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REAL-TIME DRIVER DROWSINESS DETECTION USING COMPUTER VISION ALGORITHM FOR FACE AND EYE IDENTIFICATION METHOD

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ABSTRACT

"Real-time drowsiness detection", the main purpose of this application/proposed system is to detect the drowsiness of the driver while driving vehicle. It is basically accident prevention system to avoid crashes and road accidents. Driving with drowsiness is one of the main causes of the traffic/road accidents. The proposed system automatically monitors and calculates the eye blink durations and yawning changes and prevents road accidents by alerting the driver by detecting drowsiness. These types of crashes are about 50% more likely to result in death or serious injury as they tend to be high speed impacts because a driver who has fallen asleep cannot break or swerve to avoid or reduce the impact. The system alerts the driver by an alarm when detected drowsy and it's an accident prevention system. A video camera placed inside the car is continuously filming the drivers face, a detection system analyzes the movie frame by frame and determines whether the driver's eyes are open or shut.

Keywords: Real-Time Image, Video Processing, Eye Blink Detection, Drowsiness Detection.

I. INTRODUCTION

According to the reports and studies made by the American Nation Highway Traffic Safety Administration (NHTSA), the most influential factor in the occurrence of the fatal single-vehicle run off-road crashes is the driver performance-related factor: falling asleep, followed by alcohol use and vehicle speed. In addition 3.6% of fatal crashes are associated with the drivers drowsiness and fatigue. In last ten years, an increase in amount of efforts and technology have been developed to prevent and reduce the effect of human related crashes (e. g airbags, ABS, park sensors). A new technology developed by major vehicle companies like Volvo, Mercedes – Benz, Tesla and Hyundai is knowns as 'Drowsy Driver Detection System' (DDDS) that detect a fatigue state of the driver to prevent possible accidents.

Teen age drivers, truck drivers, company car drivers and shift workers are the most at risk of falling asleep while driving. However, any driver travelling long distances or when they are tired, is at risk of a sleep related accidents. Drivers are most commonly involved in sleep- related road accidents, but this may be because they are more likely to drive in situations likely to lead to fatigue rather than because they are more susceptible to falling asleep at the wheel. At the same time, shift workers and commercial vehicle drivers may have a higher risk of sleep- related crashes due to odd working hours. However, two thirds of drivers who falls asleep at the wheel are car drivers. Mostly 83% of the drivers causing sleep- related crashes are men, and over one third are aged 30 or under.

II. CRASHES CAUSED BY TIRED DRIVERS ARE MOST LIKELY TO HAPPEN

- On long journeys on monotonous road, such as motorways
- Between 2 am and 6 am
- Between 2 pm and 4 pm (especially after eating, or taking even one alcoholic drink)
- After having less sleep than normal
- After consuming alcohol
- If taking medicines that cause drowsiness
- After long working hours, especially night shifts.

In our proposed system, we have proposed a low cost and fully automatic solution for handling drivers drowsiness and preventing accidents. The system requires a standard webcam to detects the pattern of eye-

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blink closure. The eye blink duration is the time spent while upper and lower eye lids are connected. The pattern indicates a potential drowsiness prior to the driver falling asleep and then alerts the driver by alarm attached to the system.

III. PROPOSED SYSTEM

The real-time drowsiness detection system works with the web-cam that records the frame. The face is detected with face detection methods and facial features (e.g. eyes, mouth, etc.) are detected. The eyes are detected and the eye blink moments are monitored. The eye-blink monitoring is done on the count of the blinks. How many times a person blinks in a particular time i.e. normal blink time. If the eyes are shut for more than 1/4 a second (longer than a normal blink period) then the drowsiness of the driver is detected. The buzzer associated with the system alerts the driver by beeping. A buzzer is issued to caution the driver.

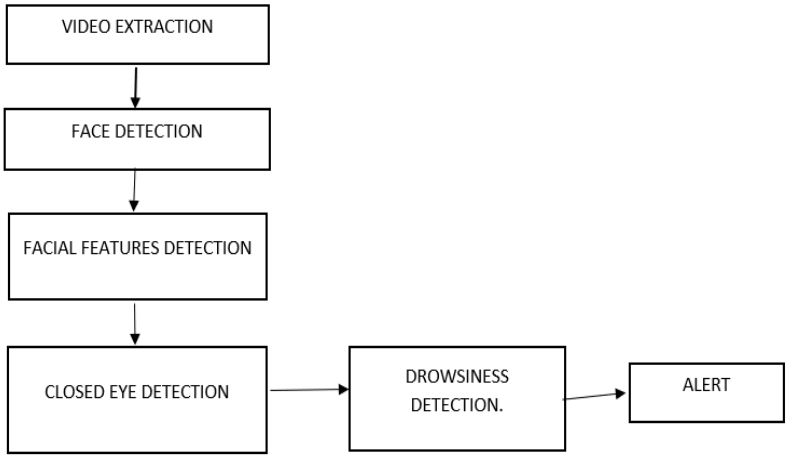

Figure 1: Block Diagram.

The method used to detect the face is viola-jones method, it is easy to use and gives satisfactory and close results. Viola and Jonas use is based on the Haar wavelets. Haar wavelets are single-wavelengths square waves. In 2 dimensions, a square wave is a pair of adjacent rectangles one light and one dark. The actual rectangle combinations used for visual object detection are not true Haar wavelets. Instead of that they contain rectangles combinations better suited to visual recognition tasks. Because of that differs this features are known as Haar like features or Haar features, rather than Haar wavelets. The presence of a Haar feature is determined by subtracting the average dark region pixel value from the average light-region pixel value. If the difference is above a threshold, that feature is said to be Present. After that cascade classifier are used to combine all Haar features to obtain face.

IV. DROWSINESS DETECTION

We define three states for the driver drowsiness as seen in Table 1. According, the Caffier's study, the normal eye blink duration is less than 400ms on average and 75ms for minimum. For this reason, we used $Td_{(Drowsy)}$=400ms and $Ts_{(Sleeping)}$=800ms.

Table 1. Drowsiness Detection

Drowsiness State	Calculation
Awake	Blink Duration<Td_{drowsy}
Drowsy	Blink Duration>$Td_{drowsy,}$ Blink Duration<$Ts_{sleeping}$
Sleeping	Blink durations>$Ts_{sleeping}$

Drowsiness detection of the human is not given properly anywhere. We are detecting it on the basis of eye moments of the driver as it is main component for falling asleep or feeling drowsy. Driver drowsiness has direct connection with the eye blink detection component. The time duration of eye closed is compared with the threshold values. To conclude drowsiness depending on eyes, edge detection technique is used. As edge

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detection is a fundamental tool in image processing, particularly in the areas of feature detection and feature extraction.

V. RESULTS

Figure 2: Yawn Alert

Figure 3: Drowsiness Alert

VI. CONCLUSION

In this paper, we have created and executed methods available to determine the drowsiness of a driver using the system in which it detects whether the driver is in drowsy state or not and if detected drowsy alert the driver with the buzzer in the system. Although, there is no certain definition of drowsiness, in this system we will detect with eye moments like blink. The various measures to detect drowsiness are been discussed earlier like vehicle based, physiological, behavioral, etc. but using physiological measures and aspects it is much more accurate so we have taken physiological aspect of measuring the drowsiness of the driver while driving the vehicle.

In future upgrades can be made like integrating car with the system such that when there is alert then car reduces speed.

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