ROAD ACCIDENTS AND THEIR PREVENTION

Introduction to Innovation Projects J Component Project

Course Code: PHY1999 - Slot – TE2

by

Naru. Rohith Reddy (18BIT0126)

VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

Department of Physics
School of Advanced Sciences
VIT, Vellore
Tamil Nadu - 632 014

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DEPARTMENT OF PHYSICS

SCHOOL OF ADVANCED SCIENCES

J Component Project

PHY1999

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Date:

Faculty Signature:

INTRODUCTION

Each year hundreds of people lose their lives due to traffic accidents around the world. Unfortunately, Iran ranks first in the world in terms of road fatalities and each year approximately thirty thousands of fellow countrymen lose their lives in these events .

The role of human factor in accidents cannot be ruled out; According to national statistics, in 90 to 95 percent of car accidents in Iran, human factor plays a pivotal role. In general, the driver fatigue accounts for 25 percent of accidents and approximately 60 percent of road accidents result in death or serious injury

In a study by the National Transportation Research Institute (NTSRB) in which 107 random car accidents had been selected, fatigue accounted for 58% of the all accidents. A main cause of fatigue is sleeplessness or insomnia.

Every year the lives of approximately 1.35 million people are cut short as a result of a road traffic crash. Between 20 and 50 million more people suffer non-fatal injuries, with many incurring a disability as a result of their injury.

Road traffic injuries cause considerable economic losses to individuals, their families, and to nations as a whole. These losses arise from the cost of treatment as well as lost productivity for those killed or disabled by their injuries, and for family members who need to take time off work or school to care for the injured. Road traffic crashes cost most countries 3% of their gross domestic product.

Traffic Collisions in India are a major source of deaths, injuries and property damage every year. The National crime records bureau (NCRB) 2016 report states there were 496,762 roads, railways and railway crossing-related traffic collisions in 2015. Of these, road collisions accounted for 464,674 collisions which caused 148,707 traffic-related deaths in India

Chart 4.1: Share of different vehicle types in road accidents 2017

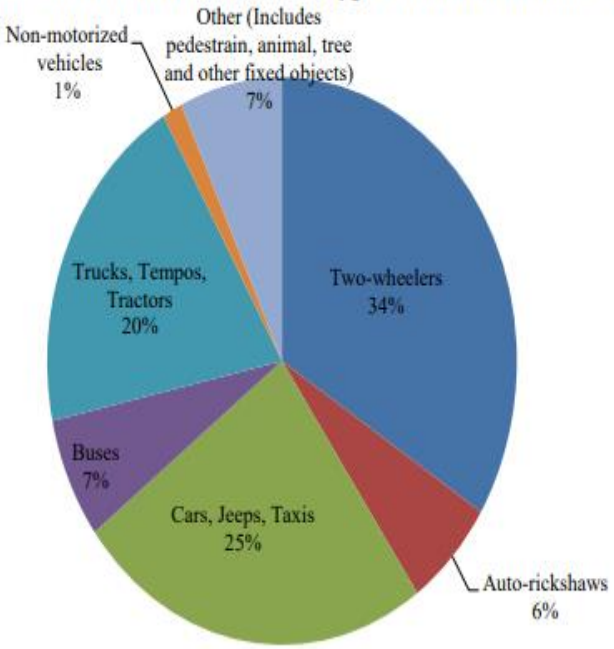
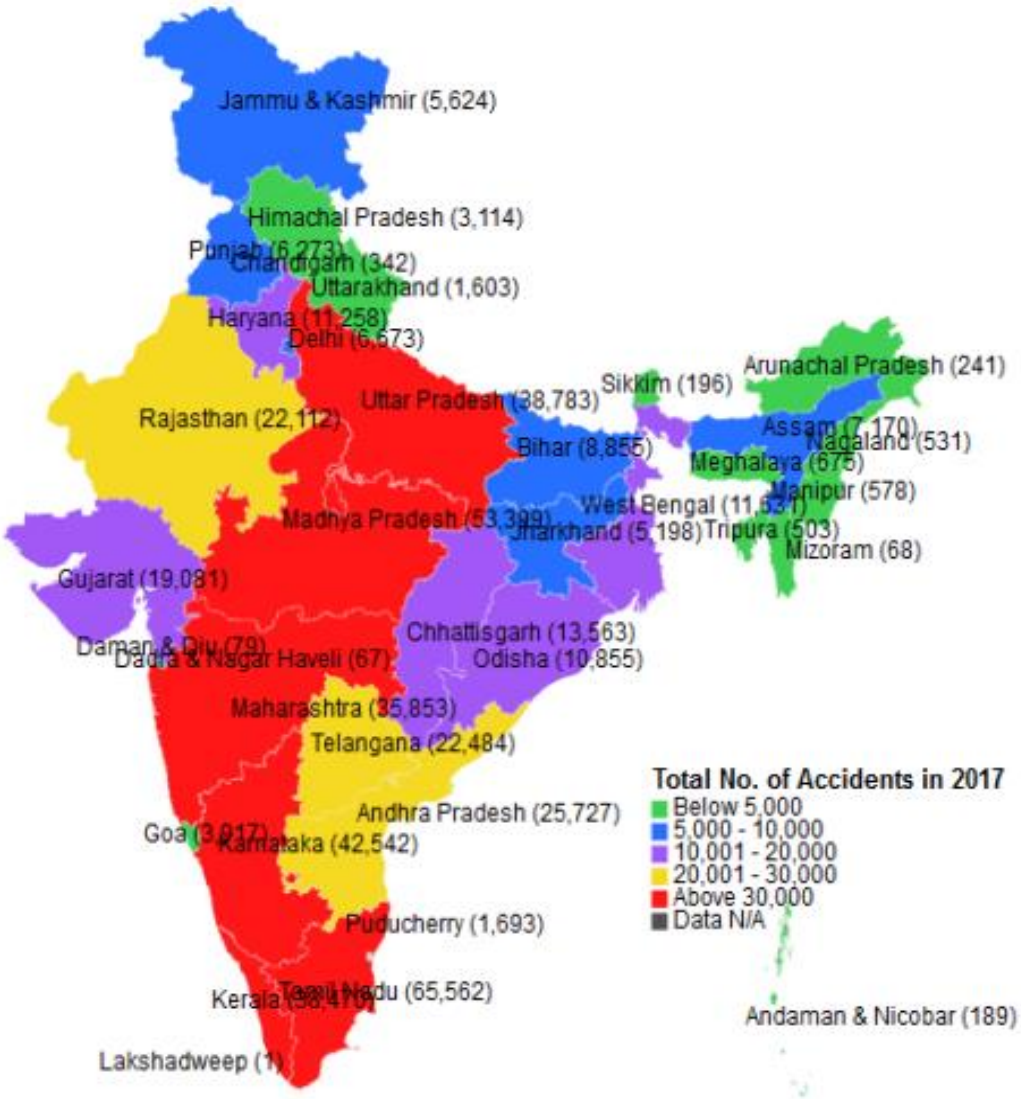


Table 1.1: Road Accidents, Registered Vehicles and Road Length in India (1970-2017)

Year	Road Accidents ('000)	Road Accident Deaths ('000)	Road Accident Injuries ('000)	Registered Vehicles ('000)	Road Length ('000 km)	Fatality rate (no. of accident deaths per 10,000 vehicles)	Vehicle density (no. of vehicles per km of road)
1970	114	15	70	1401	1,189	103.50	1.18
1980	153	24	109	4,521	1,492	53.09	3.03
1990	283	54	244	19,152	1,984	28.25	9.65
2000	391	79	399	48,857	3,316	16.15	14.73
2010	500	135	528	1,27,746	4,582	10.53	27.88
2015	501	146	500	2,10,023	5,472	6.96	38.38
2016	481	151	495	2,30,031	5,603	6.55	41.05
2017	465	148	471	NA	NA	-	-



Among other states, Delhi and Haryana showed a reduction of 1.8% and 1% accidents between September 2019 till January 2020, while accidents in Assam and Kerala increased by 7.2% and 4.9% respectively during the same months.

The states of Maharashtra, Chhattisgarh, Andhra Pradesh and Manipur saw accidents reduce by 5.4%, 4.7%, 6.4% and 3.4% respectively.

Indian roads witnessed 4,67,044 accidents in 2018, which claimed lives of over 1.5 lakh people, data from the ministry of road transport and highways has revealed.

India ranks 1st in the number of road accident deaths across the 199 countries reported in the World Road Statistics, 2018 followed by China and US. As per the WHO Global Report on Road Safety 2018, India accounts for almost 11% of the accident related deaths in the World.

The Motor Vehicles (Amendment) Act, 2019 is expected to bring down the scale of road accidents in India, by way of hefty penalties for violating traffic rules.

Among major changes, the fine for drunken driving has gone up from Rs 2,000 to Rs. 10,000 while driving without the seat belt now incurs a fine of Rs 1,000 as against Rs 100 levied previously. Cab aggregators can now be fined up to Rs. 1 lakh for violation of licensing rules.

Speeding or racing can now draw a fine of Racing can now draw a fine of Rs 5,000, while overloading of two-wheelers has seen a 20 times jump in penalty at Rs 20,000, including disqualification of driver’s license for three months.

MAJOR OBJECTIVE

The major objective of this project is to prevent accidents by today's technologies , and help the automobile to cope with that technology and then bring the new era of automobile which will work in an efficient manner in order to avoid accidents and ensure the safety of the people.

In a study by the National Transportation Research Institute (NTSRB) in which 107 random car accidents had been selected, fatigue accounted for 58% of the all accidents. A main cause of fatigue is sleeplessness or insomnia.

Drowsiness detection can be done in various ways based on the results of different researchers.

Once the eyes are located, measuring the distances between the intensity changes in the eye area determine whether the eyes are open or closed. A large distance corresponds to eye closure. If the eyes are found closed for more than number of threshold consecutive frames, the system draws the conclusion that the driver is falling asleep and issues a warning signal.

1. To study the causes of accidents and suggest corrective measures at potential location

2. To evaluate existing design

3. To compute the financial losses incurred

4. To support the proposed design and provide economic justification to the improvement suggested by the traffic engineer

5. To carry out before and after studies and to demonstrate the improvement in the problem.

Definition of the Problem

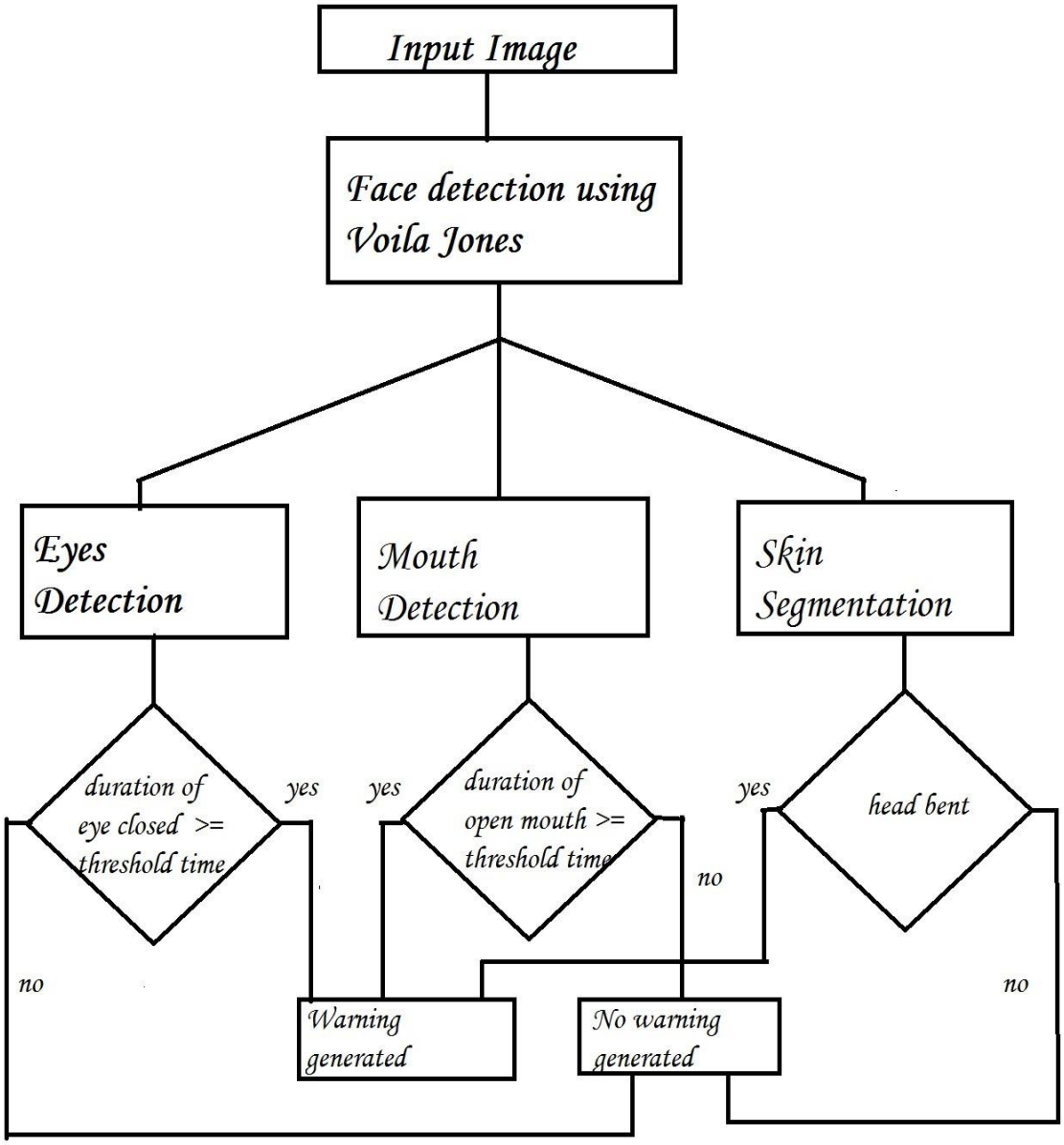
Road Traffic Injuries (RTI) ranked fourth among the leading causes of death in the world. Nearly 1.3 million people die every year on the world's roads and 20 to 50 million people suffer non-fatal injuries, with many sustaining a disability as a result of their injury.

Road traffic injuries are the leading cause of death among young people aged 15-29 years and cost countries 1-3% of the gross domestic product (GDP).

So the problem is every year many people gone to death because of the road accidents. Let us say if one person was drunken and he was driving a car then due to his unconsciousness he met with an accident . In case what if he leads to death of others. So , majorly in India the population is huge and the youth percentage is very high as we know the youth are outrageous and they will go for racing etc.. . which lead them to get in with accidents.

METHODOLOGY

Face Detection using Voila Jones Algorithm:



Hardware & Software Requirements

The requirements for an effective drowsy driver detection system are as follows:

•A non-intrusive monitoring system that will not distract the driver.

•A real-time monitoring system, to ensure accuracy in detecting drowsiness.

•A system that will work in both daytime and nighttime conditions.

•A dedicated system with about 1 GB RAM for the efficiency of the system because due to internal processes of computer, the application will run relatively slow.

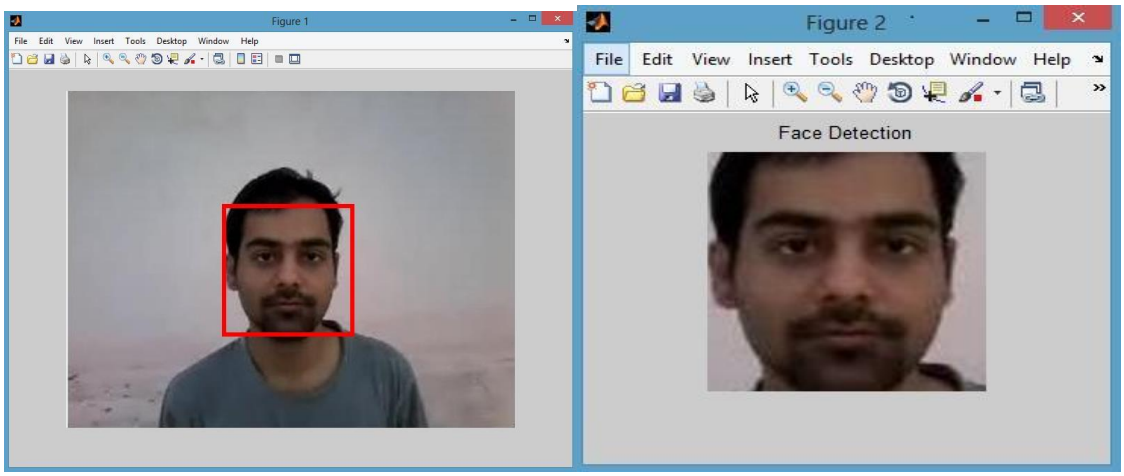
The whole system is implemented on MATLAB.

The Viola–Jones object detection framework is the first object detection framework to provide competitive object detection rates in real-time proposed in 2001 by Paul Viola and Michael Jones .Although it can be trained to detect a variety of object classes, it was motivated primarily by the problem of face detection.

In the detection phase of the Viola–Jones object detection framework, a window of the target size is moved over the input image, and for each subsection of the image the Haar-like feature is calculated.

This difference is then compared to a learned threshold that separates non-objects from objects. Because such a Haar-like feature is only a weak learner or classifier (its detection quality is slightly better than random guessing) a large number of Haar-like features are necessary to describe an object with sufficient accuracy.

In the Viola–Jones object detection framework, the Haar-like features are therefore organized in something called a classifier cascade to form a strong learner or classifier.

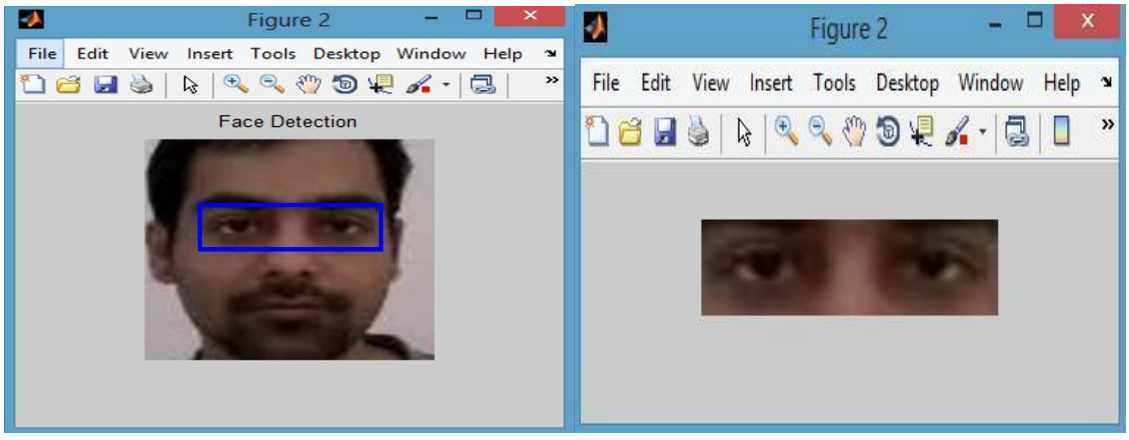


Eyes and Mouth Detection

After the face is detected using Voila-Jones, the region containing the eyes and mouth has to be separated.

To detect the coordinate from where the region of eye is starting certain calculations are done. After the rectangular window is extracted, we have considered that the eyes are located at a distance of (0.25 * height of window) from the top and (0.15 * width of window) from the left.

The size of window is (0.25 * height of window) in height and (0.68 * width of window) in width.

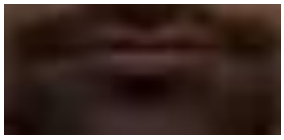


After the eyes are cropped the image is coverted to YCbCr. The reason for conversion and way to convert is mentioned in “Skin Segmentation” column. Then image is converted to grayscale and ultimately to binary image by setting a threshold of (minimum pixel value + 10).



To detect the coordinate from where the region of mouth is starting certain calculations are done. After the rectangular window is extracted, we have considered that the mouth are located at a distance of (0.67 * height of window) from the top and (0.27 * width of window) from the left.

The size of window is (0.20* height of window) in height and (0.45 * width of window) in width.

Again the mouth is converted to YCbCr colour space, then it is converted to grayscale image and in turn converted to binary image with a threshold of (minimum pixel value + 10).



Skin Segmentation

An image which taken inside a vehicle includes the driver‟s face. Typically a camera takes images within the RGB model (Red, Green and Blue). However, the RGB model includes brightness in addition to the colours. When it comes to human‟s eyes, different brightness for the same color means different colour.

When analyzing a human face, RGB model is very sensitive in image brightness. Therefore, to remove the brightness from the images is second step. We use the YCbCr space since it is widely used in video compression standards .Since the skin-tone color depends on luminance, we nonlinearly transform the YCbCr colour space to make the skin cluster luma-independent. This also enables robust detection of dark and light skin tone colours. The main advantage of converting the image to the YCbCr domain is that influence of luminosity can be removed during our image processing. In the RGB domain, each component of the picture (red, green and blue) has a different brightness. However, in the YCbCr domain all information about the brightness is given by the Y component, since the Cb (blue) and Cr (red) components are independent from the luminosity.

Conversion from RGB to YCbCr

Cb = (0.148* Red) - (0.291* Green) + (0.439 * Blue) + 128;
Cr = (0.439 * Red) - (0.368 * Green) – (0.071 * Blue) + 128;

Conversion from RGB to HSV
MATLAB has predefined function for conversion of RGB color space to HSV color space. I‟ = rgb2hsv (I);

Decision Making

The first frame is used for learning. All the results are calculated taking first frame as ideal frame.

Eyes Closed

When eyes are closed, the number of black pixels in binary image decreases considerably.

If eyes are found closed for atleast 2 consecutive seconds (i.e. 2 * 16 = 32 frames, considering 16 frames per second), then the warning will be generated.

Mouth Open

When mouth is open, the resulting black pixels in binary image can be considerably larger or smaller than the ideal frame. The difference can be more than 6% of the black pixels in ideal frame.

If mouth is found open for atleast 2 consecutive seconds (i.e. 2 * 16 = 32 frames, considering 16 frames per second), it means that the person is yawning and in response the warning will be generated.

Head Lowering

If the head is lowered, or turned around the number of skin pixels considerably decrease as compared to the ideal frame.

If head is found lowered or found turned in other directions for atleast 2 consecutive seconds (i.e. 2 * 16 = 32 frames, considering 16 frames per second), it means that the person is vulnerable for accident and in response the warning will be generated.

Limitations of the algorithm

- Objects in the video, should be uniformly illuminated, else results can differ.
- Changing distance of person from the camera can cause problems.
- Head lowering can give abrupt results in case of bald person.
- The algorithm doesn't work for the people sleeping with eyes open.
- Face symmetry calculations are not same for everyone. The calculations considered are true for most of the people.

GITHUB REPOSITORY FOR INPUT VEDIOS AND TO ANALYSE OUTPUT

https://github.com/ROHITHRAVAN1/DROWSSINESS

Code for the software

```
clear all;

clc

%%%%%%-------video input    %%%%%%

obj = VideoReader('C:\Users\18BIT0126\Desktop\b3.mp4','Tag','My reader object'); I = read(obj,1);

rate = obj.FrameRate; rate

%%%%%-----working on 1st frame    %%%%%%%%%

figure, imshow(I)

I = imresize( I, [360 640]); I = double(I);

[hue,s,v] = rgb2hsv(I);
```

```
cb = 0.148* I(:,:,1) - 0.291* I(:,:,2) + 0.439 * I(:,:,3) + 128;

cr = 0.439 * I(:,:,1) - 0.368 * I(:,:,2) -0.071 * I(:,:,3) + 128; [w h] =
size(I(:,:,1));

count = 0; for i=1:w

for j=1:h

if 135<=cr(i,j) && cr(i,j)<=180&& 120<=cb(i,j) && cb(i,j)<=200 &&
0.01<=hue(i,j) && hue(i,j)<=0.1

segment(i,j)=1; count = count + 1;

else

segment(i,j)=0; end

end end

im(:,:,1)=I(:,:,1).*segment;

im(:,:,2)=I(:,:,2).*segment;

im(:,:,3)=I(:,:,3).*segment; figure,imshow(uint8(im));

%--------Calculating the percentage--------------------

count

pixel_count = (count*5)/100

%       Working on rest frames

num = 0;

nFrames = obj.NumberOfFrames; nFrames
```

```
for t = 2:2:nFrames-1 count1 = 0;

I = read(obj,t);

I = imresize( I, [360 640]); I = double(I);

[hue,s,v] = rgb2hsv(I);

cb = 0.148* I(:,:,1) - 0.291* I(:,:,2) + 0.439 * I(:,:,3) + 128;

cr = 0.439 * I(:,:,1) - 0.368 * I(:,:,2) -0.071 * I(:,:,3) + 128; [w h] =
size(I(:,:,1));

for i=1:w for j=1:h

if 135<=cr(i,j) && cr(i,j)<=180&& 120<=cb(i,j) && cb(i,j)<=200 &&
0.01<=hue(i,j) && hue(i,j)<=0.1

segment1(i,j)=1; count1 = count1 + 1;

else

segment1(i,j)=0; end

end end

im(:,:,1)=I(:,:,1).*segment1;

im(:,:,2)=I(:,:,2).*segment1;

im(:,:,3)=I(:,:,3).*segment1; figure,imshow(uint8(im))

if count - count1 > pixel_count num = num+1;

end;

if num > 15
```

'DRIVER ASLEEP WARNING'

t/rate num = 0;

end end;

YCBCR EXPLINATION:

One of two primary color spaces used to represent digital component video (the other is RGB). The difference between YCbCr and RGB is that YCbCr represents color as brightness and two color difference signals, while RGB represents color as red, green and blue. In YCbCr, the Y is the brightness (luma), Cb is blue minus luma (B-Y) and Cr is red minus luma (R-Y). See component video. YCbCr Is Digital MPEG compression, which is used in DVDs, digital TV and Video CDs, is coded in YCbCr, and digital camcorders (MiniDV, DV, Digital Betacam, etc.) output YCbCr over a digital link such as FireWire or SDI. The ITU-R BT.601 international standard for digital video defines both YCbCr and RGB color spaces. See chroma subsampling. YPbPr Is Analog YPbPr is the analog counterpart of YCbCr. It uses three cables for connection, whereas YCbCr uses only a single cable **.**

formulae for converting from RGB to YCbCr

Y = (77/256)R + (150/256)G + (29/256)B

Cb = -(44/256)R - (87/256)G + (131/256)B + 128

Cr = (131/256)R - (110/256)G - (21/256)B + 128

KOLKATA:

Comparative Statement of Accident

India

Year	Total No. of Accident reported	Total No. of Person Injured	Total No. of Person Killed	Injured Severity *	Death Severity **
2013	486476	494893	137572	101.7	28.3
2014	489400	493474	139671	100.8	28.5
2015	501423	500279	146133	99.8	29.1

West Bengal

Year	Total No. of Accident reported	Total No. of Person Injured	Total No. of Person Killed	Injured Severity *	Death Severity **
2013	12414	13182	5504	106.2	44.3
2014	12875	12018	5875	93.3	45.6
2015	13208	11794	6234	89.3	47.2

* Injured per 100 Accidents.

** Death per 100 Accidents.

SURVEY OF MUMBAI:

- Road accidents in Navi Mumbai in 2018 had dipped by 14% compared to the previous year, but the number of deaths had seen a marginal increase, statistics provided by the traffic police show.

- In 2018, there were 1,203 accidents against 1,392 in 2017. “Major accidents occurred on Thane-Belapur road and the Sion-Panvel highway.

- Impact of a collision could be lesser if bikers wore helmets and drivers and passengers put on seatbelts,” Sunil Lokhande, Deputy Commissioner of Police, Traffic, said.

- Fatal mishaps in 2018 were 258, which killed 270 people, while it was 250 in 2017, which claimed 259 lives.

- The accidents that caused serious injuries in 2018 stood at 393, which left 532 people injured, while in 2017, 386 accidents injured 522 people.

SURVEY OF DELHI:

- The Delhi Traffic Police released data of accidents in the capital city in 2018 and it shows that the fatalities in road accidents have gone up from 1584 deaths in 2017 to 1690 deaths in 2018.

- The report states that in 2018, 6515 road accidents occurred in Delhi in which 6086 people were injured while 1690 people lost their life.

- The fatality rate has increased by 6.69 per cent though there has been a total decline in road accidents by 2.36 per cent.

- Pedestrians were the most vulnerable victims. In 2018, 45.86 per cent of the total persons killed in road accidents were pedestrians while scooter or motorcycle riders were second most vulnerable with 33.72 per cent killed in an accident.

SURVEY OF CHENNAI:

- It recorded 689 accidents, 114 deaths in January

- The city continues to lead in the number of road accidents and deaths, going by figures recorded in January this year in 32 districts of the State.

- According to a report, „Road Accident Analysis in Tamil Nadu January 2019", brought out by the Transport and Road Safety Commissioner, Chennai leads with 689 accidents of a total of 5,173 road accidents across the State for the month of January and also in the number of fatalities - at 114 of the total of 993 deaths.

- In January 2018, Chennai recorded the highest number of accidents - 611 - and deaths -

103. Kancheepuram comes in at second place with 297 accidents and 77 fatalities

SUMMARY

Road accidents cannot be stopped despite providing the best possible roads and intersections, however there are ways to reduce the impact of road accidents on road-users and the vehicles plying on the road. The incidence of accidental deaths has shown an increasing trend during the period 2005 - 2015 with an increase of 54.3% in the year 2015 as compared to 2005 increase in the rate of accidental deaths during the same period was 25.5%.A total of 4,00,517 accidental deaths were reported in the country during 2015 (5,535 more than such deaths reported in 2014) showing an increase of 1.4% as compared to 2014. However, the average rate of Accidental Deaths has remained same 32.6 in 2014 and 2015.In the stretches we studied the road accidents are increasing rapidly .We studied accidental records of various police-stations ,identified the black-spots of accidents and then analyzed the geometric features of those spots whose observation is given in this paper .The identification of such points provides us ease to work on some section of road which is most prone to accidents .We analyzed the geometric deficiencies and they recommended ways to reduce their affects. The findings indicated that large radii right-turn curves were more dangerous than left curves, in particular, during lane changing maneuvers. However sharper curves are more dangerous in both left and right curves. Moreover, motorway carriageways with no or limited shoulders have the highest CR when compared to other carriageway width. Proper traffic guidance and control system to guide road users ensuring safe movement of vehicles has been recommended and some of the facilities such as pedestrian crossings and median openings, acceleration and deceleration lane.

PROJECT CONCLUSION

Finally, whatever technology we use but it's the responsibility of each individual to follow the government rules. While traffic each individual has to be carefull so that he don't lead to any accident are met with one.Technology has the limitation that is not as wise as a man. A man can misuse the technology like now a days, Automated seat belt alarm, automatic night light system, and proximity sensors play a role to avoid accidents.The above stated can be helpful in many ways but they have some restrictions and we there is a limit of the problem that they could avoid. Man driving the vehicle is responsible for all the mistakes he does or accidents because every automated one has a manual over-ride through which we just off the alarm and get off.

There nothing we could we but we can advance our technologies in automobile areas to embed the highly advanced and accurate assistance (A..I).

REFERENCES

[1] G. Hosseini, H. Hossein-Zadeh, A "Display driver drowsiness Warning system", International Conference of the road and traffic accidents, Tehran University, 2006.

[2] L. M Bergasa, J. u. Nuevo, M A. Sotelo, R Barea and E. Lopez, "Visual Monitoring of Driver Inattention," Studies in Computational Intelligence (SCI), 2008.

[3] Viola, Jones: Robust Real-time Object Detection, IJCV 2001 pages 1,3.

[4] C. Zhang, X Lin, R Lu, P.H. Ho, X Shen, "An efficient message authentication scheme for vehicular communications". IEEE Trans Veh TechnoI57(6):3357-3368.2008.

[5] S. S. Manv M.S. Kakkasager J. Pitt, "MuItiagent based infonnation dissemination in vehicular ad hoc networks". Mobile Infonn Syst 5(4):363-389.2009.

[6] http://en.wikipedia.org/wiki/Haar-like_features

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THANK YOU;

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