



MODEL ON DROWSINESS DETECTION FOR LOCO PILOTS USING MACHING LEARNING

Matta Madmitha, Mr.P.J. Santhosh Kumar M

122022502032-MSc Data Science(2/2), Assistant professor

Department of Computer Science, GITAM (Deemed to be University)

mmatta@gitam.in, smadabat@gitam.edu

ABSTRACT

With this Python project, we will be making a drowsiness detection system. A countless number of trains work by loco pilots in day and night shifts. Loco pilots travelling long-distance suffer from lack of sleep. Due to which it becomes very dangerous to drive when feeling sleepy. The majority of accidents happen due to the drowsiness of the driver. So, to prevent these accidents I build a system using Python, OpenCV, Tkinter and Keras which will alert the driver when he feels sleepy and also if the driver doesn't come to consciousness the automatic break system will activate and then the train will stop. Drowsiness detection is a safety technology that can prevent accidents that are caused by drivers who fell asleep while driving. By connecting it to the hardware device or by using IoT we can monitor the person 24/7. So as a human that person may feel sleepy at times even though with multiple shifts and may also be ill and feel sleepy. So this may be avoided with my project work. By this they may get awake and continue their work. And also by removing the breaking system activation this project can be used to detect heavy vehicle drivers, Employees in offices, and Students during Online classes and online exams.

KEYWORDS : Python, Machine Learning, Image Processing, Keras, Opencv

I. INTRODUCTION :

According to a report by Railway Technology, India has the fourth largest rail network within the world after America, China and Russia. India's rail network is about 68 thousand route kilometers long. Now when the rail network of the country is so large, rail accidents also happen here. Most rail related accidents are simple, during which there's not much loss of life and property. But, we've also seen such rail accidents here which have rocked the full country.

Despite this, Indian Railways manages its vast railway network during a superb and secure manner. All the trains are driven by the loco pilots and their alertness is that the key to confirm the protection of the train. Traditionally Railways enforce stringent rules and regulations for loco pilots to make sure the periodical rest so loco pilots won't get drowsiness while onboard train operation.

Rail accident can happen because of many reasons Rail accidents occurring within the country are sometimes thanks to technical reasons, sometimes it will be because of negligence and human errors.

Over and over people also get such questions about railway accidents, what is going to happen if a driver (loco pilot) falls asleep during a moving train? Now you need to be thinking that if the loco pilot falls asleep within the moving train, then that train is the victim of a terrible accident. But it's not like that. Yes, you read it right. whether or not a driver falls asleep during a moving train, his train won't have an accident and there are many reasons for this.

Rail accident can happen due to many reasons

Rail accidents occurring in the country are sometimes due to technical reasons, sometimes it can be due to negligence and human errors. Many times people also get such questions about railway accidents, what will happen if a driver (loco pilot) falls asleep in a moving train? Now you must be thinking that if the loco pilot falls asleep in the moving train, then that train will be the victim of a terrible accident. but it's not like that. Yes, you read it right. Even if a driver falls asleep in a moving train, his train will not have an accident and there are many reasons for this.

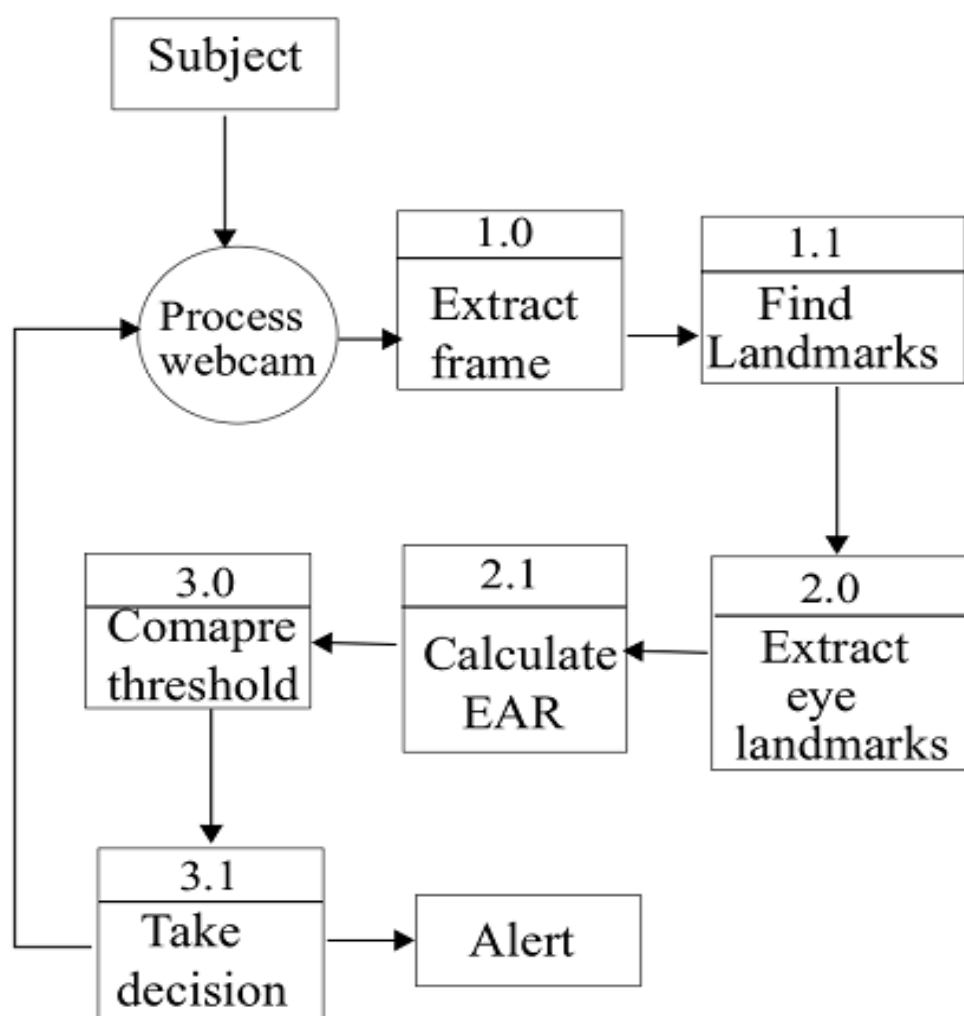
Every train has two loco pilots

All the trains in India have two loco pilots. Even if one loco pilot falls asleep, the other loco pilot is able to face any kind of situations. Apart from this, suppose that even if there is a big problem, he can wake up his fellow loco pilot and control the situation. However, this happens very rarely when a driver falls asleep in a moving train while on duty. And even if you fall asleep, there is no train accident of any kind. Apart from this, there is also a very powerful technique to avoid such situations, which do not cause train accidents. If both of them fell asleep or unable to control the train due to faintness then our project will help them.

Problem Statement :

In this project I am creating a model to detect the drowsiness of the Loco pilots who work in rotational shifts. Due to the laziness or illness of the drivers leads to many accidents and break outs. So to avoid this and to make them concentrate on their driving I introduced a system to monitor the driver 24/7. A system which can keep monitoring the driver's condition for drowsiness and alert the driver before it's too late. For this we need a system which will focus on the driver's eyes whether they are open or closed state of as by monitoring the state of the eyes detection is easy. Detection in real-time is the major challenge in the field of accident prevention system for the loco pilots.

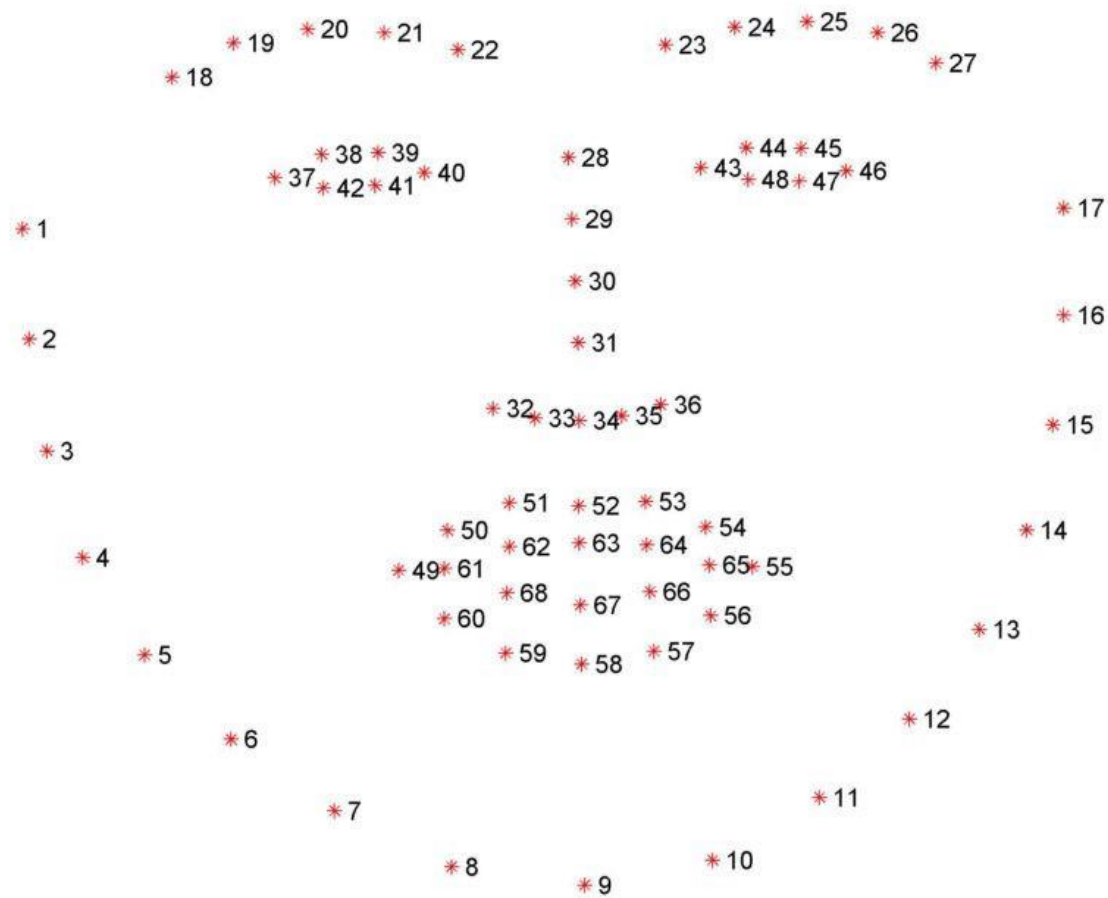
Framework and Methodology :



Data used

Shape predictor 68 face landmarks.dat file is taken for the prediction and calculation of the attention ratio. Identifying faces in photos or videos is incredibly cool, but this isn't enough information to create powerful applications, we would like to get more information about the person's face, like position, whether the mouth is opened or closed, whether the eyes are opened, closed, looking up etc. During this text will be ready to present to you (in a fast and objective way)

The Dlib, a library capable of providing you with 68 facial points (landmarks) of the face. It's a landmark's facial detector with pre-trained models, the dlib is used to estimate the case of 68 coordinates (x, y) that map the facial points on a person's face like picture below.



These facial points are identified from the pre-trained model where the dataset was used.

Libraries used

Scipy: SciPy is a scientific computation library that uses Numpy. Scipy stands for scientific python. It provides more utility functions for optimization, statistics and signal processing. Scipy is an open source so we can use it freely. It is used to solve mathematical, scientific, engineering and technical problems. It allows the user to manipulate the data and visualize the data.

PIL: Python Imaging Library (expansion of PIL) is a free and open-source additional library for the python programming language. This helps for opening, manipulating, and saving many different image file format. It is available for Mac OS X, Windows and Linux.

Imutils: Imutils is a package based on OpenCv, which can call the opencv interface more simply. It can easily realize a series of operations such as image rotation, translation, scaling, skeletonization and more. The zoom of the picture should be ensured to maintain the aspect ratio in opencv. In imutils, the aspect ratio of the original image is automatically maintained, and only the width weight and height can be specified.

Tkinter: Tkinter is a standard GUI Library for python. Python when combined with Tkinter provides a fast and easy way to create GUI applications. It provides a powerful object-oriented interface to the Tk GUI toolkit. It is the only framework built into the python Standard library.

NumPy: NumPy is a library in python programming language, provides support for the large, multi-dimensional array and matrices, along with a large collection of high-level mathematical functions to operate on the arrays. It performs wide variety of mathematical operations on arrays. It also works on linear algebra routines, Fourier transforms and many more.

Pygame: Pygame is a cross-platform set of python modules which is used to create video games and animations. It consists of computer graphics and sound libraries designed to be used with the python programming language. Pygame was written by Pete Shinnars to replace the PySDL.

dlib: dlib is written in C++ programming language. It is a general purpose cross-platform software library. Its design is heavily influenced by ideas from design by contract and component based software engineering. It is a set of independent software components. It is a toolkit for making real world machine learning and data analysis applications.

cv2: cv2 is the module import name for opencv-python. The traditional Opencv has many complicated steps involving building the module from scratch, which is unnecessary. It is a great tool for image processing and performing computer vision.

os: os library provides functions for creating and removing a directory(folder), fetching its contents, changing and identifying the current directory, etc.

Existing system

In existing system they build a driver drowsiness detection system that will detect if the eyes of the driver are close for too long time and alert if the driver is sleepy or inactive. This can be an important safety implementation to prevent road accidents as studies suggest that accidents due to drivers because of getting drowsy or sleepy calculated for around 20% of all accidents and on some long journey roads it's up to 50%. It is a serious issue and most of the people that have driven for long hours at night can relate to the get or become fatigue and slight brief state of unconsciousness can happen to anyone. There has been an increase in safety systems in cars & other heavy vehicles and many more are now mandatory in vehicles, but all of them cannot help if a driver falls asleep behind the wheel even at some moments.

Proposed System

In this project I'm creating a model to detect the drowsiness of the Loco pilots who add rotational shifts. Thanks to the laziness or illness of the drivers ends up in many accidents and break outs. So to avoid this and to create them target their driving I introduced a system to watch the motive force 24/7. In this model by monitoring the motive force the camera will work and when the driving force feels drowsy or faint then the camera will detect that and alerts him with an alarm certainly time then if the motive force remains sleepy then it'll activate the breaking system to prevent the train for avoiding accidents. this is often the method of the system that may add loop. This was done by connecting our software to the hardware device or through IoT.

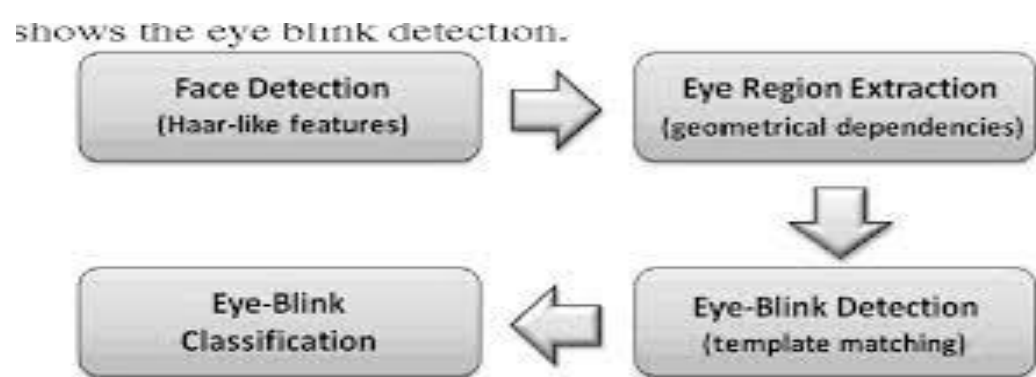
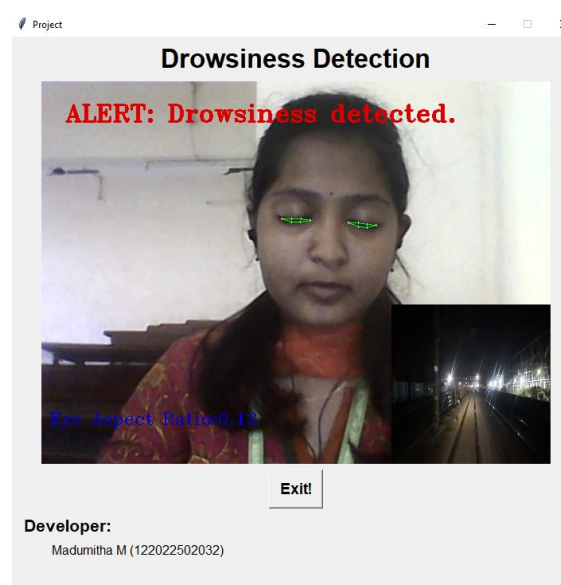
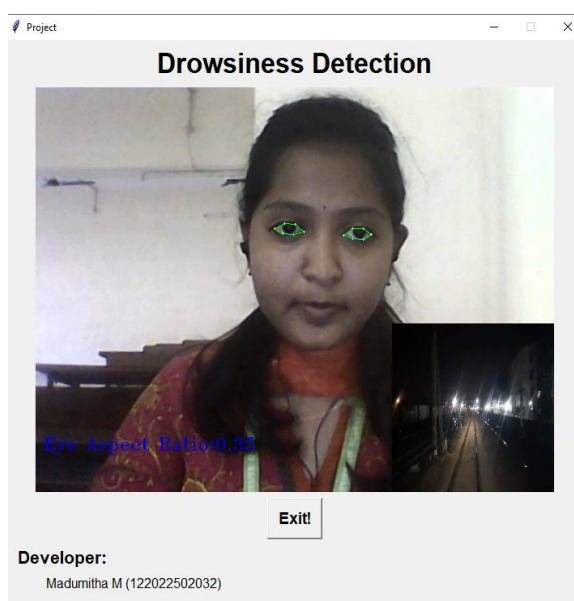


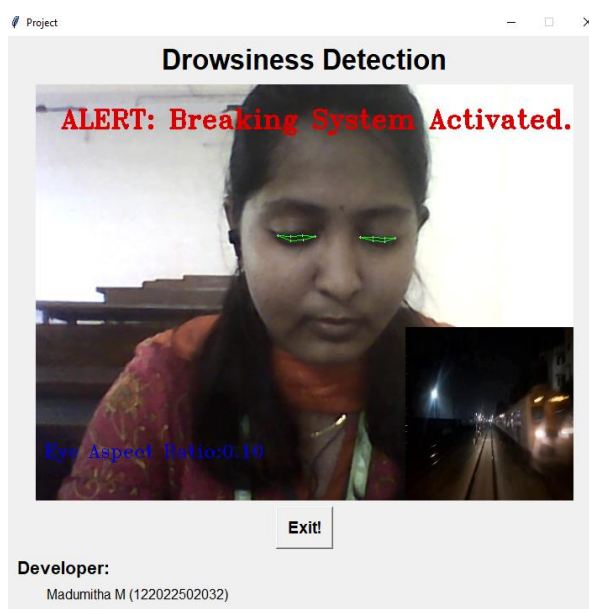
Fig. 6. Scheme of the proposed algorithm for eye-blink detection [20]

Results

The project is about the detection of drowsiness for the loco pilots in the trains. This was done using python with libraries like opencv, keras, tensorflow and some other. The results of the code or our model is shown in the below pictures



After few minutes if the driver doesn't wake up then the breaking system will be activated.



Conclusion and further scope

Here in this project the model is executed by the computer but when it is connected with IoT or any hardware device it may work much more effectively. This is the starting stage for the invention so this can be further developed in so many ways with some minor modifications. This can be used in many other places like in cars and heavy vehicles and some offices & Schools for their online classes and online exams. This proposed model may help to reduce the scope for the accidents and problems.

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