



JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Accident Prevention, Detection and Analytics

Vikramsingh Rathod

Department of Information Technology
Fr. Conceicao Rodrigues College of
Engineering
Mumbai, India
rathodvikram44@gmail.com

Project Mentor:

Mrs. Sarika Davare

Asst. Professor
Department of Information Technology
Fr. Conceicao Rodrigues College of
Engineering
Mumbai, India
sarika.davare@fragnel.edu.in

Nainam Shah

Department of Information Technology
Fr. Conceicao Rodrigues College of
Engineering
Mumbai, India
nainambshah133@gmail.com

Abstract: Road accidents have earned India a dubious distinction. With over 130,000 deaths annually, the country has overtaken China and now has the worst road traffic accident rate worldwide. Most of the road users are well aware of the general rules and safety measures while using roads but it is only the laxity on part of road users, which cause these accidents and crashes. Research shows the common causes of accidents on the road are driving under Influence (DUI), lack of alertness, reckless driving, distractions etc. This paper aims to alleviate some of these issues by proposing a system that aims to prevent and detect vehicular accidents, while providing analytics on the same. The proposed system tests the presence of alcohol in the drivers' breath and if detected over the limit, the driver is warned to stop and authorities are informed thereby preventing a potential accident.

Keywords: Accident Detection, Accident Prevention, Machine Learning, Accident Analytics.

Introduction: In India, over 1,46,377 people were killed in road accidents in the year 2017 alone, that is more than the number of people killed in all our wars put together. Most of these accidents happen due to the crashing of the vehicle with the divider or any other vehicle, due to over speeding, low lighting condition, drunk driving etc. Currently, there is no system that

tries to prevent the occurring of accidents and if accident has taken place, detect it immediately, so as to alert the concerned authorities in order to send the required help and assistance on time [3]. There exists a system which uses 360 degree cameras to detect and prevent accident, this system cannot be implemented in real life, for mass amount of vehicles, as it is not fiscally feasible [4]. The proposed system, on the other hand uses alcohol detecting sensors, GPS module, and other minor hardware.

According to statistics, the most common reasons for accidents are driver's recklessness and late response from the emergency services. The implementation of an automatic road accident detection and information communication system in every vehicle is very crucial.

Objectives:

1. Accident Prevention: The accident prevention module takes in to consideration the major factor for accidents viz. Driving under the influence of Alcohol. In this module the accidents are prevented from happening by not allowing a drunk driver to drive the car.
2. Accident Detection: This module of the system uses Machine Learning and hardware to detect an accident. The factors which will indicate

that accident has occurred are: deflation of air bags, deformation of the dashboard and deformation/cracking of the windshield.

3. **Analytics:** In this module, the data received from the sensor and accident/alcohol logs are analyzed to detect various important parameters.

Review of Literature:

1. *An Arduino based accident prevention and identification system for vehicles[1].*

In this paper an accident prevention system is being introduced with accident identification for vehicles that gives a higher probability to reduce the accidents taking place every day on roads and at the same time if accident occurs, the system locates its place and will automatically inform those people who will be able to take immediate actions. Here, an Arduino based system has been developed by using Global Positioning System (GPS) and Global System for Mobile Communication (GSM) technology. Research in accident prevention will help, preventing vehicular accidents, this current scenario does not take in to consideration the accidents caused to drunk driving which is a serious offense and one of the major cause of accidents.

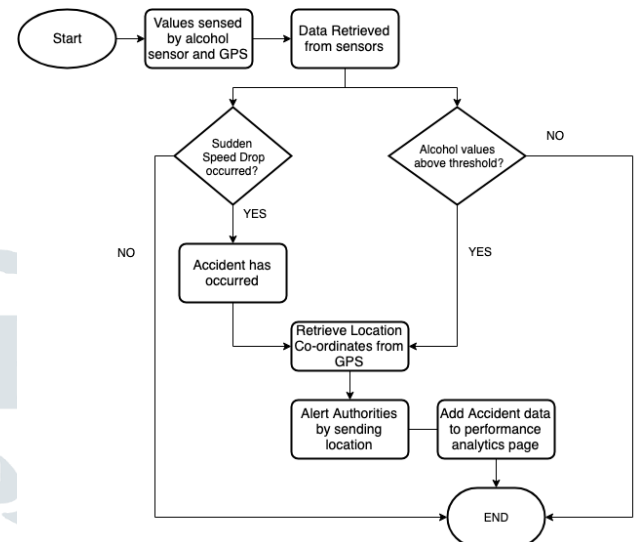
2. *Real Time Vehicle Tracking using GPS and GSM Technology[2]*

This paper proposed to design a vehicle tracking system that works using GPS and GSM technology, which would be the cheapest source of vehicle tracking and it would work as anti-theft system. It is an embedded system which is used for tracking and positioning of any vehicle by using Global Positioning System (GPS) and Global system for mobile communication (GSM). The GPS modem will continuously give the data i.e. the latitude and longitude indicating the position of the vehicle.

Design Methodology and Algorithm:

1. **Accident Prevention:** The accident prevention module takes in to consideration the major factor for accidents viz. Driving under the influence of Alcohol. This is achieved with the help of alcoholic sensors (MQ-3) which gives a reading in the range of few hundreds to a thousand. The sensor

equivalent of the limit is 500 and therefore whenever the sensor reading exceeds the limit an alert is sent to the concerned authorities and vehicle owners so that an appropriate action is taken. The data of the driver which includes the phone number, registration number of the vehicle, latitude and longitude from the GPS is sent to both the authorities as depicted in flowchart below.



2. **Accident Detection:** Accident Detection will be performed with the help of a machine learning model trained on ResNet50. It efficiently predicts the accidents with an accuracy of 89%. Data sets for classification are acquired by collecting pictures of the dashboard of the vehicles that have met with an accident and the vehicles that haven't.



Figure-1: Dataset (Accident)



Figure-2 Dataset (No Accident)

3. **Analytics:** This module includes the web application and analysis performed. The web application is divided in to two major parts viz. a platform for police authorities and the other dashboard for fleet owners of vehicles. The police authorities have access to a log of accidents and alcohol level exceeding incident. The officer can also manually lodge/register an accident or add an alcohol incident. The major functionality of the dashboard is the continuous listening of socket events which means that as soon as an accident has occurred or as soon as a driver exceeds the alcohol limit a pop up alert is given to the officer along with the details of the location where accident has taken place.

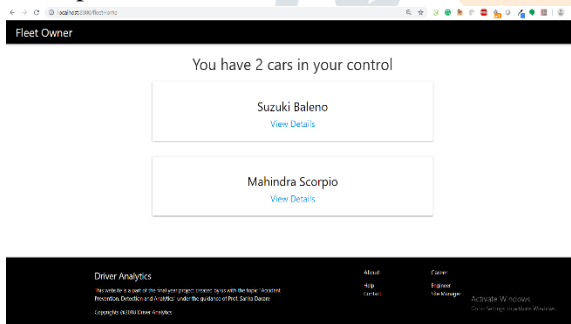


Figure -3: Fleet Owner Dashboard - 1

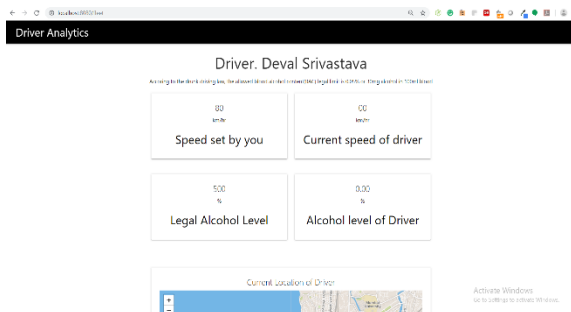


Figure-4: Fleet Owner Dashboard - 2

Machine Learning Model and ResNet50: Deep learning CNN models to train and test, each input image will pass it through a series of convolution layers with filters, Convolution is the first layer to extract

features from an input image. It is a mathematical operation that takes two inputs such as image matrix and a filter or kernel. When the stride is 1 then we move the filters to 1 pixel at a time. When the stride is 2 then we move the filters to 2 pixels at a time and so on [5].

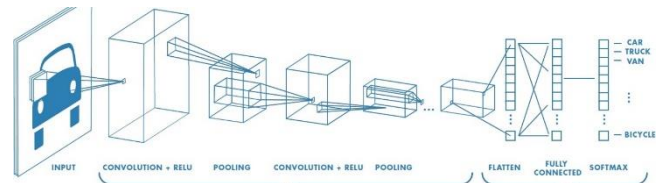


Figure-5: CNN Structure

Sometimes filter does not fit perfectly fit the input image. We have two options: Pad the picture with zeroes that is zero padding or Drop the part of the image where the filter did not fit. This is called valid padding which keeps only valid part of the image.

$$G(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{x^2}{2\sigma^2}}$$

Figure -6: Gaussian Blur Equation

To remove noise and smoothen the image we can Gaussian blur, which is done via convolving the image with the Gaussian function this is also known as the Weierstrass transform.

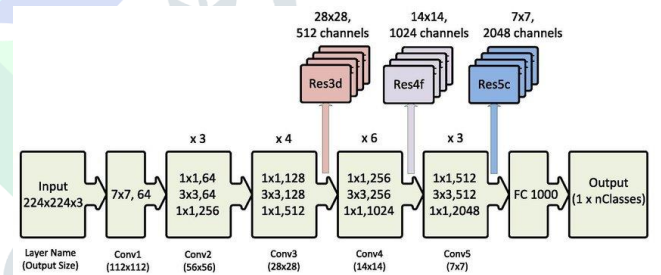


Figure -7: ResNet50 Architecture

ResNet-50 is a convolutional neural network that is trained on more than a million images from the ImageNet database. The network is 50 layers deep and can classify images into 1000 object categories, such as keyboard, mouse, pencil, and many animals. As a result, the network has learned rich feature representations for a wide range of images. The network has an image input size of 224-by-224 [6].

Implementation and Results:

For Accident Prevention the website alerts the authorities about the details of the alcohol incident. Police authority will get an alert about the coordinates

of the driver and a complaint will be lodged.

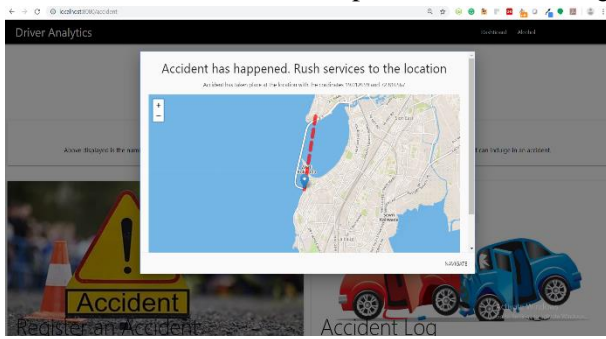


Figure -Accident Prevention by Alcohol

For Accident detection parameters like sudden speed drop and results from the ML module are taken in to consideration.

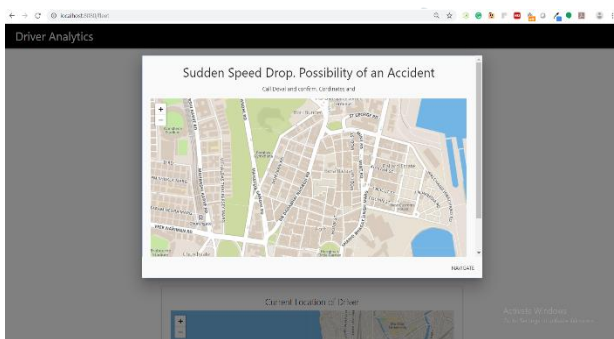


Figure-8: Speed Drop Check



Figure-9: Accident Detection model result - 1



Figure-10: Accident Detection model result – 2

Analytics section includes information about parameters like number of accidents per month or year,

number of alcohol incidents per month or year is also listed in graphical format.

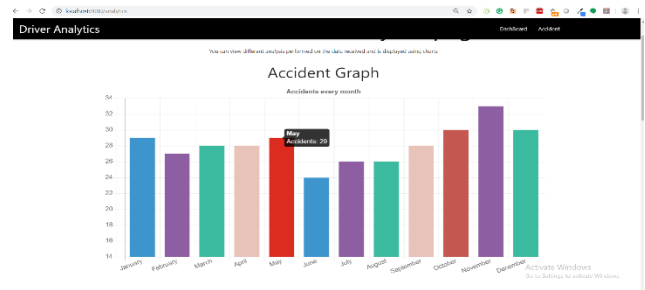


Figure -11: Analytics - 1

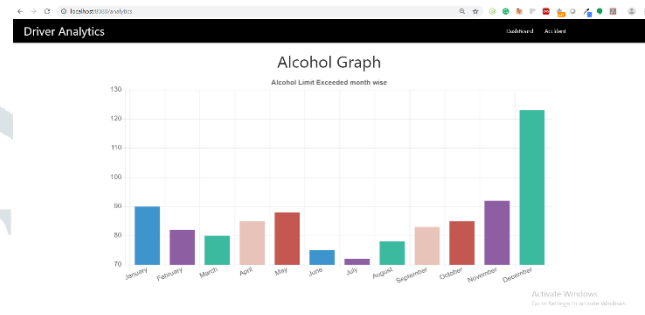


Figure-12:Analytics – 2

Conclusion: The proposed system makes use of convenient hardware for accident prevention, as compared to the current technology used which is expensive and difficult to maintain. The system detects accidents by considering factors like deformation, airbag inflation, speed drop and other factors for improved accuracy. Furthermore, accident detection module has achieved an accuracy of 89% on the test set. Lastly the web application accurately shows the location of the accident or alcohol incident. The web application supports registering alcohol and accident logs followed by an intuitive dashboard for fleet owners of vehicle.

References:

[1] M. S. Mahamud, M. Monsur and M. S. R. Zishan, "An arduino based accident prevention and identification system for vehicles," 2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC), Dhaka, 2017.

[2] Mistary, P. V., & Chile, R. H. (2015). Real time Vehicle tracking system based on GPS and GSM technology. 2015 Annual IEEE India Conference.

[3] <https://timesofindia.indiatimes.com/india/india-way-off-road-safety-targets-for-2020-road-accidents-still-kill-over-a-lakh-a-year/articleshow/65765549.cms>

[4]

<https://www.thesun.co.uk/motors/4956133/incredible-moment-terrifying-rally-car-crash-is-captured-on-360-degree-camera/>

[5]

<https://medium.com/@RaghavPrabhu/understanding-of-convolutional-neural-network-cnn-deep-learning-99760835f148>

[6]

<https://in.mathworks.com/help/deeplearning/ref/resnet50.html>

