above reference frames, which are consecutive, are selected and converted into grayscale. Conversion to grayscale further reduces the amount of computation.

The next steps include preprocessing, moving edge detection, morphological operations, edge detection, vehicle segmentation, and corner detection.

3. Product Architecture

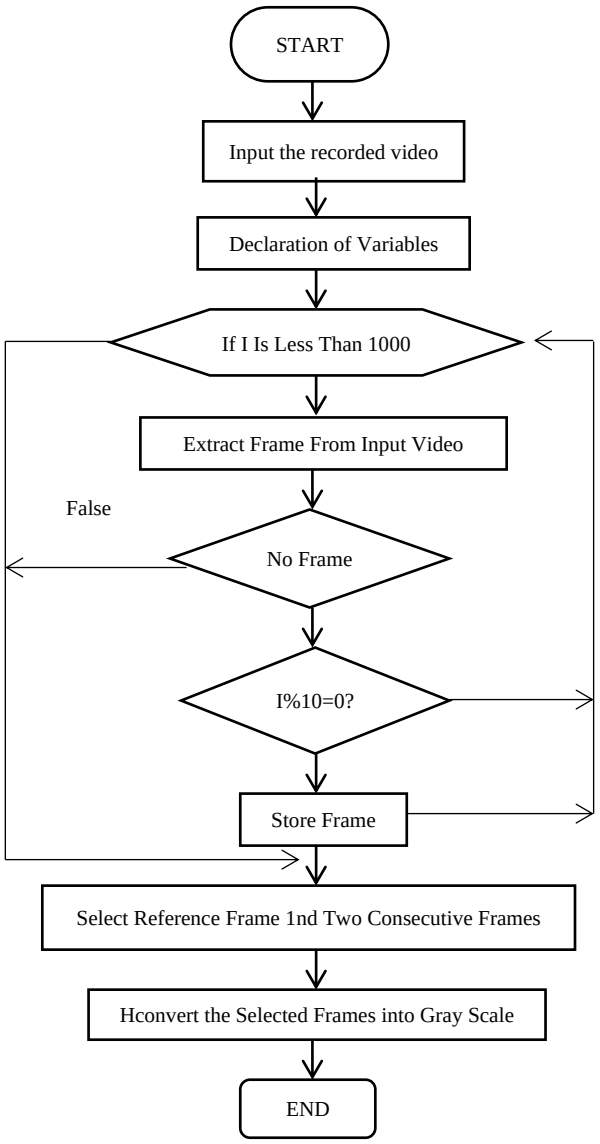

Fig. 3 Vehicle e architecture

In fig 3, a prototype system has been developed in a laboratory environment to generate random speed data using a mechanical wheel, measure the speed data with a Shimmer wireless sensor and transfer the data wirelessly to a client computer for further analysis. The Software has been developed using a Java-based socket programming technique to monitor the vehicle speed in a server computer and to send the data associated with a speeding vehicle to a remotely placed client computer. The graphical user interface (GUI) can visually display the speed of a vehicle at any particular time.

4. Sample Screens

Fig. 4 Home Screen

Fig. 5 Vehicle Moving

Fig. 6 Vehicle Speed Detection

5. Conclusion

The speed detection system can detect a vehicle's speed even with shadows. Fast processors or high-end smartphones can be seen as future vehicles' speed detectors. Since the cost of this system is many times less.

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