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DRIVER DROWSINESS DETECTION SYSTEM

Using Open CV and Haarcascade Algorithm

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Abstract: The purpose of this report is to review the various aspects of the project related to the development of a system that would detect the presence of driver drowsiness. It also provides an overview of the system's utility and its various changes.This report analysed the various techniques and procedures that were used in the development of a system for detecting driver drowsiness. The objective of this project is to provide a real-world view of how the system operates and what changes can be made to improve its utility. Through the study, we were able to identify areas of improvement that can be implemented to make the system more efficient.

IndexTerms **- Driver, drowsiness, system**

I. INTRODUCTION

The driver face monitoring system is a real-time system that investigates the driver physical based on the processing of driver face images. The driver state can be estimated from the eye closure, eyelid distance, blinking, gaze direction, yawning, and head rotation. This system will alarm in the hypo vigilance states including fatigue and distraction. The major parts of the driver face monitoring system are imaging, hardware platform and the intelligent software.

Drowsiness detection is a safety technology that can prevent accidents that are caused by drivers who fell asleep while driving. The objective of this intermediate Python 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.

II. PROBLEM STATEMENT AND OBJECTIVE

The driver face monitoring system is a real-time Fatigue is a safety problem that has not yet been deeply tackled by any country in the world mainly because of its nature. Fatigue, in general, is very difficult to measure or observe unlike alcohol and drugs, which have clear key indicators and tests that are available easily. Probably, the best solutions to this problem are awareness about fatigue-related accidents and promoting drivers to admit fatigue when needed. The former is hard and much more expensive to achieve, and the latter is not possible without the former as driving for long hours is very lucrative

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V. LITERATURE SURVEY

5.1 SURVEY OF EXISTING SYSTEM

5.1.1 Shruti Mohanty, Shruti V Hegde, Supriya Prasad, J. Manikandan Design of Real-Time Drowsiness Detection System using Dlib, 2019 5th IEEE International WIE Conference on Electrical and Computer Engineering, 15-16 Nov 2019, Bangalore, India.

Drowsy driver detection system is designed using Python and Dlib model. This model is trained to identify 64 facial landmarks. The drowsiness features are extracted and the driver is alerted in case of drowsiness. The Dlib library is used to detect and localize facial landmarks using Dlib's pre-trained facial landmark detector called Histogram of Oriented Gradients (HOG). In this method[5].

frequencies of gradient direction of an image in localized regions are used to form histograms. It is used to map the coordinates of the facial landmarks of the input video and drowsiness detected by monitoring aspect ratios of eyes and mouth.

The following steps are followed for the testing of the model:

a) Input video (pre-recorded or real time) is fed into the model. Individual frames are resized and converted to grayscale.
b) Dlib's HOG based face detector is initial location of the face is pinpointed.
c) The facial landmarks for the face region are determined by the predictor and mapped onto the face.
d) Left eye, right eye and mouth coordinates are extracted, which are then used to compute aspect ratio for both eyes and mouth based on Euclidean distance respectively.
e) The calculated aspect ratios are compared with fixed threshold values to determine signs of drowsiness. If the average aspect ratio of left and right eye falls below the threshold, it is recognized as a sign of drowsiness. Similarly, if the mouth aspect ratio exceeds the set threshold, there is a possibility for it to be a yawn.
f) When continuous signs of drowsiness are detected over a longer duration, the driver is alerted [5].

5.1.2 Wisaroot Tipprasert, Theekapun Charoenpong, Chamaporn Chianrabutra, Chamaiporn Sukjamsri. A Method of Driver's Eyes Closure and Yawning Detection for Drowsiness Analysis by Infrared Camera (2019)

A challenge in the driver drowsiness detection is to detect the drowsiness in low light condition. The proposed system is a method to detect driver's eye closure and yawning for drowsiness analysis by infrared camera. The flowchart of the proposed system is given in Figure 5.1.2.1. The advantage of this method is that it can detect eye closure and yawning in low light condition[7].

This method consists of four steps, namely,

- Face detection
- Eye detection
- Mouth detection
- Eye closure and yawning detection

The main concept is detecting the driver's face and set it to region of Interest (ROI). Next use ROI to find targets as eye and mouth. This process starts by getting input from infrared 2D camera and processing by MATLAB. First step author will set the infrared camera at the top of the vehicle facing the driver and records the driver's random action like blink, closing eyes and yawn randomly. When the program detects the symptoms of driver drowsiness, program will print red rectangle around symptom area such as yawning will print red rectangle around driver's mouth and eyes closure will print angle around driver's eyes area [7].

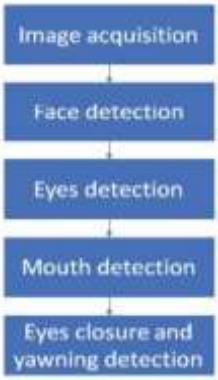

Fig 5.1.2.1 flowchart of the proposed method [7]

5.2 LIMITATION EXISTING SYSTEM OR RESEARCH GAP

5.2.1 Shruti Mohanty, Shruti V Hegde, Supriya Prasad, J. Manikandan Design of Real-Time Drowsiness Detection System using Dlib, 2019 5th IEEE International WIE Conference on Electrical and Computer Engineering, 15-16 Nov 2019, Bangalore, India

a) This method does not have any thing related for blinking of a driver so this system may give false alarms
b) The process to detect drowsiness detection takes a long time due to slow processing which may cause casualties

2.2.2 Wisaroot Tipprasert, Theekapun Charoenpong, Chamaporn Chianrabutra, Chamaiporn Sukjamsri. A Method of Driver's Eyes Closure and Yawning Detection for Drowsiness Analysis by Infrared Camera (2019)

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VI. PROPOSED SYSTEM.

6.1 METHODOLOGY

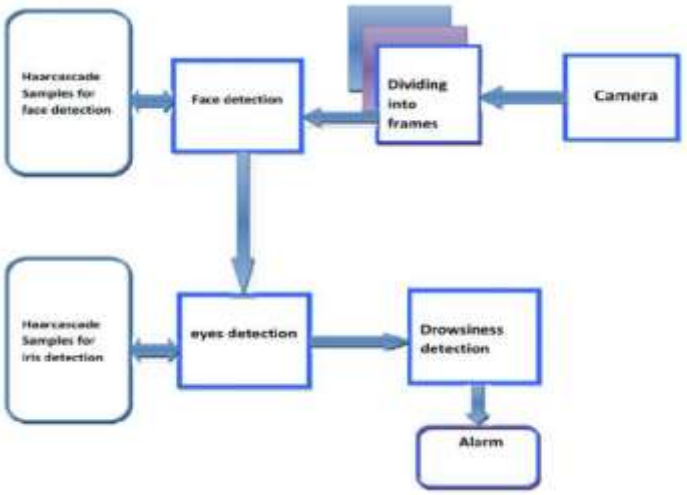

Fig 3.1.1 algorithm

Above figure showcases the various important blocks in the proposed system and their high-level interaction. It can be seen that the system consists of 5 distinct modules namely, (a) Video acquisition, (b) Dividing into frames, (c) Face detection, (d) Eye detection and (e) Drowsiness detection. In addition to these there are two external typically hardware components namely, Camera for video acquisition and an audio alarm. The functionality of each these modules in the system can be described as follows:

Step 1: - Video acquisition: Video acquisition mainly involves obtaining the live video feed of the automobile driver. Video acquisition is achieved, by making use of a camera.

Step 2: - Dividing into frames: This module is used to take live video as its input and convert it into a series of frames/ images, which are then processed.

Step 3: - Face detection: The face detection function takes one frame at a time from the frames provided by the frame grabber, and in each and every frame it tries to detect the face of the automobile driver. This is achieved by making use of a set of pre-defined Haarcascade samples.

Step 4: - Eyes detection: Once the face detection function has detected the face of the automobile driver, the eyes detection function tries to detect the automobile driver's eyes. This is achieved by making use of a set of pre-defined Haarcascade samples.

Step 5: - Detection: After detecting the eyes of the automobile driver, the drowsiness detection function detects if the automobile driver is drowsy or not, by taking into consideration the state of the eyes, that is, open or closed and the blink rate.

Step 6: - Deploy on Raspberry Pi: Deploy on Raspberry Pi using an external monitor and connect Pi camera and a buzzer to make it a complete detection system.

6.2 DETAILS OF HARDWARE & SOFTWARE

6.1.1 Hardware Specification:

1. Raspberry Pi 4+
2. 16 GB Memory Card
3. Pi Camera
4. Buzzer

6.1.2 Software Requirements:

1. Studio Code
2. Python 3.9
3. Pi OS

VII. LIMITATIONS.

The following are some of the limitations of the proposed system.

- The system fails if the automobile driver is wearing any kind of sunglasses.
- The system does not function if there is light falling directly on the camera.

VIII. CONCLUSION.

It completely meets the objectives and requirements of the system. The framework has achieved an unfaltering state where all the bugs have been disposed of. The framework cognizant clients who are familiar with the framework and comprehend its focal points and the fact that it takes care of the issue of stressing out for individuals having fatigue-related issues to inform them about the drowsiness level while driving.

IX. FUTURE WORK.

The model can be improved incrementally by using other parameters like blink rate, yawning, state of the car, etc. If all these parameters are used it can improve the accuracy by a lot. We plan to further work on the project by adding a sensor to track the heart rate in order to prevent accidents caused due to sudden heart attacks to drivers. Same model and techniques can be used for various other uses like Netflix and other streaming services can detect when the user is asleep and stop the video accordingly. It can also be used in application that prevents user from sleeping. Also, in the real time driver fatigue detection system it is required to slow down a vehicle automatically when fatigue level crosses a certain limit. Instead of threshold drowsiness level it is suggested to design a continuous scale driver fatigue detection system. It monitors the level of drowsiness continuously and when this level exceeds a certain value a signal is generated which controls the hydraulic braking system of the vehicle.

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