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Driver Drowsiness Detection Using Haarcascade Algorithm

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***Abstract*: Recently, in addition to research and development of autonomous vehicle technology, machine learning systems have been used to assess driver positions and emotions to upgrade road safety. The driver's position is assessed not only by basic characteristics such as gender, age, and driving experience, but also by the driver's facial expressions, biosignals, and driving behavior. Recent developments in video processing using machine learning have made it possible to analyze images obtained from cameras with high accuracy. Therefore, based on the relationship between facial features and the driver's sluggish position, variables that reflect facial features are established. In this paper, we propose a method of collecting detailed features of the eyes, mouth, and head using the OpenCV and DeLib library to assess the driver's level of drowsiness.**

***Keywords*: Face detection, Eye detection, Real-time system, Haarcascade, Drowsy driver detection, Blinking, Yawning, Head position.**

1. Introduction

Analysis of the driver's internal characteristics and the condition is useful to provide interactive services for safe driving. In a developing country like India, with the increase in transport technology and the total number of vehicles, road accidents are increasing rapidly.

The driver is alerted when the buzzer or vibration mechanism flows from the normal warning mode to the non-alert mode or exits. In this project, real-time data is collected by video camera. This data gives information about the driving status of the driver acting as the input of the controller. The controller takes appropriate action to alert the driver.

The current system describes the process of determining a driver's drowsiness based on youth measurement and head speed. It is based on real-time detection and tracking, detection, rate of the driver's face, and the number of changes in both oral contour area and head movement tracking.

Haar classification is a machine learning approach to visual object recognition developed by Vizola and Jones. It was originally intended to estimate milestones and facial contours but can be used for any object. In the proposed concept, the driver's face is constantly recorded using a camera to determine the level of hypo-vigilance. Then he closed his eyes and learned about making gestures. The blink frequency is higher than the normal rate and this is a condition of fatigue. A micro sleep lasting 3 to 4 seconds is a good indicator of fatigue. This closed eye gesture is implemented using an open CV. It alerts the driver about his fatigue using the alarm.

2. Methodology

In this section, results can be obtained using software and hardware platforms for the purpose of detecting driver drowsiness. In addition to eye and head movements, another visual cue that can capture the level of intoxication is his eyes and facial recognition analysis. Creating a computer-focused real-time application can be a very effective and efficient challenge to process powerful systems.

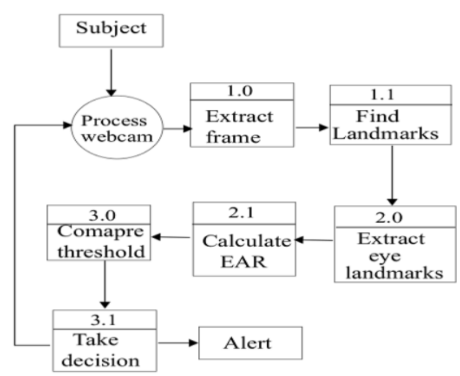

Fig. 1. Methodology

A. Module description

1) Capturing

The driver's image is captured using a Logitech camera, which is known for its clarity and cost-effectiveness. This camera produces a video clip and focuses on a single frame that catches the driver's eye. The extracted video is divided into frames for analysis.

2) Detection

This step involves first locating the driver's face. Face detection is performed using Face landmarks, resulting in face detection in the frame. Only structures or features related to the face are found and all kinds of objects such as buildings, trees, bodies are ignored. There is a determining parameter in our method to find the location of the eye driver. Eye aspect ratio (EAR) is the ratio of the number of eyelid blinks to the width of the eye.

3) Correction

The original position is found if the eye is closed or open or semi-closed or semi-open. Locating the location of the eyes is a very important requirement. If a certain entry value is near or in a semi-close position, a warning message will be channeled. If the system detects that the eyes are open, repeat until the closed eyes are visible.

B. Eye detection

The parameter eye that determines the condition of the patient in our project. Once the face is detected using the facial landmark algorithm, a rectangular box is created around the eyes, allowing easy focus on eye movement as if the eyes were open or closed. Eye field localization is the first step in this module. The eye area through the marked face is used for eye tracking and blink detection. The localized area is shown in the image below.

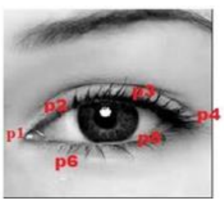

Fig. 2. Localized area

1) Eye Aspect Ratio

After identifying the eye from the face, the next step is to locate the eyelid. We use the eye aspect ratio formula to identify eye blinks. The eye aspect ratio which involves a very simple calculation based on the ratio of the distance between the milestones of the eye face. the formula is given below.

$$EAR = \frac{||P_2 - P_6|| + ||P_3 - P_5||}{2||P_1 - P_4||}$$

3. Conclusion

The main objective of this project is to develop a real-time drowsiness monitoring system in automobiles. We come from a simple system that divides the 5 modules into (a) video acquisition, (b) frame, (c) face detection, (d) eye detection and (e) drowsiness. Each of these components is handled independently and therefore provides a way to design them based on needs. Four features that make our system different from the current ones: (a) Focus on the driver, which is a direct way to detect drowsiness (b) A real-time system that includes the face, iris, eyelid and driver. Drowsiness (c) is a completely impermeable system, and (d) costly.

This work proposed a system to detect drowsiness while driving. The output of the system may be a warning to the vehicle or road company paying special attention to the vehicle or a warning to start a buzzer.

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