

Driver Drowsiness Detection and Autobraking System for Accident Prevention

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Abstract - The transport systems are an essential part of the human beings. When you're behind the wheel of a car whether alone or with passengers driving safely should always be your number one concern. Nearly 1.3 million people die in road crashes each year, on average 3,287 deaths a day. An additional 20-50 million are injured or disabled. More than half of all road traffic deaths occur among young adults ages 15-44. In India around half a million people are injured in the road accidents of which the significant cause is the drowsiness of the driver arising due to alcohol or liquor products consumption. This paper presents a system which can be useful for the prevention of such accidents.

Key Words: Driver Drowsiness, Autobrake, Deceleration, Eye Blink, Yawn, Obstacle.

1. INTRODUCTION

Drowsiness of the driver is one of the most significant cause of road accidents. Drowsiness is a state resulting in reduction of consciousness caused due to lack of sleep and fatigue [11]. The drowsiness can lead to deviation of the current path of the driver, the path which was intended, to an unknown and unpredictable path which can be deleterious for the driver. Drowsiness can be caused mainly due to less amount of sleep, long periods of driving, drugs, liquor consumption or medications. The system is mainly comprised of two basic components. The first component is the driver's drowsiness detection and alert and the subsequent one is the autobraking system which is intended to decelerate the vehicle at a gradual rate.

1.1 PROPOSED SYSTEM

This section describes in detail the main stages of the system. The drowsiness detection system aims to warn the driver about his state of drowsiness.

In these systems driver's face is monitored and symptoms related to eye region, distance between the eyelids, gaze direction, eye blink rate are monitored.

The system monitors different facial expressions for the drowsiness detection. A finite state machine is used to measure the driver's alertness index based on the different factors such as eye closure, eye blink rate and head orientation. The autobraking system makes use of object and obstacle detection and predicts the collision of vehicle. Along with it handles the deceleration of the vehicle.

1.2 DROWSINESS DETECTION

The drowsiness is detected on the basis of the eye and facial movements, yawning and blink rate of the eye.

The system actively monitors the driver periodically for drowsiness. The eye blink movements and yawning are categorized into three categories mainly: -

Level 0. Safe.

Level 1. Low-risk.

Level 2. Hazardous.

1.2.1 Eye Blink and Face Detection

The system receives a video footage from the camera attached in the front of the driver.

The face detection can be done using Viola Jones [1] face detector available in the OpenCV library and the neural network based eye detector available in the STASM [1] library.

Due to the circular shape of the eyes, an open eye has a horizontal symmetry whereas a closed eye does not. Thus this property can be used to discriminate between the open and closed eyes.

1.2.2 Yawning Detection

Yawn is one of the symptoms which shows the drowsiness of the driver. A yawn is generally assumed to be modeled with large vertical mouth opening [5].

With the help of face detection and mouth detection the yawn rate can be monitored and the system can alert the driver about the yawning symptoms with an interactive alert message.

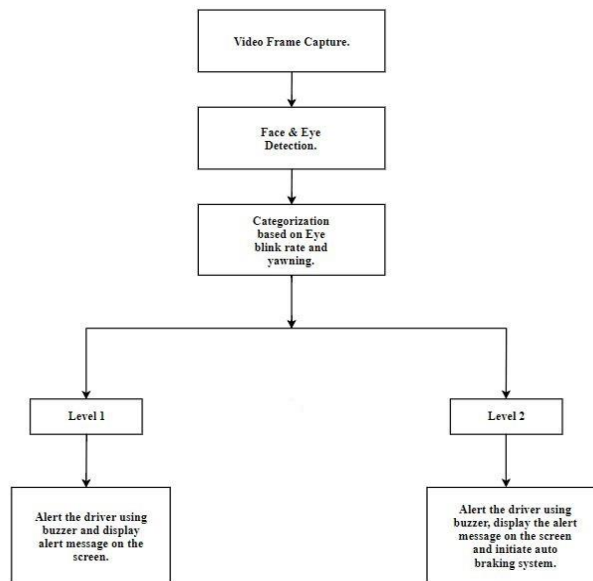


Fig 1: Flowchart for Drowsiness Detection

1.2.3 Alerting Phase

The driver is alerted if the results based on the eye blink and yawn detection fall into Level 1 or Level 2 category. In the Level 1 category the driver is alerted using a buzzer or a vibrator and an alert message is displayed on the information display of the car. However there is no initiation of the autobraking system in Level 1 category. In the Level 2 category the driver is alerted accordingly as the Level 1 category and the autobraking system is initiated.

2. THE AUTOBRAKE SYSTEM

The main motive of the autobraking system is to decelerate the vehicle at a gradual rate. The autobrake system also detects the object and obstacle present in the pathway of the automobile. The sensors used for the detection of the obstacles and the vehicles in the vicinity can include radar, infrared, video or ultrasonic technologies. Thus the autobrake system along with the deceleration of the vehicle can alert the nearby pedestrians or the drivers using emergency lights.

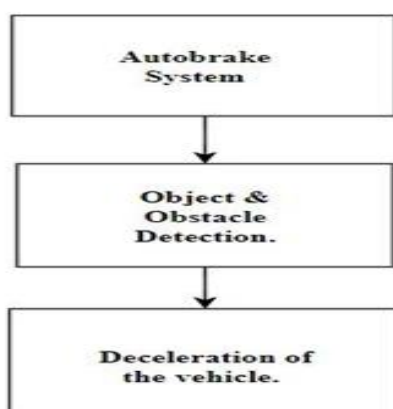


Fig 2: Flowchart of the autobrake system

3. FUTURE SCOPE

This paper proposed a system which can assist the drivers by detecting their drowsiness. The drowsiness of the driver can cause the driver to react slowly and can lead into a major accident. Such advanced systems can be used for a secure future, where the automobile has become an important transportation factor of our life and hope to minimize the accidental statistics in the future.

4. CONCLUSIONS

In this paper, we can conclude that the system can actively monitor the drowsiness of the driver and can help to prevent the accident using the autobraking methodology. The drowsiness of the driver is monitored mainly based on the eye blink rate and yawning of the driver. The system actively monitors the activity of the driver and can alert him about the same. The system can intelligently act on its own if the monitored activity is hazardous for the driver and can initiate autobraking. Thus this system aims on reducing the accidents and vehicle crashes in the future.

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