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AI BASED FATIGUE ALERT SYSTEM

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Abstract

The main reason for motor vehicular accidents is the driver drowsiness. This work shows a surveillance system developed to detect and alert the vehicle driver about the presence of drowsiness. Here we use an application using Android operating system to implement the Human Computer Interaction System. For the detection of drowsiness, the most relevant visual indicators that reflect the driver's condition are the behavior of the eyes, assent of the head and the yawn. The system works adequately. Due to a large number of traffic accidents when driver has fallen asleep this proposal was developed in order to prevent them by providing a non-invasive system, easy to use and without the necessity of purchasing specialized devices. This model describes a simple fatigue detection approach for a smartphone with Android application using Android Studio 2020.1 and Mobile Vision API (From Google ML Kit) for fatigue detection before and while driving. Physiological analysis and a quick facial analysis were performed to check drowsiness before the driver starts driving. The smartphone camera was used for facial analysis, and it will be undertaken by Google Vision API which determined the head position, blinking duration and yawning frequency through the eye opening and mouth opening probabilities.So,when the analysis show that the driver is drowsy, it will start producing alarm sounds by which the driver gets alerted.

1. INTRODUCTION

Sleeping is one of the basic needs of the human being, sleep lack causes the body to react inefficiently, reducing both reaction time and wakefulness, also produce low alertness and lose of concentration which reduces the ability to perform activities based on care that is necessary in the case of driving a car. According to many researches drowsiness is related to thousands of traffic accidents each year, the accidents produces approximately 50%

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of death or serious injuries as they tend to be impacts at high speed because the driver who has fallen asleep cannot brake or deviate to avoid or reduce impact. To mitigate these accidents, manufacturers have developed drowsiness detection systems that recognize signs of possible drowsiness, alerting the driver to their condition.

The objective of this work was to implement a surveillance system to the driver based on artificial vision techniques and implemented in a smartphone in order to detect and alert when the driver have drowsiness signs.

2. RELATED WORK

To increase accurateness and accelerate drowsiness detection, several approaches have been proposed. The first previously-used approach is based on driving patterns, and it is highly dependent on vehicle characteristics, road conditions, and driving skills. To calculate driving pattern, deviation from a lateral or lane position or steering wheel movement should be calculated. While driving, it is necessary to perform micro adjustments to the steering wheel to keep the car in a lane. The another type of technique uses data acquired from physiological sensors, such as Electrooculography (EOG), Electrocardiogram (ECG) and Electroencephalogram (EEG) data. EEG signals provide information about the brain's activity. the main disadvantage of this method is it requires many sensors to be attached to the driver's body, which could be uncomfortable. The last technique is Computer Vision, based on facial feature extraction. It uses behaviors such as gaze or facial expression, yawning duration, head movement, and eye closure. And measured the drowsiness of three levels through the distance between eyelids. This calculation considered the number of blinks per minute, assuming that it increases as the driver becomes drowsier.

3. IMPLEMENTATION

According to many researches drowsiness is related to thousands of traffic accidents each year, the accidents produces approximately 50% of death or serious injuries. To prevent this a surveillance system is to be developed to detect and alert the vehicle driver about the presence of drowsiness. So here we need to develop an android application which acts as surveillance system in the cars.

Methodology

In this work, an application has been proposed for the same purpose of drowsiness detection using a dedicated smartphone. The persistent sequence of

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driver monitoring lasts till the destination is reached. Results are analysed every one minute and the timer set to check blinking of eye. The project aims at using no external hardware or any gadgets which the driver otherwise might feel uncomfortable to wear except a mobile phone**.** It is mostly suitable to use an android application and an android platform for the system since it allows customization in any way the user wants giving it an awesome user interface, it is an independent device whereby no big external hardware support is required as required for EEG, ElectroOculogram(EOG) except for a smart phone holder to hold the smartphone during driver drowsiness detection.Reamle 8 pro was used for the experiment.

4. EXPERIMENTAL RESULTS

The AI based fatigue alert system is based on facial feature extraction. It uses behaviors such as gaze or facial expression, yawning duration, head movement, and eye closure. It measures drowsiness of three levels through the distance between eye lids. This calculation considered the number of blinks per minute, assuming that it increases as the driver becomes drowsier. The drowsiness measurements are the behaviors of the mouth and yawning. The object detection algorithm was employed for face and mouth detection. Recently, the deep learning approaches, especially the Convolutional Neural Networks (CNNs) methods, has gained prominence in resolving challenging classifications problems. Most of them represent a breakthrough for various Computer Vision tasks, including scene segmentation, emotion recognition, object detection, image classification etc. With adapted shallow CNNs, it achieved 78% accuracy of detecting drowsy drivers. Developed a new architecture employing three networks. We need to attempt to improve the accuracy of drowsiness detection accuracy using binary classification.The aim of this project is to ensure to provide a safe journey to the drivers driving at the late nights. As this project mainly aims for the drivers, the drivers may work over-time to get paid more even though they feel drowsy. So, this surveillance will allow us to monitor the driver and analyze the facial movements. After analyzing the data, we come to know the drowsiness levels of the driver and as per that we will alert them. This would help us to reduce the accidents caused due to fatigue of the drivers.

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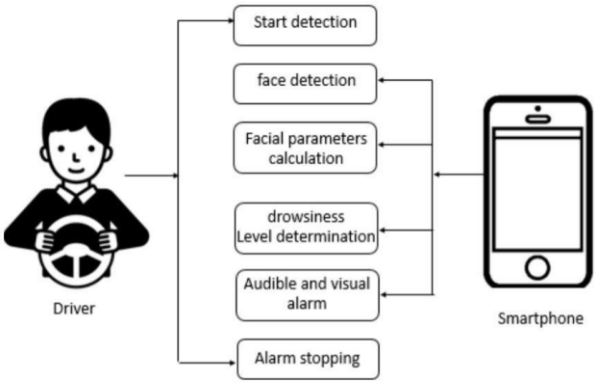

Schematic Diagram

Prototype

5. CONCLUSION

The aim of this work was to design and implement a user friendly driver monitoring and drowsiness detection application. Android Studio 3.6.1 software was used for developing the application. The application mainly tested the physiological analysis, facial analysis of driver and speed monitoring. Google ML-Kit (Mobile vision Face API) was used for face detection, classification and for computing the blinking frequency. The face orientation was computed through pose angle estimation in the Y and Z plane. However, we aimed at providing ease of use, availability, reduced cost and privacy since data was stored in the user phone before and while driving.

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