ARTIFICIAL INTELLIGENCE

Project Title:

DRIVER DROWSINESS DETECTOR

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1. INTRODUCTION:

1.1 OVERVIEW:

Accidents due to drivers falling asleep has become very common this could be due increased work,stress, etc. There are also a number of people that drive on the highway at night and can experience fatigue which can result in them falling asleep while driving and can lead to major accidents.According to research at least 20% to 30% of road accidents are due to fatigued drivers who fall asleep while on the road. This proves to be a threat for other vehicles on the road as well who aren’t aware of the uncertainty of another vehicle going out of control. When the driver is tired and hasn’t slept in a while it can causes severe side effects like delay in reaction time, low concentration and their alertness when it comes to noticing the activities on the road. This minimal attention to the road can affect their decision-making time and also could lead to loss of speed control.

Significance of the problem:

Driver drowsiness and alerting systems that use artificial intelligence (AI) are even more significant because they can provide more accurate and personalized alerts based on individual driving behavior and patterns.AI-based systems can use machine learning algorithms to analyze data from various sensors and devices in the vehicle, such as cameras, infrared sensors, and accelerometers, to detect signs of drowsiness. The system can learn the driver's typical behavior and patterns and can detect changes in those patterns that may indicate fatigue or drowsiness.By using AI, these systems can adapt to different driving conditions and environments, such as changing road conditions, weather, and traffic patterns. This can help prevent false alarms and provide more accurate alerts when the driver is actually drowsy or fatigued.Moreover, AI-based systems can continuously learn and improve their accuracy over time as they collect more data, which can help prevent accidents caused by driver fatigue or drowsiness. This technology can also provide valuable insights for fleet managers and transportation companies, allowing them to track driver behavior and patterns and take proactive measures to prevent accidents.Overall, driver drowsiness and alerting systems using AI have the potential to significantly reduce the number of accidents caused by driver fatigue or drowsiness, making roads safer for everyone.

Motivations:

Truck drivers, company car drivers and shift workers are the most at risk of falling asleep while driving. Majority of the accidents occur due to the drunkenness of the driver. The burden of which lies on the company owner as they are made liable. It can lead to economic loss Each year there are thousands of truck accidents, leading to injuries and fatalities, expensive insurance claims and lengthy traffic jams as wreckage is cleared. When a commercial truck is involved in a serious accident, the driver is usually the spotlight. Usually size and weights of trucks requires the driver to be both highly skilled & focused on controlling these multi-ton behemoths. Due to severity of injuries and property damage commercial truck accidents often produce large claim amounts. One of the most common fault of the truck driver is their failure in checking blind spots, known in the trucking industries as “no zones”, before turning or changing lanes.They are on the all four sides of the semi, and many accidents happen when the trucker manoeuvres into the spots without carefully checking for clearance first. They are operating a dangerous vehicle, driving the rig defensively is part of truckers’ “expanded duty” to protect us.

1.2 PURPOSE:

Drowsiness detection is a sociological, technological, and industrial issue with possible economic repercussions. It is crucial for society and business to address the problem of drowsiness because it might result in mishaps and reduced production.Drowsy detection might be difficult technologically since conventional techniques like self- reporting or physiological measurements can not always be accurate. This is where artificial intelligence (AI) can contribute to the development of more precise and efficient sleepiness detection techniques.Artificial intelligence (AI)-based solutions are now available that use computer vision and machine learning algorithms to identify sleepiness symptoms such changes in facial expressions, eye movements, and head position. Potential uses for these systems include the transportation sector, where they may be able to lessen the number of accidents brought on by fatigued driving.In terms of money, reducing accidents and boosting productivity can save businesses and society at large a lot of money. Additionally, the creation and application of AI-based sleepy detection systems has the potential to boost innovation in linked industries and open up new job opportunities.Drowsy detection is a complex topic that has effects on society, technology, business, and the economy. AI has the potential to be a crucial tool for solving this issue and building a safer, more effective world.

2. LITERATURE SURVEY:

2.1 EXISTING PROBLEM:

The existing system of driver drowsiness detection system has the following disadvantages:Mainly, using of two cameras in the system one for monitoring the head movement and the other one for facial expressions. The other disadvantage is the aging of sensors, and all these sensors are attached to the driver’s body which may affect the driver.

2.2 PROPOSED SOLUTION:

So to overcome all these disadvantages we designed a system in which a live camera is used for monitoring the driver’s drowsiness condition and alert the driver, which reduces the road accidents.

The objective of this project is to build a drowsiness detection system that will detect that a person’s eyes are closed for a few seconds. This system will alert the driver when drowsiness is detected. The Drowsiness Detection System developed based on eye closure of the driver can differentiate normal eye blink and drowsiness and detect the drowsiness while driving. The proposed system can prevent accidents due to sleepiness while driving. The system works well even in the case of drivers wearing spectacles and even under low light conditions if the camera delivers better output. Information about the head and eyes position is obtained through various self-developed image processing algorithms. During the monitoring, the system is able to decide if the eyes are opened or closed. When the eyes have been closed for too long, a warning signal is issued. processing judges the driver’s alertness level on the basis of continuous eye closures. To conclude, we were able to successfully implement a model which will play a sound to wake the driver up in case he/she ends up being drowsy and close their eyes during driving. We were able to implement it using several libraries like Kera’s, tensorflow, etc. and use CNN for real-time image capture for face detection. We are of the opinion that this technology will be able to reduce the accidents caused by drowsiness of the driver, significantly.

References for Literature Survey:

1.In 2013, G. Kong et. al. described '**Visual nalysis of Eye State and Head Pose for Driver lertness Monitoring'**.The proposed scheme uses visual features such as eye index (EI), pupil activity (PA), and HP to extract critical information on non- alertness of a vehicle driver.Experimental results show that the proposed scheme offers high classification accuracy with acceptably low errors and false alarms for people of various ethnicity and gender in real road driving conditions.

2.described '**Driver Drowsiness Detection through \HMM based Dynamic Modeling'**.They proposed a new method of analyzing the facial expression of the driver through Hidden Markov Model (HMM) based dynamicmodeling to detect drowsiness.
They have implemented the algorithm using a simulated driving setup.

3.Driver Monitoring Based on LowCost 3-D Sensors.Based on the captured cloud of 3-D points from the sensor and analyzing the 2-D projection, the points corresponding to the head are determined and extracted for further analysis.It represents an interesting tool for human factor research studies, allowing automatic study of specific factors and the detection of special event related to the driver, e.g., driver drowsiness, inattention, or head pose

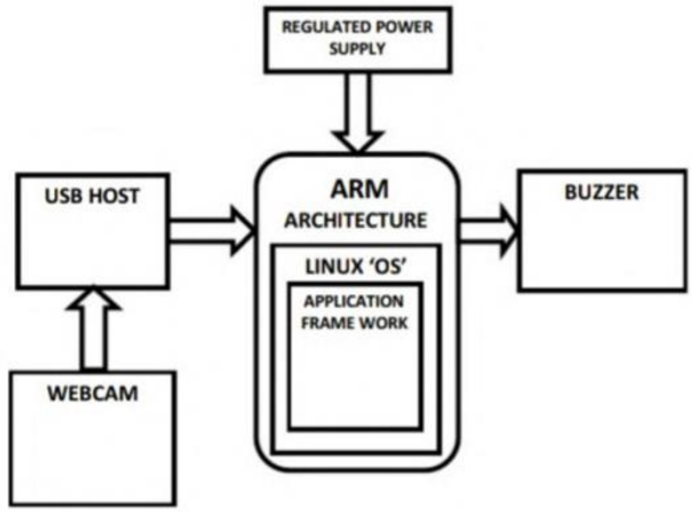
4.Visual Analysis of Eye State and Head Pose for Driver Alertness Monitoring.The system was able to detect facial landmarks from images captured on a mobile device and pass it to a CNN-based trained Deep Learning model to detect drowsy driving behavior.This system can be integrated easily into dashboards in the next generation of cars to support advanced driver-assistance programs or even a mobile device to provide intervention when drivers are sleep.

5.**Driver drowsiness detection using Behavioral measures and machine learning techniques**:The main goal of these systems is to detect a slight change in a driver's facial expression that contains drowsiness information.
Although there are different methods that can be used to measure the level of drowsiness (vehicle-based, physiological, and behavioral methods), this review has focused on behavioral methods because they are non-invasive, work in various light conditions and do not necessarily require vehicle modifications.

6.**Bias Remediation in Driver Drowsiness Detection systems using Generative Adversarial Networks**. In this paper, we introduced a novel framework that can be used to boost the performance of driver drowsiness detection models by reducing bias in the training dataset.Importantly, the proposed approach does not rely on any meta-data or assumptions about the race or ethnicity of individuals in the datasets, which is a commonly used approach to determine algorithmic fairness or bias

3. THEORETICAL ANALYSIS:

3.1 BLOCK DIAGRAM:



3.2 HARDWARE/ SOFTWARE DESIGNING:

- The hardware and software requirements for a Driver Drowsiness Detection and Alerting System using CNN and OpenCV may vary depending on the specific implementation and desired performance. However, here are the general requirements:

- **Hardware Requirements:**

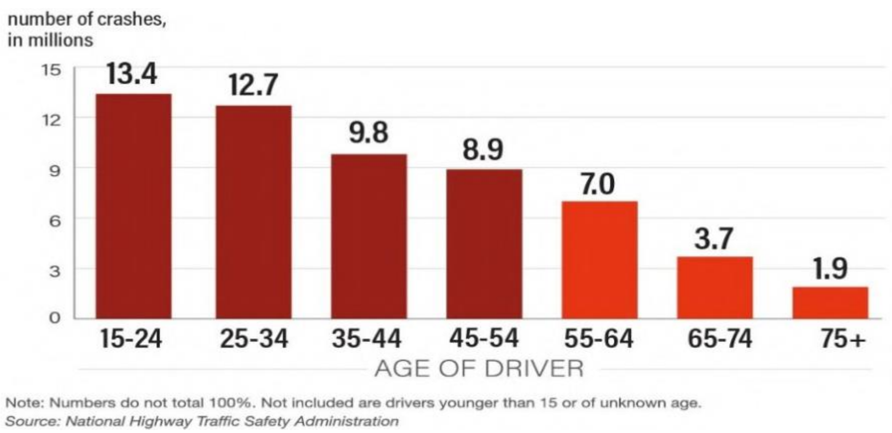
- **Computer**: A computer or embedded system with sufficient processing power to run the software components.
- **Camera:** A camera to capture video frames of the driver's face. This can be a built-in camera on a laptop or a separate camera connected to the system.
- Audio Output: Speakers or headphones to deliver audio alerts to the driver.
- **Optional**: Sensors: Additional sensors like accelerometers or steering angle sensors can be integrated to enhance the drowsiness detection system.
- Software Requirements:

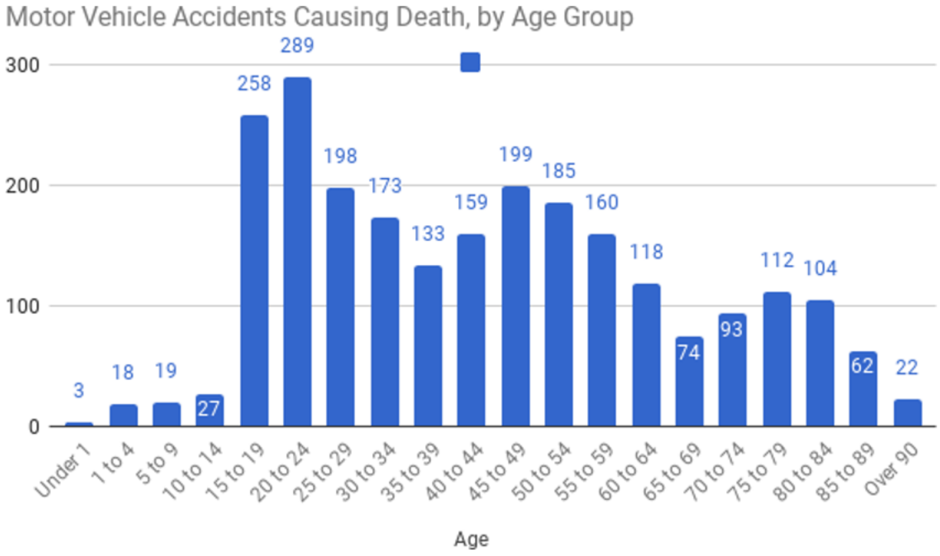
- Operating System: The system should support an operating system compatible with OpenCV and the selected deep learning framework (e.g., TensorFlow, PyTorch).
- **Python**: The software components are typically implemented in Python programming language.
- **OpenCV**: Install OpenCV library to capture video frames, perform image processing, and access computer vision functionalities.
- Deep Learning Framework: Choose a deep learning framework such as TensorFlow or PyTorch to implement and train the CNN model.
- CNN Model: Depending on the selected deep learning framework, install the necessary libraries and dependencies to define, train, and evaluate the CNN model.
- Additional Libraries: Depending on the specific requirements of your implementation, you may need to install other libraries for data manipulation, visualization, or audio processing.
- Development Environment: Choose an integrated development environment (IDE) or code editor suitable for Python development, such as PyCharm, Visual Studio Code, or Jupyter Notebook.

4. EXPERIMENTAL INVESTIGATION

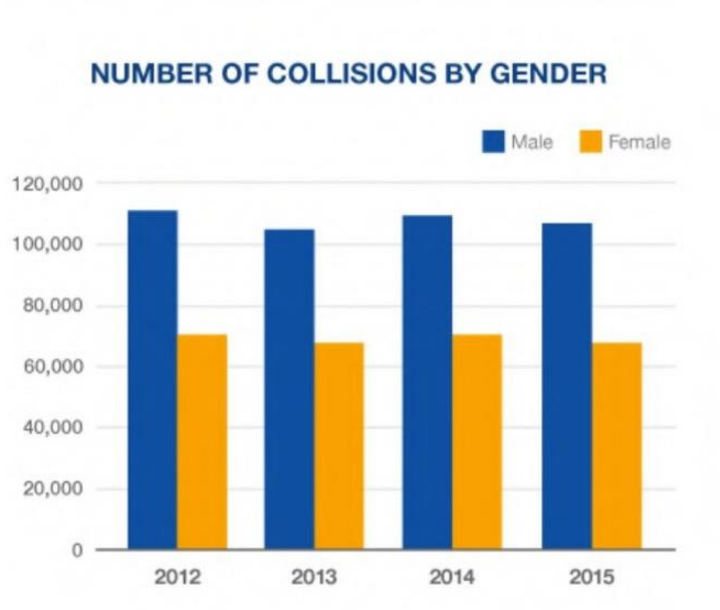
REPORT ON ACCIDENTS BASED ON DIFFERENT FACTORS:

AGE: Accidents can be influenced by age, with young children and teenagers being more susceptible to accidents. The National Highway Traffic Safety Administration (NHTSA) shows that the risk of motor vehicle accidents increases with age until around 65, but decreases after that. Factors like human error, environmental factors, equipment failure, gender, race, socioeconomic status, and geographic location also contribute to accident risk. It's crucial to consider a range of factors when assessing and addressing accident risk in different populations.

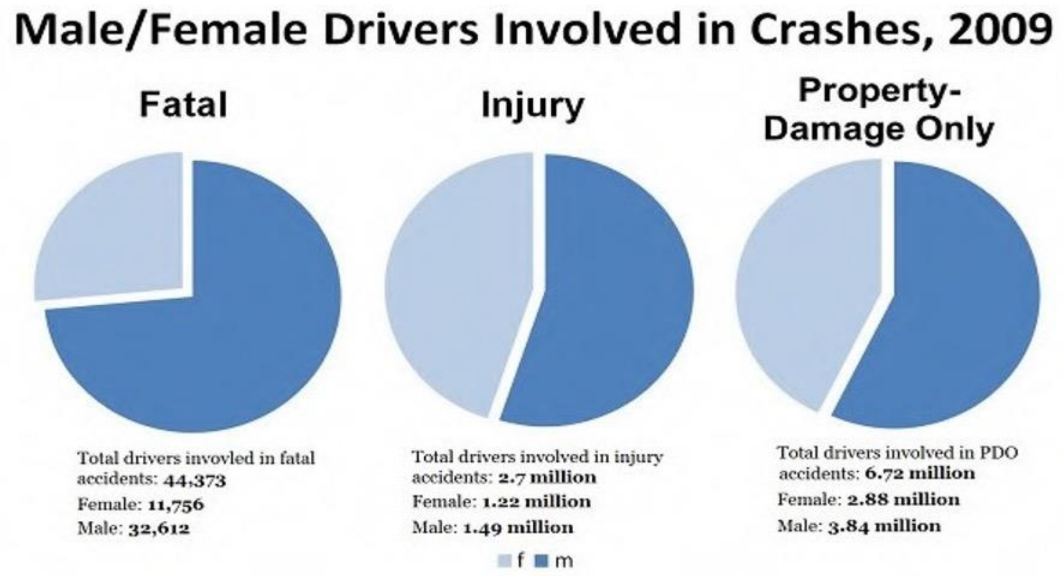




GENDER: Gender plays a significant role in accident risk, as men and women are more susceptible to different types of accidents. Men are more likely to be involved in motor vehicle accidents, while women are more likely to experience slip and fall accidents. Unintentional injuries are more common in men, with a 65% higher death rate in 2019. Factors contributing to this disparity include risk-taking behavior, exposure to hazardous environments, and activities.

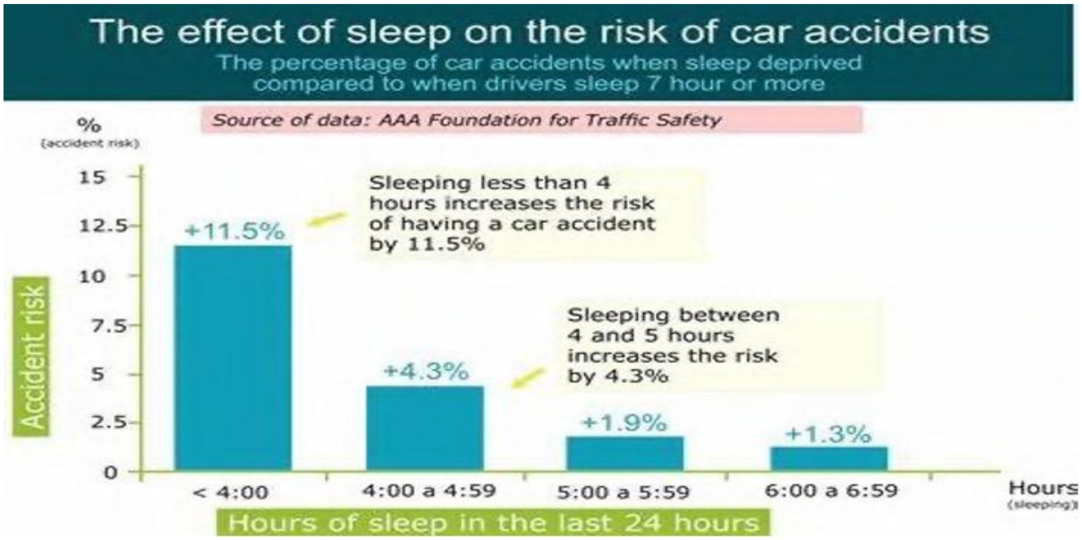


MEDICAL HISTORY;Medical history significantly impacts accident risk, as individuals with certain conditions may be more susceptible to accidents or experience complications. Heart disease, vision, balance, and cognitive function conditions increase the risk of falls or slips. It's crucial for individuals to be aware of their medical history, discuss it with healthcare providers, and take appropriate steps to manage their health and reduce accident risk.

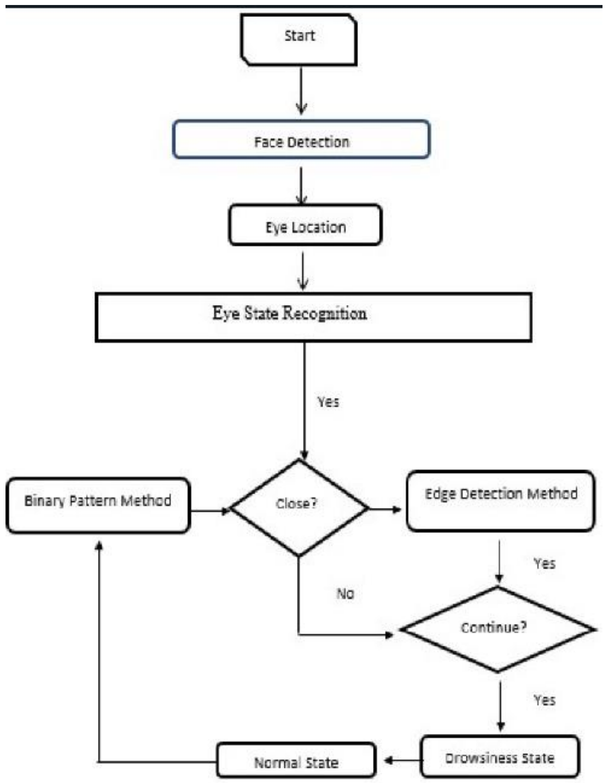


SLEEP PATTERNS:

Sleep patterns can impact accident risk, as inadequate or disrupted sleep can impair cognitive function, reaction time, and decision-making abilities. Adults should aim for 7-9 hours of sleep, while children and adolescents need more. Sleep deprivation, sleep disorders, and shift work can also increase accident risk. Prioritizing healthy sleep patterns and ensuring consistent sleep can reduce accident risk. This includes establishing a regular schedule, creating a sleep-conducive environment, and seeking treatment for sleep disorders if necessary.



5. FLOWCHART:



6. RESULT:

Image.1: when Driver's eyes are active:

Score:0

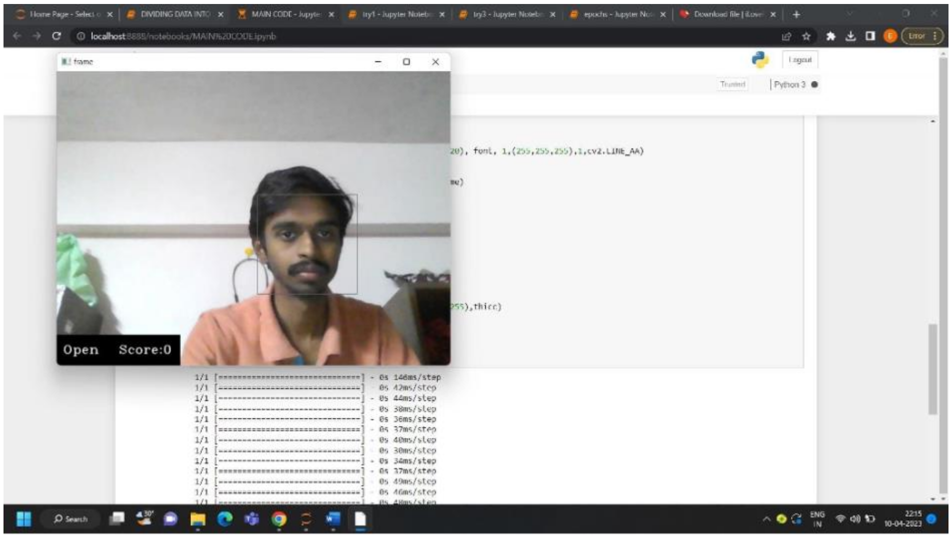
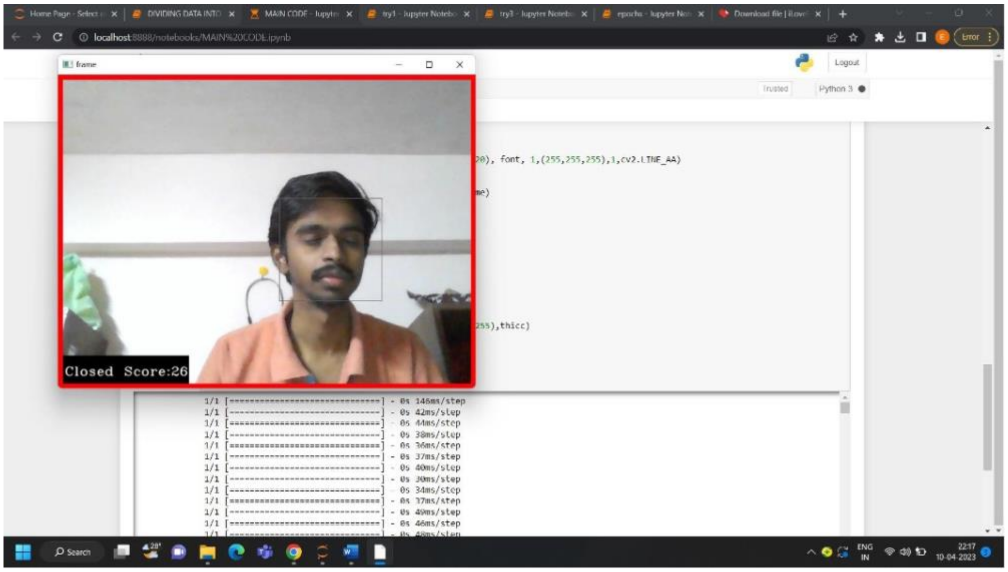


Image.2: When driver's eyes are inactive:

Score: 26



7. ADVANTAGES & DISADVANTAGES

• In transportation vehicles where drivers make accidents while they are drowsy.

• In Military applications where high intensity monitory of soldier was needed.

• In the security guard cabins to stop thefts while security was sleeping.

• In classrooms where students feels drowsy and gets inattentive in class.

• In operators at nuclear power plants where continuous monitoring is necessary

8. APPLICATIONS

• This system can be used in factories to alert the workers.

• If found drowsy, the alarm system gets activated and the driver is alerted.

• If there is any obstacles it is alerted to the driver.

• This system can also be used for the railway.

9. CONCLUSION

• The drowsiness detection system is capable of detecting drowsiness in quickly. The system which can differentiate normal eye blink and drowsiness can prevent the driver from entering the state of sleepiness while driving. The system works well irrespective of driver wearing spectacles and under low light conditions also. During the monitoring, the system is able to decide if the eyes are closed or opened. When the eyes have been closed for too long a warning signal is issued. The ultimate goal of the system is to check the drowsiness condition of the driver.

• Based on the eye movements of the driver, the drowsiness is detected and according o eye blink, the alarm will be generated to alert the driver and to reduce the speed of the vehicle along with the indication of parking light. By doing this, many accidents will be reduced and provides safety to the driver and vehicle. A system that is driver safety and car security is presented only in luxurious costly cars. Using eye detection, driver security and safety can be implemented din normal car also.

10. FUTURE SCOPE

• The future works may focus on the utilization of outer factors such as vehicle states, sleeping hours, weather conditions, mechanical data, etc. for fatigue measurement. Driver drowsiness poses a major problem to highway safety. 24 hours operations, high annual mileage, exposure to the challenging environmental condition, and demanding work schedules all contribute to the serious safety issue.

• Monitoring the driver's state of drowsiness and vigilance and providing feedback on their condition so that they can take appropriate action is one crucial step in a series of preventive measure to necessary to address this problem. Currently there is no adjustment in zoom or direction of the camera during operation. Future work may be automatically zoom in on eyes once they are localized. This would avoid trade-off between having wide field of view in order to locate the eyes, and narrow view in order to detect fatigue.

11. BIBLIOGRAPHY:

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11.1 APPENDIX

A. SOURCE CODE:

```
import cv2

import os

from keras.models import load_model

import numpy as np

from pygame import mixer

import time

mixer.init()

sound = mixer.Sound('alarm.wav')

face = cv2.CascadeClassifier(cv2.data.haarcascades+'haarcascade_frontalface_default.xml')

leye = cv2.CascadeClassifier(cv2.data.haarcascades+'haarcascade_lefteye_2splits.xml')

reye = cv2.CascadeClassifier(cv2.data.haarcascades+'haarcascade_righteye_2splits.xml')

lbl=['Close','Open']
```

```
model = load_model(r'C:\Users\Giridhar\Downloads\Drowsiness detection\models\cnnCat2.h5')
path = os.getcwd()
cap = cv2.VideoCapture(0)
font = cv2.FONT_HERSHEY_COMPLEX_SMALL
count=0
score=0
thicc=2
rpred=[99]
lpred=[99]
while(True):
    ret, frame = cap.read()
    height,width = frame.shape[0:2]
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
    faces = face.detectMultiScale(gray,minNeighbors=5,scaleFactor=1.1,minSize=(25,25))
    left_eye = leye.detectMultiScale(gray)
    right_eye = reye.detectMultiScale(gray)
    cv2.rectangle(frame, (0,height-50) , (200,height) , (0,0,0) , thickness=cv2.FILLED )
    for (x,y,w,h) in faces:
        cv2.rectangle(frame, (x,y) , (x+w,y+h) , (100,100,100) , 1 )
    for (x,y,w,h) in right_eye:
        r_eye=frame[y:y+h,x:x+w]
        count=count+1
        r_eye = cv2.cvtColor(r_eye,cv2.COLOR_BGR2GRAY)
        r_eye = cv2.resize(r_eye,(24,24))
        r_eye= r_eye/255
        r_eye= r_eye.reshape(24,24,-1)
```

```
  r_eye = np.expand_dims(r_eye,axis=0)
    rpred = np.argmax(model.predict(r_eye), axis=-1)
    if(rpred[0]==1):
        lbl='Open'
    if(rpred[0]==0):
        lbl='Closed'
    break
for (x,y,w,h) in left_eye:
    l_eye=frame[y:y+h,x:x+w]
    count=count+1
    l_eye = cv2.cvtColor(l_eye,cv2.COLOR_BGR2GRAY)
    l_eye = cv2.resize(l_eye,(24,24))
    l_eye= l_eye/255
    l_eye=l_eye.reshape(24,24,-1)
    l_eye = np.expand_dims(l_eye,axis=0)
    lpred = np.argmax(model.predict(l_eye), axis=-1)
    if(lpred[0]==1):
        lbl='Open'
    if(lpred[0]==0):
        lbl='Closed'
    break
if(rpred[0]==0 and lpred[0]==0):
    score=score+1
    cv2.putText(frame,"Closed",(10,height-20), font, 1,(255,255,255),1,cv2.LINE_AA)
# if(rpred[0]==1 or lpred[0]==1):
else:
```

```
        score=score-1
        cv2.putText(frame,"Open",(10,height-20), font, 1,(255,255,255),1,cv2.LINE_AA)
    if(score<0):
        score=0
    cv2.putText(frame,'Score:'+str(score),(100,height-20), font, 1,(255,255,255),1,cv2.LINE_AA)
    if(score>15):
        #person is feeling sleepy so we beep the alarm
        cv2.imwrite(os.path.join(path,'image.jpg'),frame)
        try:
            sound.play()
        except: # isplaying = False
            passQ
        if(thicc<16):
            thicc= thicc+2
        else:
            thicc=thicc-2
            if(thicc<2):
                thicc=2
        cv2.rectangle(frame,(0,0),(width,height),(0,0,255),thicc)
    cv2.imshow('frame',frame)
    if cv2.waitKey(1) & 0xFF == ord('q'):
        break
cap.release()
cv2.destroyAllWindows()
```

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THANK YOU