OPERATOR FATIGUE DETECTING AND ANALYSING SYSTEM (2018CSEPID41)

by

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PROBLEM STATEMENT

Fatigue is a safety issue that has yet to be fully addressed by any government in the world, owing to its nature. Fatigue is difficult to detect or observe in general, unlike alcohol and drugs, which have well-defined key indications and tests that are readily available. The greatest remedies to this problem are probably increased awareness of fatigue-related accidents and encouraging Operators to confess weariness when necessary. The former is difficult and expensive to achieve, while the latter is impossible without the former, as long-distance driving is extremely lucrative.

Problem: A new system to monitor the operator fatigue and analyze them.

INTRODUCTION

What is Operator fatigue?

Operator fatigue is a common phenomena which is occured due to long time of driving or lack of sleep.

How to detect fatigue in operator?

As the eyes closure occurrences dramatically increase during the ten second period preceding an accident, monitoring such closures is a good way to determine drowsiness and prevent the accident.

Implementation Block Diagram

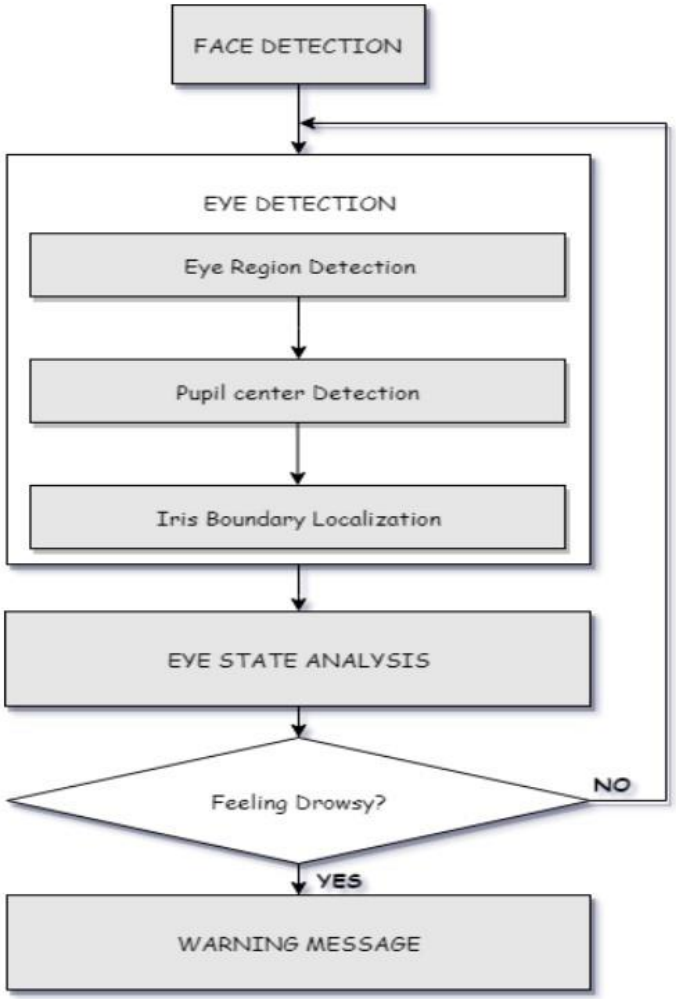

Fig. 1 OFDS

User Case Diagram

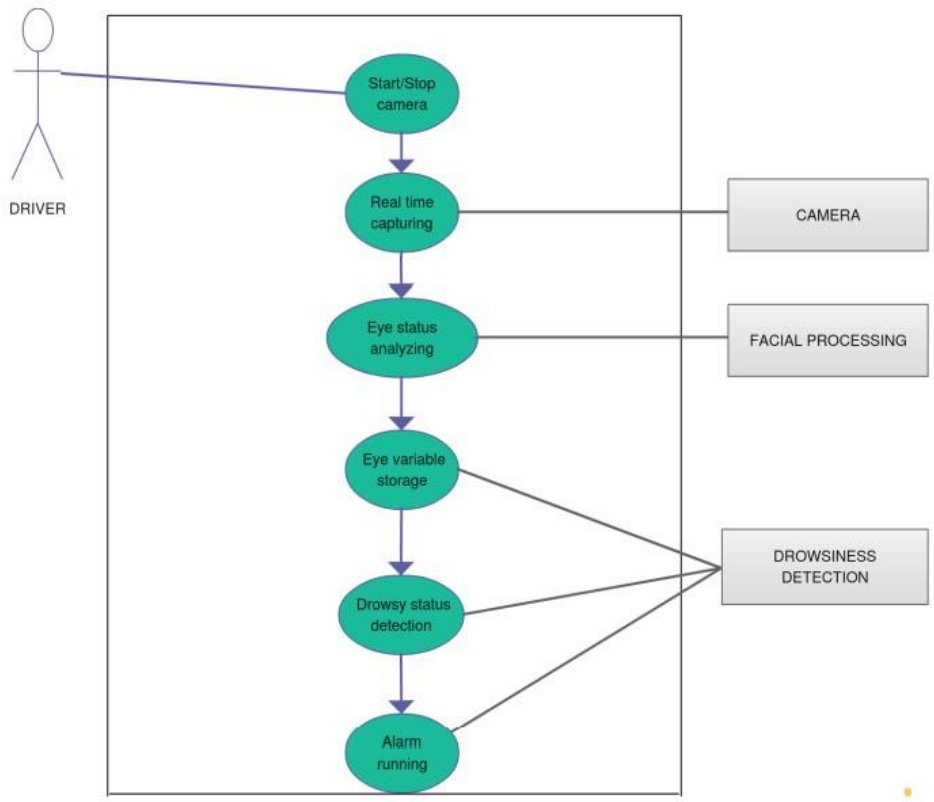

Fig. 2 Block Diagram

PROJECT IMPLIMENTATION

- (1) Face Detection and Aspect Ratio Calculation Of Pupil .
- (2) Image Processing.
- (3) Alert Message Generation.

Phase 1. Calculation Of Aspect Ratio

Aspect Ratio Formula

The formula for finding aspect ratio is:

$$AR = W/H$$

Where:

- AR is the aspect ratio
- W is the width of the displayed image.
- H is the height of the displayed image.

Phase 2. Image Processing

(a) Coding of Image Processing

phase3.py > {} cv2

```python
#Importing OpenCV Library for basic image processing functions
import cv2
# Numpy for array related functions
import numpy as np
# Dlib for deep learning based Modules and face landmark detection
import dlib
#face_utils for basic operations of conversion
from imutils import face_utils


#Initializing the camera and taking the instance
cap = cv2.VideoCapture(0)

#Initializing the face detector and landmark detector
detector = dlib.get_frontal_face_detector()
predictor = dlib.shape_predictor("shape_predictor_68_face_landmarks.dat")

#status marking for current state
sleep = 0
drowsy = 0
active = 0
status=""
color=(0,0,0)

```

Fig. 3 Code 1

(b) Image Processing visualization

(1) In our program we used Dlib , a pre-trained program trained on the HELEN dataset to detect human faces using the pre-defined 68 landmarks.
(2) After passing our video feed to the dlib frame by frame, we are able to detect left eye and right eye features of the face.
(3) Now, we drew contours around it using OpenCV

Fig. 4 Image Processing

Obtained Output

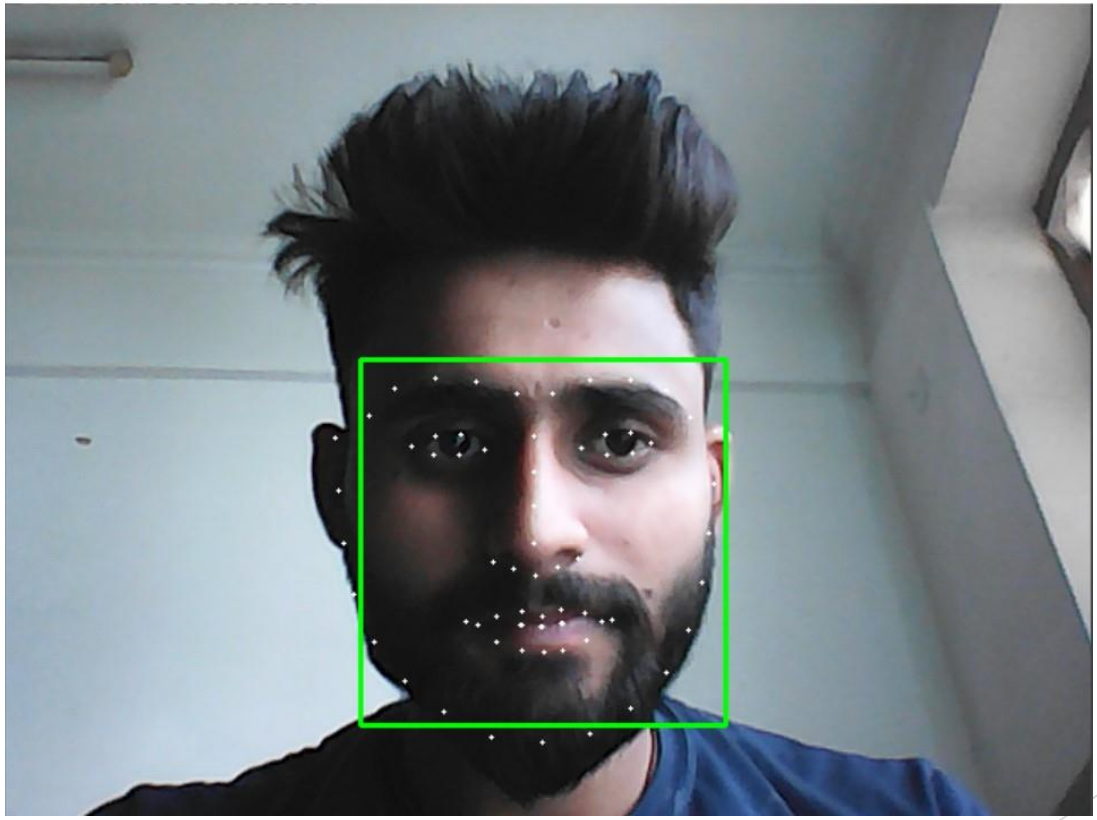

Fig. 5 Output Figure 1

Phase 3. Alert Notification

(i) Aspect ratio >= 0.25

Aspect ratio is greater than 0.25 determine the activeness of operator which is operating the vehicle.

Fig. 6 Output Figure 2

(ii) 0.24<= Aspect ratio <= 0.05

Aspect ratio for operator which lie between 0.05 to 0.25 describe the drowsiness of operator as they are operator is operating the vehicles for longer time.

Fig. 7 Output Figure 3

(iii) Aspect Ratio< 0.05

To identify the operator sleeping is very important aspect because if any operator blinking their eyes which might cause accidents. So with aspect ratio less than 0.05 gives us alert notification that our operator is sleeping.

Fig. 8 Output Figure 4

TEST CASE AND SYSTEM RESULT

Test Cases and Test Results

Test Id	Test Case Title	Test Condition	System Behavior	Expected Result
T01	Case_1	Straight Face, Good Light, With no Glasses	Active	Active
T02	Case_2	Tilted Face, Good Light, No Glasses	Drowsy	Drowsy
T03	Case_3	Tilted Face, Good Light, No Glasses	Sleeping	Sleeping

IMPORTANCE OF PROJECT FOR SOCIETY

- Helps to save life of driver as well those people who are present as that time on the road by alerting driver with alarm.
- Help to save properties loss which might occurred due to drowsiness of operator.
- The same model and techniques can be applied to a variety of other applications, such as detecting when a user is sleeping and stopping the video accordingly.

LITERATURE SERVEY

Author	Publisher	Title	Work
Vishnu Yarlagadda, Shashidhar G. Koolagudi, Manoj Kumar M V, Swapna Donepudi	IEEE (December 2020)	Driver Drowsiness Detection Using Facial Parameters and RNNs with LSTM	In this project we detect the state of drowsiness using facial parameters obtained using facial points with the help of RNNS and LSTM with accuracy of 92.25%.
WANGHUA DENG AND RUOXUE WU	IEEE (21st August 2019)	Real-Time Driver-Drowsiness Detection System Using Facial Features	In this paper, we propose a system called “DriCare”, which detects the drivers’ fatigue status, such as yawning, blinking, and duration of eye closure, with accuracy of 90%.
Subramanian Arumugam* and R. Bhargavi	Springer (2019)	A survey on driving behavior analysis in usage based insurance using big. data.	In this research paper, Pay-How-You-Drive (PHYD) model is developed in which the premium is charged for the personal auto insurance depending on the post-trip analysis.

Author	Publisher	Title	Work
Jun Wang, Xiaoping Yu*, Qiang Liu,and Zhou Yang	Springer (2019)	Research on key technologies of intelligent transpotation based on image recoznigation and anti fatigue.	This paper focuses on the traffic safety caused by fatigue driving based on image recognition of key technologies for research and analysis. It uses KNN algorithm with accuracy of 87.82%.
Felipe Jiménez José Eugenio Naranjo , José Javier Anaya , Fernando García b	ScienceDirect (18 April 2016)	Advanced Driver Assistance System for road environments to improve safety and efficiency	In this project, advanced driver assistance system (ADAS) for rural and intercity environments is proposed. The system focuses mainly on compared to motorways and the high number of severe and fatal accidents on them.

CONCLUSION & FUTURE WORK

OFDAS detects sleepiness Of operator with excellent accuracy of 94% and high reliability.

Processing determines the operator's degree of awareness based on continuous eye closures.

Alert Notification will provide an self realization of the safety of operator.

Some Future Scopes are:

We intend to expand on the concept by adding a sensor to monitor heart rate in order to prevent accidents caused by Operators suffering from sudden heart attacks.

It can also be utilized in an application that warns users about their level of tiredness while driving.

Tools Used In Implementation

Cython

Dlib

Visual Studio Code

RESEARCH PAPER PUBLICATION DETAILS

Research Paper is communicated in 4th IEEE international Conference in Scopus Index

The following submission has been created.

Track Name: ICAC3N2022

Paper ID: 97

Paper Title: Operator Fatigue Detecting and Analyzing System

Abstract:
Operator fatigue is defined as the mental tiredness occurred due to late night work. This system proposed to detect the mental tiredness of operator. Road accidents are caused by a variety of factors, including driver carelessness, weather conditions, road invisibility, sleepiness, and alcohol intake. In addition, the study provides an outline of the authors' findings in order to aid future optimization in the indicated sector in order to obtain utility at a higher efficiency for a safer road. This gives us the alert notification about the status of operator who is operating the vehicle by calculating the aspect ratio of their eyes and determine them which fixed and calculated ratio. This manually tested experimental results showed that Operator Fatigue Detecting System achieved around 94% accuracy.

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Detail of research paper Publication in IEEE International Conference in Scopus Index

Notification 4th IEEE ICAC3N-22 & Registration: Paper ID 97

Inbox ×

Microsoft CMT <email@msr-cmt.org>
to me

Fri, May 6, 2:36 PM (7 days ago)

Dear Author,

Greetings from Galgotias College of Engineering and Technology!!!

On behalf of the 4th ICAC3N-22 Program Committee, I am delighted to inform you that the submission of "Paper ID- 97 " titled " Operator Fatigue Detecting and Analyzing System " has been accepted for presentation at the ICAC3N- 22 and will be sent for the submission in the conference proceedings to be published by the IEEE.

Please complete your registration by clicking on the following Link: https://forms.gle/8acy23i3UbtwLkFXA on or before 20 May 2022.

Note:
1. All figures and equations in the paper must be clear.
2. Final camera ready copy must be strictly in IEEE format.
3. Minimum paper length should be 5 pages.
4. If plagiarism is found at any stage in your accepted paper, the registration will be cancelled and paper will be rejected and the authors will be responsible for any consequences.
5. Violation of any of the above point may lead to rejection of your paper at any stage of publication.

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(2) Real-Time Driver-Drowsiness Detection System Using Facial Features , WANGHUA DENG1 AND RUOXUE WU in IEEE(21 August 2019).

(3) A survey on driving behavior analysis in usage based insurance using big data, Subramanian Arumugam* and R. Bhargavi in Springer(2019).

(4) Research on key technologies of intelligent transportation based on image recognition and anti-fatigue driving Jun Wang, Xiaoping Yu, Qiang Liu and Zhou Yang in Springer(2019).

(5) Advanced Driver Assistance System for road environments to improve safety and efficiency Felipe Jiménez a,*, José Eugenio Naranjo a, José Javier Anaya a, Fernando García b, Aurelio Ponz b, José María Armingol in ScienceDirect(18 April 2016)

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THANK YOU