Proceedings of the 2023 International Conference on Software Engineering and Machine Learning
DOI: 10.54254/2755-2721/8/20230238

Real time alert system for slumberous and fatigue driver using eye blink sensor

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Abstract. Various technologies are being created to reduce accidents, which are rising rapidly in the modern day. Driver weariness or drowsiness is a significant factor in the occurrence of accidents. Drowsiness is detected using a variety of deep learning and image processing techniques. However, these techniques are pricey, and they might not work for those who wear glasses. This suggested solution employs an eye blink sensor to stop drowsiness-related accidents. This serves as an accident avoidance mechanism. The eye blink sensor-equipped goggles that the driver is required to wear include these features.To detect driver drowsiness, the goggles must be worn by the driver the entire time they are operating a vehicle and must blink for a few seconds. When the alarm system detects that the driver is dozing off, it will sound an alert until they open their eyes. Along with detecting drowsiness, the LDR sensor is used to control the high intensity of the headlights when two vehicles are approaching from opposite directions. Additionally, it helps to avoid accidents caused by blurry vision. When a driver snoozes more than five times, the GSM modem alerts the vehicle's owner. In this situation, the both owner and the driver could be alerted when the driver is drowsy.

Keywords: drowsy driving, IR sensor, alarm system, LDR, GSM modem.

1. Introduction

The risky combination of driving when asleep is drowsy driving. This often occurs when a driver has not sleep deprived, although it can also occur because of shift work or untreated fatigue problems. Alcohol can combine with sleepiness to both impairment and slumberous, and prescription and overthecounter medications can also make persons feel sleepy. Although it is obviously unsafe to doze off while driving, being drowsy also has an impact on one's ability to do so safely. When someone is sleepy, they are less able to pay attention to the road, they respond more slowly when they need to stop or turn unexpectedly, and they are less able to make wise judgements when things are on the line.

The hazards of drinking and driving are well understood by most drivers, yet many individuals underestimate the dangers of sleepy driving. As stated by the National Safety Council, sleepy while driving causes around 100,000 conflicts, 71,000 sufferings, and 1,550 casualties each year. Furthermore, according to a AAA Foundation for Traffic Safety research, tiredness was a factor in upto 9.5% of all collisions and 10.8% of crashes involving deployment of airbags, injury, or extensive damage to

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properties.Slumberous driving is extremely risky, and drivers must be aware of the dangers. The following chronic predisposing variables and certain situational factors are known to increase the threat of sleepy driving and related collisions, despite the fact that the evidence is limited or inferential: Driving habits such as driving between the hours of midnight and six in the morning, driving a significant amount of miles annually and/or driving for a significant amount of time each day, driving in the middle of the day (especially for older people), and driving for longer periods of time without stopping, use of sedative drugs, particularly anxiolytic hypnotics on prescription, tricycle antidepressants, and certain antihistamines, Untreated or undiagnosed sleep disorders, including narcolepsy and sleep apnea syndrome (SAS), alcohol consumption, which interacts with sleepiness and makes it worse. These elements have cumulative effects, and their combination significantly raises the chance of an accident.

Despite the limited or inconclusive data, the following chronic predisposing factors and acute situational events are known to raise the risk of tired driving and associated collisions: Driving practices like driving between the hours of midnight and six in the morning, driving a significant amount of miles annually and/or for a significant amount of time each day, driving in the middle of the day (especially for older people), and driving for longer periods of time without stopping, as well as the use of sedative medications, particularly anxiolytic hypnotics on prescription, tricycle antidepressants, and certain antihistamines, are all risk factors for accidents. Untreated or untreated sleep problems, such as sleep apnea syndrome (SAS) and narcolepsy, as well as alcohol use, which exacerbates drowsiness. Because it affects factors of human performance necessary for safe driving, such as response time, alertness, and information processing, drowsiness is a severe issue when driving and can result in accidents. The sleepiness detection system's goal is to help reduce accidents involving both passenger and commercial vehicles. Almost all data list driver inattention as a top concern for vehicle safety.

2. Related work

Anshul Pinto and Mohit Bhasi et al., approached[1] a Deep Learning for detecting driver’s drowsiness in Real Time. In terms of architecture, the VGG-16 model is utilized, which forecasts the driver's condition using a blink detection method and a measure termed EAR. Aman Dohare and Gargie Bharti proposed[2] aAlert System in real-time detection for Driver Drowsiness. Usingthe Open Cv Library, a fatigue recognition framework is constructed. The recognition computation works perfectly throughout the day, but also during the nighttime. The extraction of the Eye package is seamless and gradual, with no delays on the PC.

Whui Kim and Youl-Kyeong Lee et al. suggested[3] a Driver Status Monitoring System based on Adaptive Batch-ImageGPU-Equipped SBC on a Light-weight. ABI-DSMdesigns focus on decreasing Deep Learning model parameters in the system to handle batch photos in real-time. Shakeel M.F and Bajwa N.A et al. proposed[4] a Real time Detecting Driver Drowsiness based Object detection Using Deep Learning. The problem of detecting sleepiness as a detection of object that is both practical and trustworthy. By include low-light photos (in near-infrared light), the model is able to identify tiredness in low-light circumstances. Kusuma Kumari B.M presented[5] an Eye Blink Sensor Detection of Driver Drowsiness. If the driver falls asleep, the frame of the eye blink sensor frame attached to the car vibrates, and the LCD displays an warning message and informs the driver with an alarming sound.

3. Proposed slumberous detection system

The sleepy driver detection system employs an Infrared sensor to monitor the blink of the driver’s eye, and if the driver closes eyes for a few seconds, the drowsiness detector's alert system activates. The alert will sound until the driver opens his or her eyes. The PIC Microcontroller is utilized to control all of the modules and sensors that are connected. The Infrared sensor is linked to the LM358 Comparator, which compares the outputs of the Infrared sensor. The driver circuit is used to power an LDR, a buzzer motor, and a vibrator that also serves as a relay.

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3.1. System architecture

The block diagram of Real Time Fatigue and Slumberous Detection System is shown in thefigure1. The sleepy driver detector is separated into manysubsystems, including an eye blink sensor frame, an alert system, an illumination control system, and a GSM system.

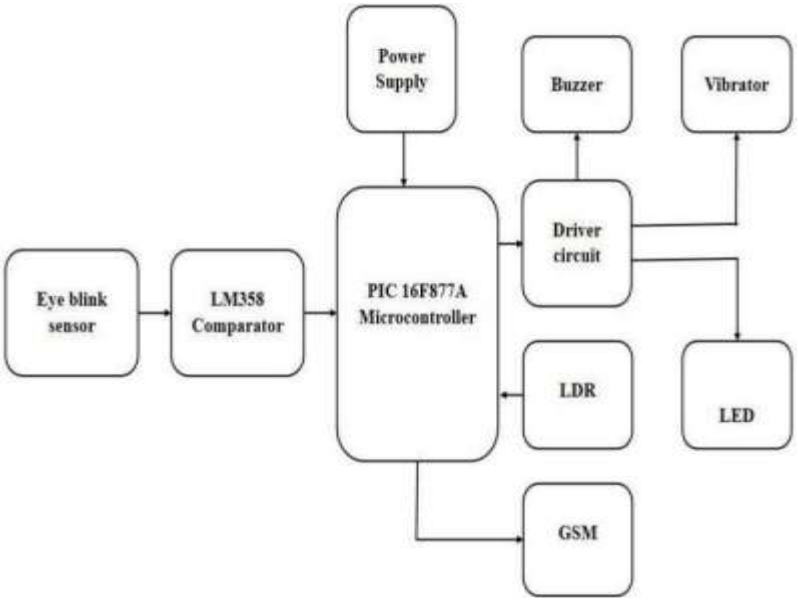

Figure 1. Block diagram of slumberous detection system.

3.2. Methodology.

The slumberous driver detection system uses an infrared sensor to measure and regulate the eye blink. Infrared emitters are used to send Infrared light to the eyes. The IR receives the infrared rays reflected by the eye. If eye lids are closed, IR receiver output is high; otherwise the IR receiver output is low. This is used to resolve whether the eye is closed or open. This output is sent to the OP-Amp circuit, which displays the alert. The control of accidents due to unconsciousness is the subject of this study. In this case, one Infrared sensor is installed in the car, and if somebody loses consciousness, an alert is triggered. The logic of drowsy detection is shown in the table 1.

Table 1. Drowsy detection logic.

STATES	OUTPUT PULSE	CONDITIONS
Case 1	0,1	Eye blinking
Case 2	0	Eye open
Case 3	1	Eye close

3.3. PIC 16F877a microcontroller

The PIC microcontroller is intended to allow programming and interfacing in the Slumberous detection system and also has minimum power consumption.Once the output of the IR sensor detects the sleepiness it causes through alert system.

3.4. Eye blink sensor

The Infrared sensor is made up of an IR transmitter and an IR receiver and both of them should be situated in straight line. The eye blink is sensed by the IR signals.When blinking, the lids of the eyes will be closed. With eyes closed, output will be high; otherwise the output will be low. This is used to

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resolve whether the eye is closed or open. This output is sent to the comparator circuit, which displays an alarm. The Conflicts or crashescaused by unconsciousness can be prevented.

3.5. IC LM358 comparator

The LM358 is used as a comparator and it continuously monitors the IR Receiver's output. If the eyes are in open state, the comparator output goes low as the IR sensor does not receive any signal and there will be no alert.

4. Result analysis

The Drowsy Driver Detection system detects the driver's sleepiness. In this system, the MikroC PRO compiler is used in the PIC Microcontroller to interface all the modules. The Infrared sensor is used to detect the slumberous of the driver and alerts them through Alarm system. Simultaneously, an alert message will send to the vehicle's owner by using GSM. In addition, LDR is used for reducing the illumination of the vehicle to prevent conflicts. The table 2 summarizes the comparison of existing method with proposed method.

Table 2. Comparison of existing method with proposed method.

Method	Detection	Dataset
PydMobileNet	Facial behaviour	865,000 images
2s-STGCN	Yawning and Blinking	NTHU-DDD and YawDD
MTCNN	Eyes and Mouth	NTHU-DDD Video
Infrared Sensor	**Eye blink and headlight illumination**	**Real Time**

4.1. Slumberous detection system

A vibrating alarm attached to the driver's seat will sound until the driver opens his eyes if he is dozing off. Along with detecting drowsiness, the LDR also lowers the headlight's intensity to reduce the risk of accidents caused by blurry vision. If the driver nods off, a message is sent to the vehicle's owner using a GSM modem. The figure 2 shows the slumberous detection system.

4.2. Eye is closed

When the eyes of the driver are closed, then the LED will glow to indicate the person falls asleep.The detection of slumberous is shown in figure 3.

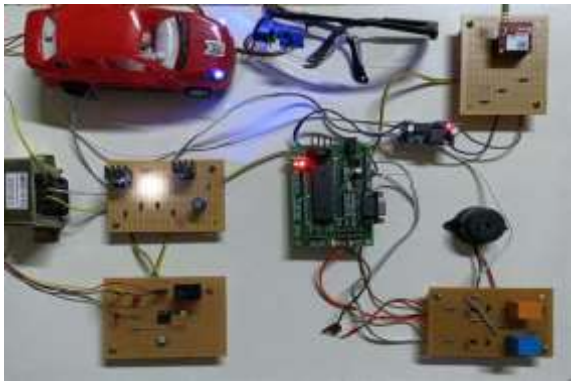

Figure 2. Slumberous detection system.

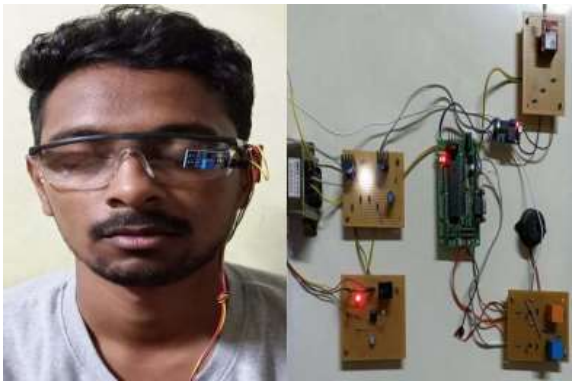

Figure 3. Detection of sleepiness.

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4.3. Alert message

If the person falls asleep, the LED will glows and the GSM will sends an alert message to the owner of the vehicle that the driver falls asleep. The figure 4 shows the output of the alert message.

Figure 4. Output of alert message.

5. Conclusion and future scope

Previous implementations of sleepiness detection have either been in image processing or have not been deployed in real time. The drowsiness detector's image processing is accomplished using a camera, but the implementation is pricey and it is not used in real time because the driver must travel at different times of day. As a result of the lack of vision, the camera may be unable to identify sleepiness. To circumvent this constraint, the suggested architecture of the sleepiness detection system employs an eye blink sensor that can detect eye blinks regardless of time. The wireless slumberous and fatigue detection system will be used in the future and will be easier to deploy in real time, less expensive, and have a simpler design. It is very useful for preventing accidents due to drowsy driving and poor vision.

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