SOMNIFEROUS RECOGNITION: DRIVING SYSTEM

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Abstract

Each year, road accidents caused by human error result in a growing number of deaths and injuries around the world. Somniferous driving plays an important role in automobile collisions. It has been proven that as tiredness increases due to workload issues, driving ability deteriorates, with crashes accounting for more than 20% of all vehicle accidents. However, life is lost once it can't be regained again. I mentioned some basics of somniferous driving in this paper. It begins with an introduction to somniferous driving, its characteristics and problems, the possibilities of risk of somniferous driving, and the preventions which minimize the risk factor of accidents caused by somniferous driving.
Keywords: Somniferousness, Arduino, Convolutional Neural Network.

Introduction

Somniferous driving, also called sleepy driving or driving when u feel exhausted or tired, can be caused by a number of factors, including severe sleepiness, sleep deprivation, shift work-related load and mismatch of schedule, exhaustion, and consuming alcohol while feeling tired. These elements have a significant impact on performance, alertness, memory, concentration, and reaction speeds when all come together.

Even every driver has a past experience of driving when somniferous. It's an insidious problem because it may affect any driver and sneak up on you. The motorist will often refuse to admit to falling asleep because doing so would put them at fault and make them liable. Furthermore, if the driver dies before giving a statement, we will never know if they were asleep when the car crashed. According to a 1999 poll, 24% of adults had fallen asleep behind the wheel. Male drivers admit to falling asleep while driving twice as often as female drivers.

Driving While Somniferous (problems)

According to reports of statistics, drivers with somniferous issues are much more responsible for roughly a third of all fatal car accidents, and a study from the University of Pennsylvania Health System backs up this claim. Accidents caused by sleeping are many more serious and scary nightmare crashes than drinking. Says Dr. Michael Grandner while we all heard of drunk driving us rarely heard about the somniferous driving but it is a more serious health and safety issue. A survey of over 17,000 persons revealed that most people require at least seven hours of sleep each night: While distracted driving has received a lot of attention recently, sleepy driving is still a major cause of car accidents.

Two in every five drivers (41%) admit to falling asleep, behind the wheel at some point. According to a new Traffic Safety study, one in ten people stated they had done so in the previous year.
A somniferous deprived driver was involved in one out of every six (16.5 percent) fatal crashes, one out of every eight crashes that resulted in hospitalization, and one out of every fourteen crashes that required a vehicle to be towed. Somniferous driving is estimated to cause 1,650 deaths, 69,000 injuries, and more than 100,120 accidents per year, according to the National Highway Safety Administration. More than half (54%) of drivers who fell asleep while driving in the previous year indicated they had been driving for less than an hour when they fell asleep. Many traffic experts believe that somniferous driving is under-reported and undervalued. Date and Time

Due to circadian cycles, sleep-related accidents are most common in the early morning, between 02:00 and 06:00 a.m., and in the late afternoon, between 03:00 and 04:00 p.m. According to Horne24, drivers are 50 times more likely to fall asleep behind the wheel at 02:00 a.m. than they are at 10:00 a.m. Between 03:00 and 04:00 p.m., the danger is three times higher than between 10:00 and 11:00 a.m.

There seems to be a relationship between the driver's age and the period when they are most tired.25 Younger drivers are more likely to get fatigued early in the morning, while senior drivers are more likely to fall asleep behind the wheel during the afternoon nap time. The peak time period for drivers aged 70 and above was between 10:00 and 11:00 a.m.Maycock8 discovered a relationship between sleep-related accidents and the time of day, with the early morning hours being the most dangerous .According to research, the temporal pattern of sleep-related accidents is similarly connected to the driver's age. Those under 45 years old were most at danger in the early hours, those 45 to 65 years old were most at risk around 07:00 a.m., and those over 70 years old were most at risk around 03:00 p.m.

Somniferous: the following characteristics define driving

Driving after a lack of sleep is less than 6-7 hours.
If you need to stay awake for more than 12 hours, you don't need to drive.
Frequently yawning
Difficult to hold your head up.
Focusing problems, frequent blinking, and heavy eyelids.
You can't recall the past few kilometers you drove.
Drifting out of your lane, swerving, or following too closely

Literature Review

Somniferous Driving (risk)

Sleepiness, exhaustion, drowsiness, weariness, and somniferous driving are caused by too many factors. Sleep loss due to restriction, interruption, or fragmentation; chronic sleep debt; circadian factors related to driving patterns or work schedules; time on task; the use of sedating drugs; and the use of alcohol when already sleepy are just a few examples. These factors have progressive effects, and combining any of them considerably increases the probability of a collision. The chances of a car accident caused by somniferous driving is not equally distributed all over the inhabitants. There are two reasons for this. First, crashes tend to happen at times consistent with one's circadian rhythms, such as during the night and in the midafternoon. As a result, people who drive late at night are far more likely to have an accident. Second, those who are overly sleepy during the day, either because of lifestyle circumstances or because of an untreated sleep issue, are more prone to suffer crashes. Young youth males, time-shift workers, commercial vehicle drivers, and persons not treated with sleep problems or short-term or chronic sleep deprivation have all been linked to an increased risk of falling asleep behind the wheel. Those who are at a higher risk of driving when somniferous include. Have slept for fewer than 7 to 8 hours. After being awake for more than 12 hours, drive. Take a sleepiness-inducing drug.

Drive late at night or early in the afternoon. Have trouble falling asleep or staying asleep at night on a regular basis. Have untreated organic sleep disorders including sleep apnea, or periodic limb movement disorder. Drive for lengthy periods of time on monotonous highways or country roads. Work the night time shift, especially when driving home after the work shift. Furthermore, drivers aged 16 to 24 are nearly twice as likely as drivers aged 40 to 59 to be involved in a sleepy driving accident. Men (48 percent) are also more likely than women (28 percent) to admit to falling asleep behind the wheel.

Somniferous Driving (preventions)

Somniferous driving is something that causes major loss to a driver and their family and these practices can be prevented in multiple ways. The main symptoms of slow stimulation, are lack of judgment, lack of concentration, blurry vision due to sleep, and short processing time. So getting an adequate amount of sleep for 7-9 hours is the most important and greatest way to avoid somniferous driving which most people are not able to get. if you are going for a long driving trip it's better to avoid getting up early and try to make a good night sleep habit try to on the radio while

driving and try to do daily workout try to get a good amount of caffeine while starting a long drive it is very beneficial but most important you should develop a good sleeping habit that will help you more in getting rid of somniferous driving.

Systems implemented to detect driver's fatigue is implemented in cars such as in Fords ND Volkswagen. There driver assistant system analyze the irregular and rapid breaking, steering movements of the driver. The system collects and assign the driver to drive properly.

Skoda cars uses a similar system the cars compares the movement of the driver and compares it to normal driver. When the system detects the driving is abnormal, the drivers fatigue status is displayed on screen, by beep informing to take rest.

Volkswagen use the somniferous detection system. That analyze how a car should behave on a road. The steering sensor, angle sensor, the system detect sudden changes the car and the driver fatigue detention method was used by using the heart rate analysis. Detroit auto show have a system that relies on drivers heart rate and uses the camera to observe the eyes of the driver this allows the driver to detect the fatigue. And EEG can be used to detect driver's brain wave that indicates fatigue symptoms.

The PSA group collapse with Lausanne University of technology ,they are working on an idea to make camera based system to detect the fatigue of the driver by see the changes in facial expressions and informs the driver. The system was based on the analysis of eye, mouth movement.

Problem statement we need to resolve

Somniferous driving is a big problem currently, with tens of thousands of collisions occurring each year. Motor vehicle collisions result in numerous deaths and injuries, as well as significant financial losses for both the government and the individual. Because to the drivers' carelessness, this has happened. Drunk driving may make collisions worse. In India, a driver's level of drowsiness is not tracked. Driving fatigue monitors, real-time vision based on driver state monitoring systems, seeing driver aid systems, and driver drowsiness detection and functioning system user centers are all now in use in other countries. Changes in eye movement, physiological measures, and driving performance are the main focus points for all of the systems. The old methods have flaws as a result of illumination variance, which has been previously described in the literature study, but updating our system, which includes vibrating motors and seat belt alarms with the help of Arduino, can reduce some of the causes of accidents that result in driver grave.

As when you are too much in the state of the sleeping and when a driver is too much tired that a sound is not heard. And many more of the consequences like that of the sound system fitted in the car. Then may be the sound is not heard. And these state mostly comes in night then the person is not in the correct state of their mind. So then the sound from the buzzing alarm is not heard by the driver then to improve the efficiency of the model we introduced the vibrational equipment in the seat belt. So when the somniferous state comes than not only the sound would be heard but also the vibration would be feel by the driver. And that the whole of the equipment is fitted into the seat so when the alarm is active then the vibration is felled by the driver.

Architecture

SciPy is a Python extension that contains a library of mathematical methods and useful functions. It gives the user high-level commands and classes for manipulating and displaying data, which gives the interactive Python session a lot more power.

Imutils A set of utility functions for OpenCV and Python 3 that make simple image processing tasks like translation, rotation, scaling, skeletonization, and presenting Matplotlib pictures easier.

OpenCV It's an excellent programme for image processing and computer vision. It's an open-source library for tasks including face identification, object tracking, landmark detection, and more. Python, Java, and C++ are some of the languages supported.
Dlib is a C++ toolkit for real-world machine learning and data analysis. Despite the fact that the library was created in C++, it has excellent Python bindings. Face detection and facial landmark detection are two of the most common uses of dlib.

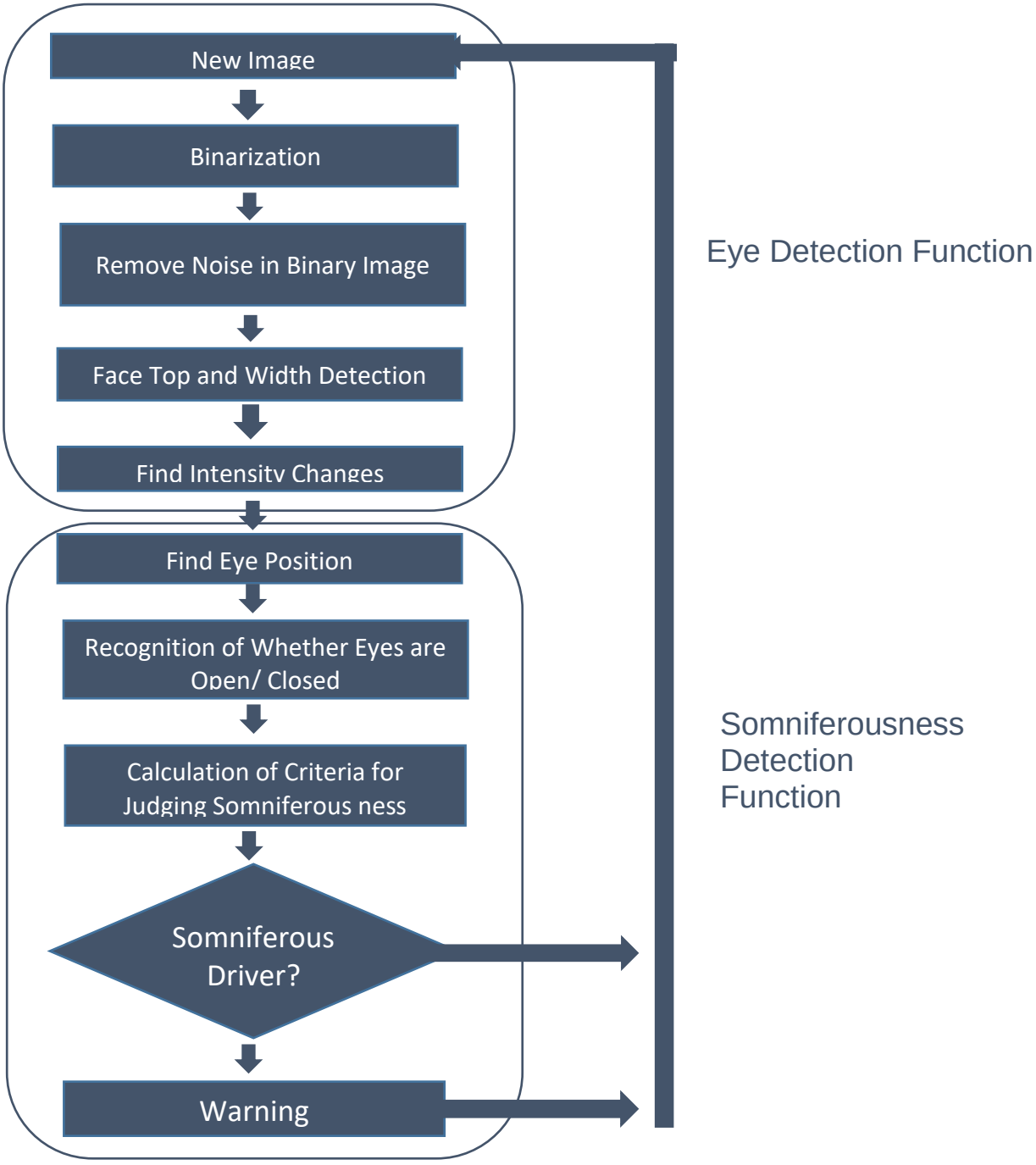
TensorFlow, a Python library for rapid numerical processing. It's a foundation library that can be used to develop Deep Learning models directly or via wrapper libraries built on top of TensorFlow to make the process easier.

Keras is a free open source Python framework for building and analysing deep learning models that is both powerful and simple to use. It covers the fast numerical calculation libraries Theano and TensorFlow, allowing you to design and train neural network models with only a few lines of code.

Time This module gives you a variety of ways to represent time in code, including objects, integers, and texts. Other than expressing time, it also allows you to wait throughout code execution and measure the performance of your code.

Algorithm

To get rid of the somniferous ness we develop a machine learning AI model that helps to prevent the accidents that would happen in the future. As to make this model possible we use multiple libraries of python language to develop a model that is the scipy.spatial, imutils, threading, numpy, opencv and at last the dlib library, and for playing the sound and vibration using the libraries that are play sound and argparse. And the time library has used the delaying the time to train the model for the correct observation. And from the basic principle of artificial intelligence that is if we want a perfect model for better accuracy we would need to train the model as much as we can. As it gains some experience from the model that it would perform well. Then we can upload the whole code to the Arduino and then the whole model would be placed into the seat belt of the car like a vibrator and for playing the alert sound for the driver. Then the camera would detect the consciousness of the driver that was being placed on the dashboard of that car. That whole of the code would be uploaded on the Arduino or the software that was being installed in the car. And using OpenCV, Keras, and TensorFlow libraries at the backend of the code it would help our model to predict the accurate result. Then the OpenCV would detect the face structure of the human that was sitting in the front of the camera that uses the convolutional neural networking layers to identify its structure. As the convolutional networks use the layers in 32, 32, 64 & 128 nodes with the kernals in it is like in the procedure of 3, 3, 3, 2 CNN’s layers format to detect the accurate prediction of the somniferous ness and this process would be fastened by using TensorFlow at the backend. And that would make the whole model possible.



So as per the flow chart of the system we used the whole of the model to train the model first to improve the efficiency of the whole of the system then we would train the model again and again so that the model can gain the experience from the previous and work effectively and efficiently.

We will use OpenCV to acquire photos from a camera in this Python project:

Step 1: Take an image from a camera as input.

Step 2 – Create a Region of Interest around the face in the image (ROI).

Step 3: Use the ROI to find the eyes and input them to the classifier.

Step 4 – The classifier will determine whether or not the eyes are open.

Step 5: Calculate the score to see if the person is exhausted.

STEP 1

We'll use a webcam to capture photographs as input. So we created an infinite loop to access the webcam and grab each frame. We employ the cv2 technique offered by OpenCV. To access the camera and set the capture object, use VideoCapture(0) (cap). Each frame is read with cap.read(), and the image is saved in a frame variable.

Localization of Face

A symmetry-based method is appropriate because the Face is symmetric. It was discovered that using a sub sampled gray-scale rendition of the image is sufficient. After that, a symmetry value is calculated for each pixel column in the reduced image.

$S(x) = \sum\sum$ [abs I ((x,y-w)-(x,y+w))].

If the picture is represented as I(x, y), then S(x) = [abs I ((x,y-w)-(x,y+w)] is the symmetry value for a pixel-column.

S(x) is calculated for X € [k,size-k], where k is the greatest distance from the pixel column at which symmetry is assessed and x size is the image width. The face's centre is the x that corresponds to the lowest value of S(x).

STEP 2

To find the face in the image, we must first convert it to grayscale, as the OpenCV object detection algorithm only accepts grayscale images as input. To detect the objects, we don't require colour information. To detect faces, we'll use the Haar cascade classifier. Face = cv2.CascadeClassifier('path to our haar cascade xml file') is used to set our classifier. Then we use faces = face to accomplish the detection. detectMultiScale(gray). It produces an array of detections with x,y coordinates as well as height, which is the width of the object's border box. We can now cycle across the faces, drawing boundary boxes for each one.

The eye is monitored by searching the anticipated region for the darkest pixel. It is ensured that none of the geometrical requirements are broken in order to recover from tracking failures. The eyeballs are re-localized to the following frame if they are.

To determine the best match for the eye template, it is first centred on the darkest pixel, then a gradient descent is used to obtain a local minimum.

By looking for the darkest pixel in the expected zone, the eyes are monitored.

STEP 3

Eyes are detected using the same process as faces. To detect the eyes, we first establish the cascade classifier for eyes in leye and reye, then use left eye = leye. detectMultiScale(gray). Only the eyes data from the complete image must now be extracted. This is accomplished by first extracting the eye's boundary box, and then using this code to extract the eye image from the frame.

STEP 4

The ocular state is predicted using a CNN classifier. We must conduct specific procedures to feed our image into the model because the model requires the correct dimensions to begin with. First, we use r eye = cv2.cvtColor(r eye, cv2.COLOR BGR2GRAY) to convert the colour image to grayscale. Then, using cv2.scale(r eye, (24,24), we resize the image to 24*24 pixels, as our model was trained on 24*24 pixel images. For improved convergence, we normalise our data (r eye = r eye/255). (All numbers will be in the range of 0-1). To feed our classifier, expand the dimensions.

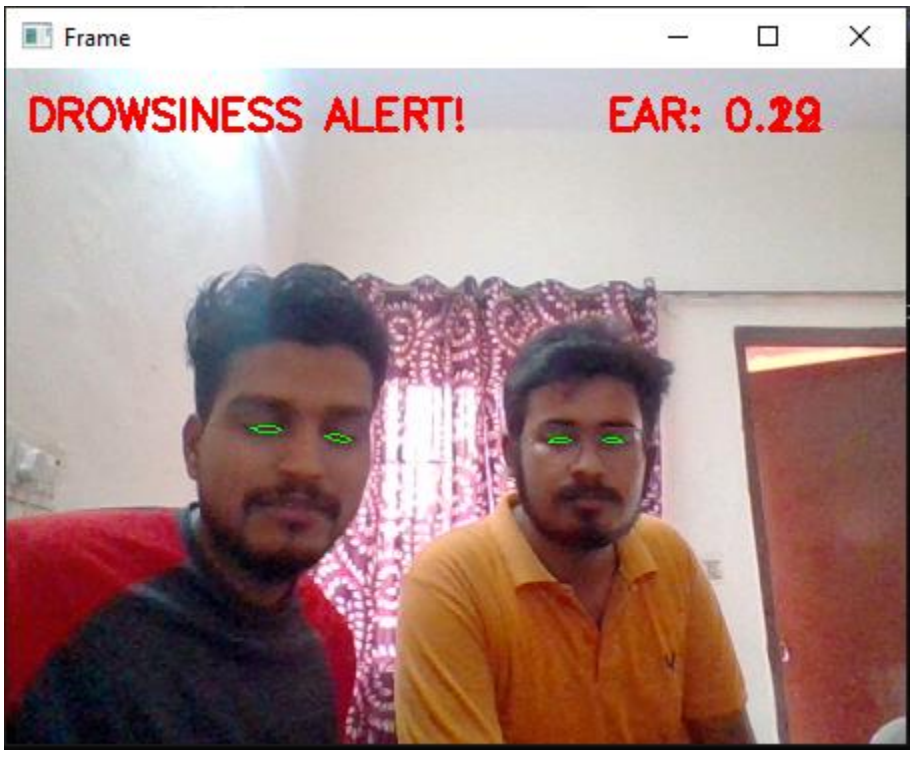
model = load model('models/cnnCat2.h5') was used to load our model. With our model, we can now forecast each eye.

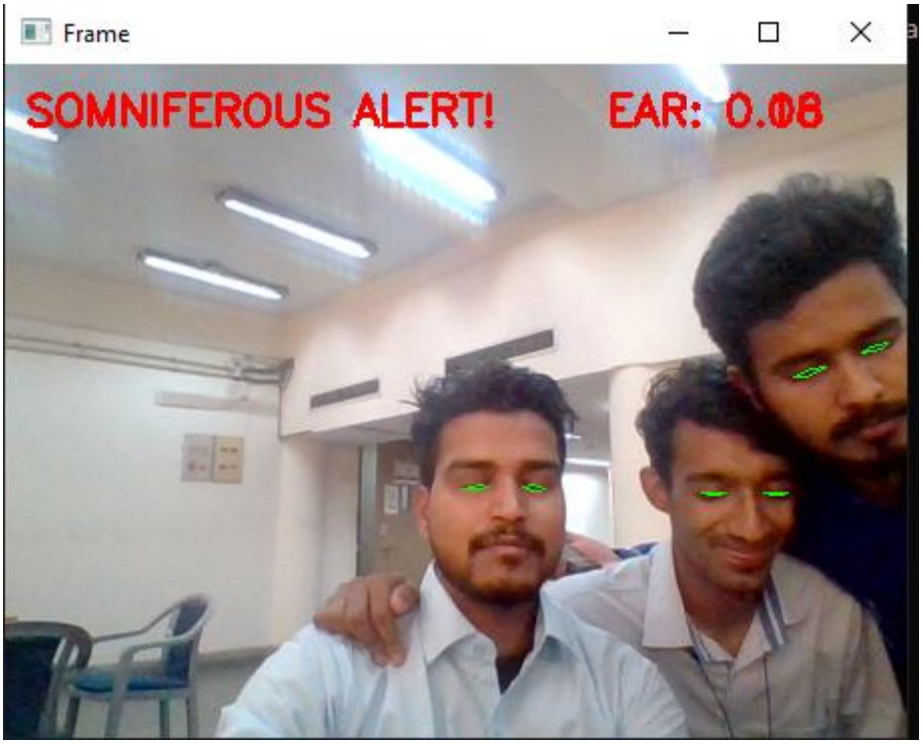
STEP 5

The score is a number that will be used to determine how long the person has been closed-eyed. So if both eyes are closed, the score will continue to rise, whereas if both eyes are open, the score will fall. We're using the cv2.putText() function to draw the result on the screen, which will show the person's current state.

Results and Discussions

The DRIVER FATIGUE DETECTION SYSTEM has been deployed by a number of top car firms to help drivers maintain their physical and emotional well-being while driving.




Frame
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