International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-8 Issue-2, July 2019

A Research For Tracking Overspeeding Vehicles

Arpita Kulkarni, Amulya K J, Radhika A D

Abstract: ***In this paper, we proposed an idea to estimate the speed of the vehicle and track over the speeding vehicle. We use two sensors one at the initial point and the other at the tracking point. When the sensor senses the moving vehicle it captures the image and a time recorder will record the time. We will compare the two frames captured at the two points if the frames match we estimate the time. If the estimated time is less than initially fixed time-limit then the vehicle is considered to be over speeded and will track that vehicle.***

Index Terms: motion detection sensor, time recorder, red color inverter, grey image converter, the binary matching algorithm

I. INTRODUCTION

India is a developing country; our government is planning to develop smart cities in India. Smart city includes smart services like smart traffic management. Traffic management is nothing but controlling and managing of all traffic of vehicles and foot traveler around the developing area, thus ensuring public safety. Proper and better traffic management will ensure that traffic flows evenly and systematically and it also plays the main role in preventing global warming. Maximum of the disastrous accidents are due to over speeding of vehicle. As the speed of the vehicle increases, the possibility of accident and injury also increases. The vehicle moving at high speed needs large distance to stop when the vehicle skid and controlling of such vehicles is difficult while the vehicle moving at low speed stops immediately and controlling of such vehicle is easier. Nowadays youths are fascinated in driving the vehicles at high speed this leads to violation of traffic rules and regulation. If the traffic management tracks the over speeding vehicle, and impose fines on drivers of such vehicle, they won't drive at high speed from next time and they will follow traffic rules and regulation strictly, thus the number of accidents and injuries can be reduced to a certain extent ensuring public safety.

Revised Manuscript Received on 30 July 2019.

***** Correspondence Author

Arpita Kulkarni*, Department of Computer Science and Engineering, Vidyavardhaka College of Engineering, Mysuru, Karnataka. (E-mail: arpitakulkarni1998@gmail.com)

Amulya K J, Department of Computer Science and Engineering, Vidyavardhaka College of Engineering, Mysuru, Karnataka. (E-mail: amulyakj03@gmail.com)

Radhika A D, Department of Computer Science and Engineering, Vidyavardhaka College of Engineering, Mysuru, Karnataka,

II. EXISTING METHODOLOGY

A. Manual Method

In this method police manually uses speed guns to check the speed of the moving vehicle. And in one more method, the hardware sensors (which is used to detect the speed of the vehicle) fixed initially inside the car.

B. Interceptor

In interceptor 2 types of radar guns are used. They are regular radar (frequency radar) and light detection and ranging radar(LIDAR). They use radio transmitters and receivers in radar guns. Radar guns give a radio message and then get home the same message as the item bounces. When it bounces away, the radar rate is distinct from the one acquired difference the radar gun will calculate the object speed. Doppler shift is the phenomenon used in radars. Frequency-based radar- when we are using these radars, it Should be in stationary and should not be moving to measure the speed of the vehicle, frequency-based radar is not successful when the source is moving [1]. Because of this drawback in frequency based radars a new technology came into existence, LIDAR. Light detection and ranging radar- this uses laser beams instead of radio waves these are extremely accurate as they take several 100 samples infraction of a second. The currently roaming vans in Bengaluru are using light detection and ranging radar [2].

C. Using 7segment display

In the paper [3] they proposed a system of early detection, alert of the dangerous vehicles. This system includes an IR receiver, IR transmitter, Buzzer, and a Control circuit. In every location, the speed limit is set by the police. The control circuit calculates the time taken by the vehicle from one point to the other and displays on 7 segment display. If any vehicle crosses the speed limit then the buzzer sounds.

D. Drawbacks

1. As GPS tracks the vehicle the works are not comfortable to work as they feel that they are being monitored all the time this causes worker resentment.
2. To track the vehicle many uses GPS as the main tool, but the installation of the GPS causes more cost. For a small business, it causes a very huge amount to spend money on the installation of GPS [4].

III. IMAGE PROCESSING TECHNIQUES

In [5] they presented ReVISE device layout and evaluation that allows vehicle motion detection and speed measurement using already integrated wireless networks and without the use of any hardware.

This utilizes a multi-class SVM that classifies the ability to detect. First, they suggested two techniques for estimating velocity depending on a statistical technique that relies on changing the signal strength when the car arrives and the other method is focused on curve fitting technique that reflects the relationship between the velocity of the car and the signal strength.

In [6, 16] for traffic regulation, they provided vehicle detection, monitoring, and speed evaluation. In this paper, they proposed the identification, monitoring, and estimation of the shifting vehicle speed. Considering the constraints of the current system, such as noise and light sensitivity, etc., a novel background subtraction design was provided in this article for shifting vehicle identification, considering strength, changing pixel position, etc. After further subtracting the backdrop picture, the enhanced morphological technique focused mainly on dilution and dilution as produced extra powerful and accurate predicted system. Later the vehicle identification enabled monitoring and speed measurement with the assistance of red dot using region props feature accompanied by velocity estimation. This paper focuses on vehicle identification and monitoring on single-lane roads and may be created for multi-lane structures in the future.

IV. SYSTEM ARCHITECTURE

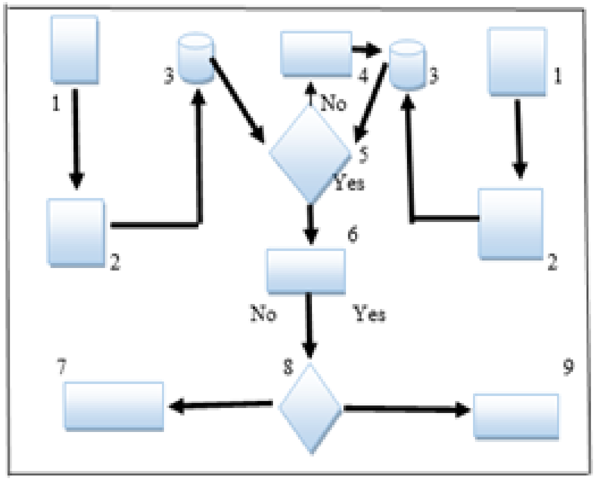

Figure 1. Proposed System Architecture

1. image capture and time recording
2. pre-processing
3. database
4. search for matching the frame
5. if frame match
6. calculate T
7. vehicle not over speeded
8. if T < T limit
9. vehicle over speeded

A. Hardware

- Motion detection sensor
- Time recorder
- Camera

V. PROPOSED METHODOLOGY & RESULTS

A. Image Capture and Time Recording

A motion sensor is an electronic device used to identify physical motion in a specified region and transform movement into an electronic message. This sensor will be placed at the signal when the vehicle passes the signal, the sensor senses the moving object and captures the image of the vehicle and it notes the time at which the image is captured [7].

B. Preprocessing

Red color inverter: This procedure is added to the images obtained, thereby increasing the pixel strength in the region of concern. Region of concern includes most white pixels of colour. The intensity of pixels of the region of interest is increased and other than that region the intensity is decreased by applying this red invert operation.

Grey image converter: after red color inverter operation grey image converter is applied. The intensity of the region of interest is increased after the background subtraction.

Cropping: The gray screen is used to extract the unwanted region from the picture [8].

Background subtraction: This procedure is used to identify objects in the foreground. Subtraction of the background is introduced to a gray picture [9,10].

Threshold and noise removal: threshold operation is applied after the background subtraction. This procedure allows the picture to be converted into a binary image. To extract sound from the picture, an average matrix is used.

C. OCR

Optical character reader (optical character recognition) is the electronic or mechanical transformation of handwritten, typed or published document pictures into encoded data by the device [11, 12].

D. Character Segmentation

Character Segmentation segments the character from extracted number plates. It leaves all the extra spaces from right to left and top to bottom [11].

E. Binary conversion

1) Image segmentation

Binary images are obtained by image segmentation from the color images. Image segmentation is the method of assigning two or more categories to each and every object in the picture. If there are more than two categories, several binary images are acquired. Otsu's technique is one of the easiest types of picture segmentation. This technique gives backdrop or foreground images depending on the strength of the gray scale. Another technique is the computation of the catchment. Edge detection is the method of generating a binary pixel picture allocated to border pixels and this is the first phase in the further segmentation [13].

2) Skeletons

Skeletonization or thinning produces binary images which consist of pixel white lines. The endpoints and branch Points can be extracted, and the extracted image is converted to a graph [14].

3) Interpretation

The analysis binary valuation of the pixel is device-dependent. Some schemes display the chip point 0 as brown and 1 as yellow, while others regard the price [15, 16] as reversed.

F. Binary matching algorithm

```
PREPROCESS (P, m)
M ← 1^m 0^(k-plast)
for j = 0 to k-1 do
Last[j] = [(m+j)/k]-1
for h = 0 to last[j] do
Patt[j, h] ← (P [h] >> j)
Mask[j, h] ← (M[h] >> j)
if h > 0 then
Y ← Patt[j, h] | (P [h − 1] << (k − j))
Patt[j, h] ← Y
X ← Mask[j, h] | (M[h − 1] << (k − j))
Mask[j, h] ← X
return (Patt, Last, Mask)
```

The Binary-Naive algorithm for the binary string matching problem [16].

```
Binary-Naive (P, m, T, n)
(Patt, L, M) ← Preprocess (P, m)
s ← j ← w ← 0
while s < n do
i ← 0
while i < L[j] and
Patt[j, i] = (T[w + i]&M[j, i])
do i ← i + 1
if i = L[j] then Output(s)
j ← j + 1
if j = k then
w ← w + 1
j ← 0
s ← s+1
```

G. Estimation of speed

All the above-mentioned procedures are performed both at the initial and the final point. then the frames and the time will be stored at their respective database. If the frame from the initial point match with the frame in the final point, then the time will be calculated

i.e., $T= T_{op} - T_{ip}$

where T_{fp} is time at the final point

The t_{ip} is time at the initial point

If T is less than the time limit that is initially fixed for a particular distance, the vehicle is considered to be over speeded and track the over speeded vehicle. Else the vehicle is not over speeded.

VI. CHALLENGES

The challenge in this, all the data that was recorded in the initial point should reach the final point and calculate the time T before the vehicle passes the final point.

VII. CONCLUSION

In this, we proposed a method for tracking the over speeded vehicle using Image Processing and sensors. This is done by capturing the image of the vehicle and pre-processing both at the initial and final point and comparing the image if it matches then time T is calculated. Based on T calculated we will decide whether the vehicle is over speeded or not.

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