

Accident Detection in Live Surveillance

Vandana Choudhary

Received: 12 December 2018 Accepted: 3 January 2019 Published: 15 January 2019

Abstract

With the increase in number of vehicles in the country vehicle detection is an important in road traffic management system. Different traffic accident causes such as vehicle overspeeding, wrong way driving, collision and accident can be detected by CCTV installed on roads. The results obtained from traffic parameters can be applied for vehicle tracking, vehicle classification, parking area monitoring, road traffic monitoring and management etc. The main objective of this project is to decrease the deaths caused by accident occurring because over speeding, wrong war driving by ensuring public safety and also a building a better system for managing the traffic on the roads. The aim of this paper is to develop a system that can detect the vehicle accident which are caused by overspeeding, wrong way driving and collision detection on city roads. A prototype system is developed and tested.

Index terms— deep learning, heatmap, openCV, ROI, SSD model, tensor fl ow.

1 Introduction

With the increasing number of vehicles on the road there is a need to develop a system which provides information of vehicles to the driving assistant system in intelligent transportation system. It is an essential building block for traffic monitoring and many other applications. Smart traffic monitoring system is incomplete without the existence of system that is capable of detecting any traffic problems automatically, such as traffic rules violation and traffic jam. Thus, the problems solved by this project are:

2 a) Accident in India

In our country road accidents is a negative externality associated with expansion in road network, motorization and urbanization in the country. A major public health problem is the road traffic injuries, leading to loss of life and forever sufferings to the family of the victim causing disabilities and hospitalization. In case of India, road injuries is the number one causes of death and health loss among persons of age group 15-29 years. During the calendar year 2016, the total number of road accidents is reported at 4,80,652 causing injuries to 4,94,624 persons and claiming 1,50,785 lives in the country. and their number increases around 10% annually. Rail and coastal shipping account for about 32 per cent and 7 per cent, respectively, while the share of inland waterways transportation and air is less than 1 per cent each. Railways are a relatively cheaper mode of

3 PROPOSED SYSTEM

The proposed system will help in developing a smart city transportation system that is capable of sending alert to authorities by detecting the speeds of the car, car moving in wrong direction and collision which can help us in decreasing death caused by road accidents. Traffic jam can also be detected by slow speed and high volume of vehicles, and we can estimate road profile based on it. The road accidents can be reduced by speed detection of a vehicle and wrong direction of moving vehicle thus help to stop the violation of traffic rules to maintain smooth flow to traffic on city roads.

4 a) Software and Libraries used

The main libraries used in this project to implement different modules together are: Python 3

42 Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is designed to
43 be highly readable. The other languages use punctuation, but python uses English keywords instead. Python
44 3.0 is a new version of the language that is incompatible with the 2.x line of releases.

45 5 OpenCV

46 OpenCV (Open Source Computer Vision Library) is a machine learning open source computer vision software
47 library. OpenCV is built to increase the use of machine perception in commercial sector by providing a common
48 infrastructure for new technologies and computer applications. By using this library code can be modified easily
49 and utilized for business.

50 6 TensorFlow

51 TensorFlow? is a high-performance numerical computation open source software library. The TensorFlow Object
52 Detection API is built on top of TensorFlow open source frame work that makes it object detection models easy
53 to construct, train and deploy on the projects.

54 7 III.

55 8 Working of Proposed System

56 The proposed system consists of 3 different modules. These are explained below:

57 Car Speed Module detects the speed of the car ensuring the road safety and reduce in the number of road
58 accidents caused due to overspeeding.

59 Collision Prevention Module detects distance between car and object and help to pre-charge the brakes in
60 conjunction with an automatic braking or emergency brake assist system.

61 Wrong Way Detection Module detects car moving in wrong direction by mainly the two causes overtaking and
62 lazy/reckless driving Accident Detection Module detects accident caused due to overspeeding, wrong way driving.
63 Also, it sends alert to authorities so that on time help can be provided to the road accident victim.

64 9 a) Module 1: Car Speed

65 In this the vehicle is detected by frames using OpenCV and then with the help of the tensorflow detection api
66 these frames are processed and vehicle is detected. After the Vehicle is detected its image is stored and then
67 check for the direction of the vehicle by using the approach defined in car count module.

68 The main area of interest for us is when the car crosses the ROI line area. The pixel length is calculated by
69 subtracting the bottom position with the bottom position of the detected car. After that the real scale length is
70 calculated by multiplying pixel length with 44 to convert the pixel length in meter.

71 Total time passed is also calculated by subtracting the current frame number at which the car is detected from
72 the current frame number detected lists. To know the scale of the total time elapsed for a vehicle to pass through
73 ROI area (24 = fps) the Total time passed is multiplied with 24.

74 Finally, the speed can be computed by: $speed = \frac{real_length}{real_time_passed} / constant$

75 To get the vehicle speed in kilometer units, compute the following mathematical calculation: $speed = \frac{speed}{6 * 40}$
76

77 10 : Collision Prevention

78 A collision Detection system, also known as a precrash system, forward collision warning system, or collision
79 mitigating system, is an automobile safety system designed to prevent or reduce the severity of a collision.

80 The camera on the dashboard detect he object by using TensorFlow object detection api and then calculate
81 the distance relative to object from camera. If the distance is less than 0.5 m then the warning is issued on the
82 car dashboard with the alarming sound in the speakers of the car.

83 Having analyzed the results the loss of speed after impact depends on the initial speed of a car and the angle
84 of collision. The bigger collision angles the higher speed loss is after the hit. From the car movement trajectories
85 after the modeled accident it is observed that the character of the trajectory depends on: the angle of collision,
86 the car speed before the impact. The bigger the angle between the movement direction and the road fencing, the
87 bigger the deflection of the trajectory appears.

88 11 Figure 5 c) Module 3: Wrong Way Detection

89 Wrong way driving crashes occur infrequently, accounting for almost 3 percent of all crashes, but they have a
90 very high likelihood of resulting in fatal or serious injury crashes. The causes associated with wrong-way crashes
91 tend to make them spatially concentrated to particular stretches of roads, making it important to identify and
92 monitor such high-risk locations. The detail about two popular scenarios of people driving in wrong direction are
93 as follows: Scenario 1 (Overtaking): IDEAL: According to the traffic rules of India, there should be no overtaking
94 when there is a single lane for both the directions of traffic as shown in the figure 6. The solution model will
95 consist of two blocks:

96 ? First Block: Intelligence to detect whether there is any vehicle driving in wrong direction using Computer
97 Vision. ? Second Block: Using the output generated from the first block, the second block can be used to ring
98 the siren and glow the red LED light whenever wrong direction driving vehicle is detected on either/both sides
99 of the road.

100 By implementing the above solution model, we can alert the vehicles on either side of the road to be extra
101 careful. In this project, we will only deal with the first block (computer vision part) of the abovementioned
102 model. In this the vehicle is detected by reading frames at multiple instances from webcam to different variable
103 frames using OpenCV and then with the help of the tensorflow detection api these frames are processed and
104 vehicle is detected. After the Vehicle is detected its image is stored in different frame. And reading of frames at
105 multiple instances from camera and then these frames are stored at different variables.

106 The difference in frames is calculated. And calling of the difference function occur with the opening of
107 histogram of the two main images store.

108 When the accident occurs the two-image frame gets overlapped with other rms value of the two images opened
109 before is calculated. If the RMS value of the images is less than 250, then there is a similarity between images.
110 i.e., Scene similar to an accident is found and alert to authorities is send and frame is updated.

111 Finally, the RMS can be computed by: $RMS = \text{math}$.

112 12 FUTURE SCOPE a) Car Speed

113 Speed estimation process will give an idea to build a smart system for traffic monitoring that is capable of
114 detecting, counting, classifying, and estimating speed of vehicle object from video data.

115 This will help us to automatically generate over speeding ticket which will reduces the number of traffic police
116 officers needed to deploy in the real field for checking speeding vehicles.

117 13 b) Collision Prevention

118 The collision Detection system can be used pre-charge the brakes in conjunction with an automatic braking or
119 emergency brake assist system.. That can provide the driver with a substantial amount of braking power the
120 moment he depresses the pedal, which may effectively reduce the severity of an accident.

121 This can helps the driver be more attentive to the road, react sooner to dangerous situations, and have added
122 peace of mind while operating a vehicle, especially at high speeds. Also, it will function reliably in any weather
123 conditions, making driving in fog or rain less risky.

124 14 c) Wrong Way Detection

125 Upon installation, if a wrong-way vehicle entry is detected, the system would immediately alert the wrong-way
126 driver of the error and notify the Authority. Once the wrong-way entry is confirmed, law enforcement would
127 receive immediate notification of the exact entry point. They then could use their protocols and procedures to
128 stop the wrong-way vehicle prior to a crash. While the system aims to notify a driver of their mistake, the focus
129 is to enable law enforcement and Authority to track a wrong-way vehicle on the highway system in real time.
130 The chances of successfully stopping a wrong-way vehicle before a collision become greater when officers know
131 where the vehicle is and where it might be headed.

132 15 d) Accident Detection

133 Accident Detection can enable us to send alert to the authorities on time so that help can be given to the road
134 accident victim and decrease the death caused due to road accidents. Also this system can be interfaced with
135 vehicle airbag system that prevents vehicle occupants from striking interior objects such as the steering wheel
136 or window. This can be also be developed by interconnecting a camera to the photograph of the accident spot
137 makes the tracking easier.

138 16 V. CONCLUSION

139 This system is capable to detect speed of the car, collision prevention, wrong way direction and accident detection
140 together. The system detects different causes of accidents and send alert to the authorities. It detects the speed
141 of the car by capturing the image detected by the camera. The main aim of this project is to decrease the
142 chances of loss of lives in accident occurring because over speeding, wrong way detection and collision detection
143 and hence improve public safety and also a better system for the managing the traffic on the roads. The system is
144 cost-effective, scalable, fast, at a distance measuring system that can be easily housed in present live surveillance.
145 Apart from this, it also gives an opportunity for transportation engineers and decision makers to plan building of
146 road and can be helpful both in case of personal as well as business purpose, to improves safety and security of the
147 person on road. ACKNOWLEDGMENT I am highly indebted to my project guide, Mrs. Vandana Choudhary
148 for her constant supervision as well as for providing necessary information regarding the projects & also for their
149 support in completing the project. The co-operation is much indeed appreciated. ¹

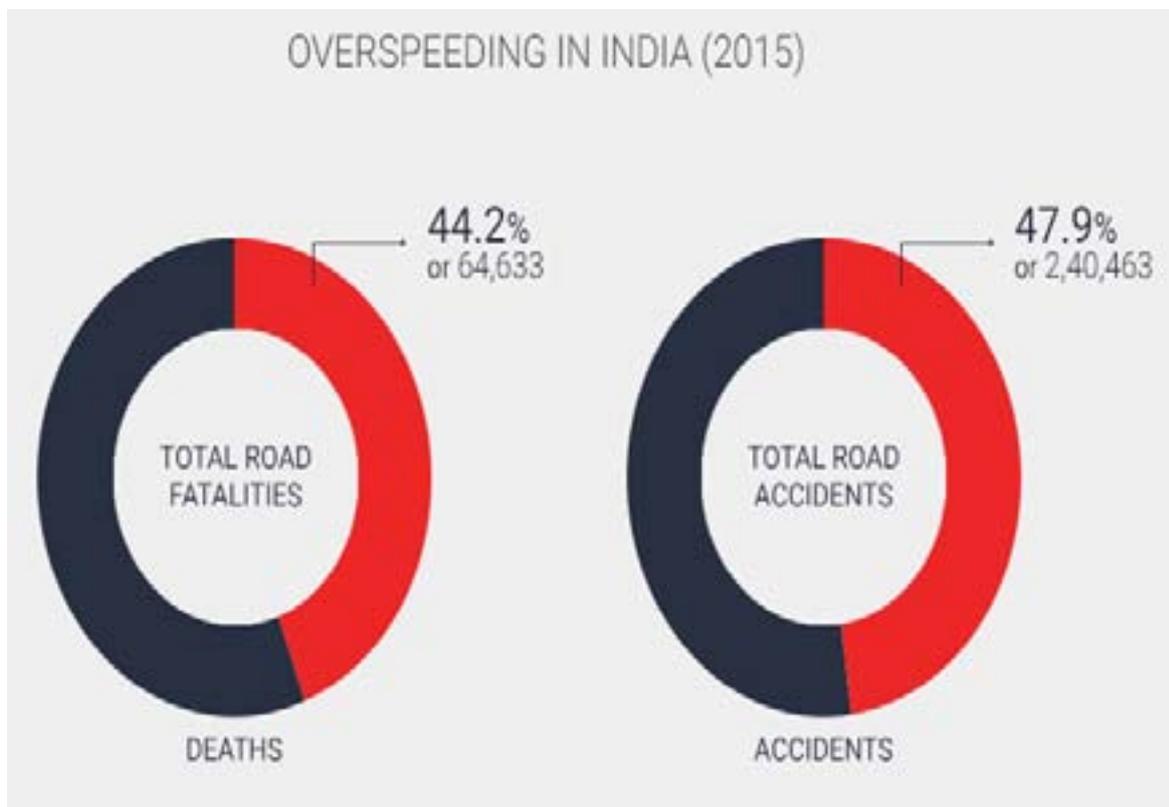


Figure 1:



Figure 2: Figure 1 c

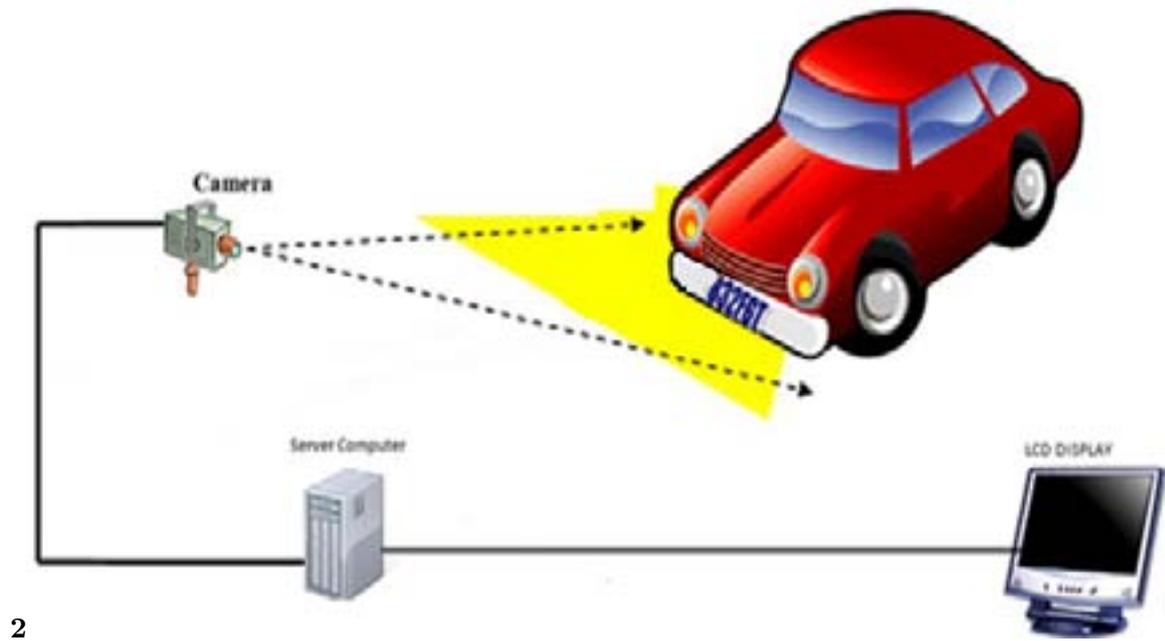


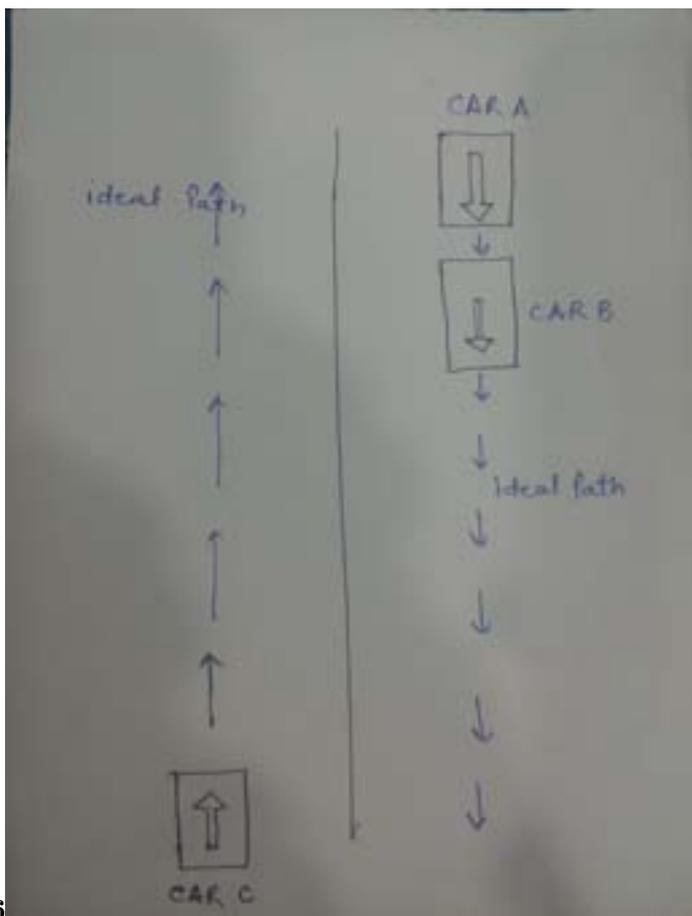
Figure 3: Figure 2 W



Figure 4: Figure 4 Global



Figure 5:



6

Figure 6: Figure 6 :

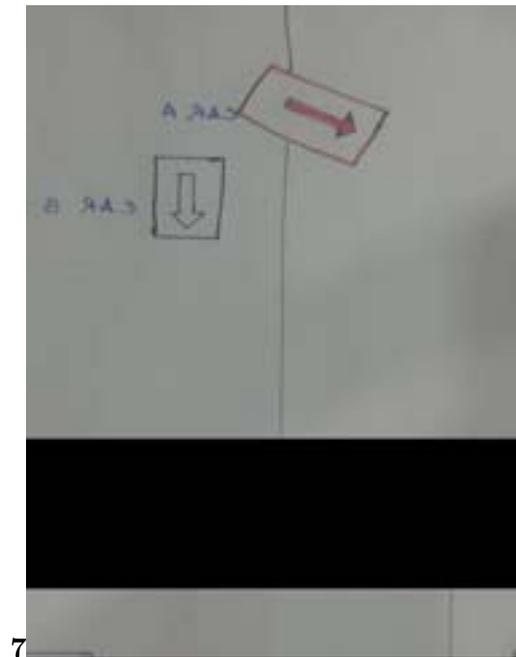


Figure 7: FigureFigure 7

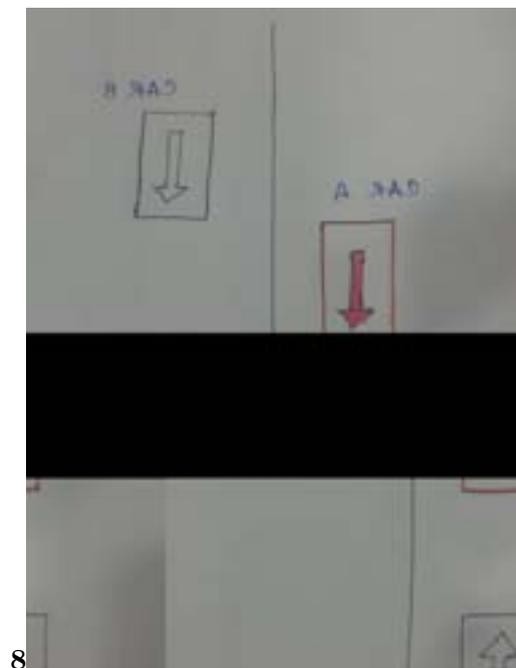
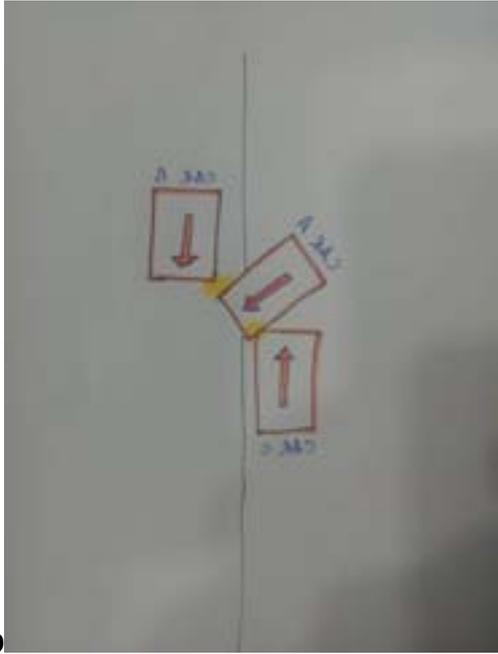
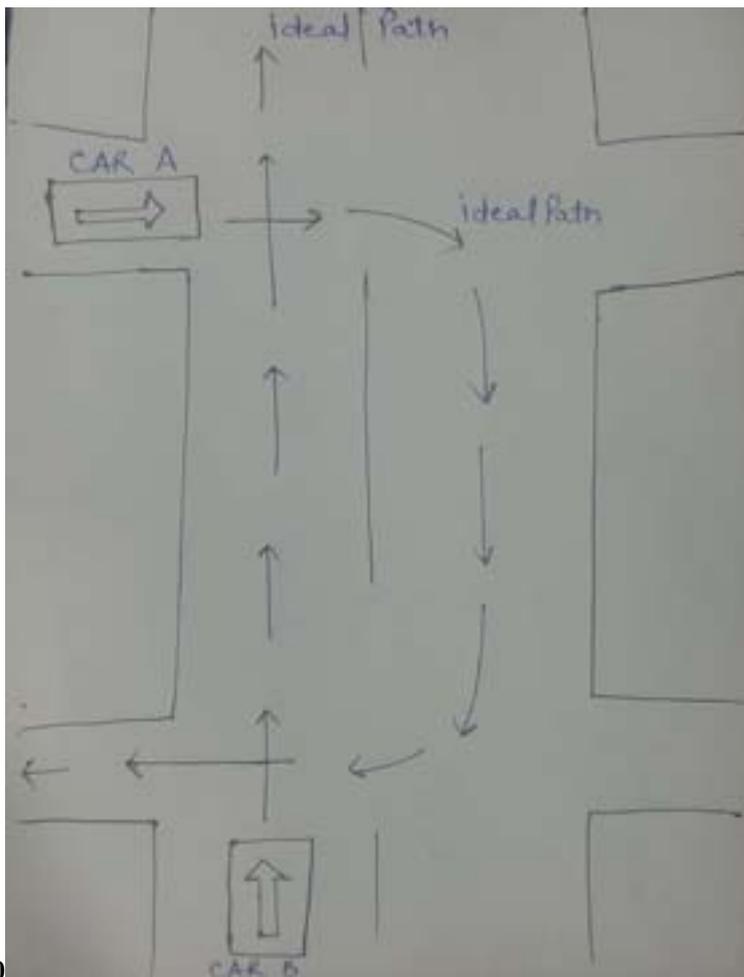


Figure 8: Figure 8 :



9

Figure 9: Figure 9



10

Figure 10: Figure 10



Figure 11:

Accident Detection in Live Surveillance
Year 2019
6
Volume XIX Issue I Version I
)
(H
Global Journal of Computer Science and Technology

Figure 12:

150 □ , 10.1080/16484142.2004.9637965?needAccess=true. <http://airccse.org/journal/jcsit/>
151 [6214ijcsit16.pdf2.https://www.tandfonline.com/doi/pdf/10.1080/16484142.2004.](https://www.tandfonline.com/doi/pdf/10.1080/16484142.2004.9637965?needAccess=true)
152 [9637965?needAccess=true](https://www.tandfonline.com/doi/pdf/10.1080/16484142.2004.9637965?needAccess=true)