AN INTELLIGENT DROWSY DRIVING ACCIDENT PREVENTION SYSTEM

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ABSTRACT

To prevent accidents caused by drowsiness, we can use a device called an eye blink sensor that uses infrared (IR) rays. This sensor consists of two parts: an IR transmitter and an IR receiver. The transmitter emits IR rays towards the driver's eye. When the eye is closed, the sensor outputs a high signal, and when the eye is open, the output is low. This output is connected to an alarm system both inside and outside the vehicle. Inside the vehicle, an alarm will sound if the driver's eyes remain closed for too long, alerting them to the potential danger. The alarm will continue until the driver regains consciousness and takes control of the vehicle. If the driver is still unable to respond after a certain period of time, the alarm outside the vehicle will activate to alert others nearby and encourage them to assist the driver. In addition, this eye blink sensor can also be linked to the vehicle's braking system, allowing it to automatically reduce the vehicle's speed when drowsiness is detected, further enhancing safety measures.

Keywords: Drowsiness Detection, Eye Blink Sensor, Arduino Uno, Accident Prevention System.

I. INTRODUCTION

Today's world is undefined without the use of transportation and without any query vehicles and drivers are an integral part of our society. But as we know with all good thing's responsibilities are huge and that's how driving while Drowsy is one of the major causes of death occurring in road accidents. Truck drivers who drive for continuous long hours (especially at night), bus drivers of long-distance routes or overnight buses and those people who take their families to long destinations are more susceptible to this problem. Driver drowsiness [1][2] is an overcast nightmare for passengers in every country whether it's a developing /developed country (America/Canada) or an underdeveloped country. The US National Highway Traffic Safety Administration has estimated that worldwide every year, about 100 000 road accidents are caused by drowsiness, accounting for > 1500 deaths and > 70,000 injuries. Every year, a large number of injuries and deaths occur due to fatigue-related road accidents. Hence, the detection of driver fatigue and its indication is an active area of research due to its immense practical applicability. The basic drowsiness detection system [3][4] has three blocks/modules; acquisition, processing, and warning. The proposed model contains IR Rays sensors that work together to form a harmonious work platform. This sensor consists of two parts: an IR transmitter and an IR receiver. The transmitter emits IR rays towards the driver's eye. When the eye is closed, the sensor outputs a high signal, and when the eye is open, the output is low. This output is connected to an alarm system both inside and outside the vehicle. Inside the vehicle, an alarm will sound if the driver's eyes remain closed for too long, alerting them to the potential danger. The alarm will continue until the driver regains consciousness and takes control of the vehicle. If the driver is still unable to respond after a certain period of time, the alarm outside the vehicle will activate to alert others nearby and encourage them to assist the driver. In addition, this eye blink sensor can also be linked to the vehicle's braking system, allowing it to automatically reduce the vehicle's speed when drowsiness is detected, further enhancing safety measures. Not only we should depend on Machines we also must take necessary measures to overcome this problem, such as we should limit the age to use vehicles because the risk of motor vehicle crashes is higher among teens ages 16–19 than among any other age group.

The proposed model is important because it's not possible for anyone to have professionals at every checkpoint who would check every car /truck Driver whether he is in drowsy [5] or unconscious situation.

II. BACKGROUND STUDY

Ideally, each individual needs between seven and eight hours of good-quality sleep each night. Those with less build up sleep debt, or sleep deficit. At worst, drivers with sleep debt risk nodding off, yet fatigue can impair reaction time and decision-making when behind the wheel which increases the risk of being involved in an
accident. If a driver falls asleep for just four seconds while travelling at a speed of 100 km/h the vehicle will have gone 111 meters without a driver in control. Those groups of drivers considered at greatest risk of being involved in a fatigue-related accident are:

1. Heavy vehicle drivers
2. Drivers with sleep disorders
3. Young Drivers.

The integrated module comprises several key components meticulously orchestrated to deliver sophisticated functionality. These components include An Arduino Uno, Arduino UNO is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analogue inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. And for an audio signal, a buzzer is used as an audio signaling device like a beeper or a buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren, and a Relay Module, Relay modules [8] are simply circuit boards that house one or more relays. The relay module's function is mainly to switch electrical devices and systems on or off. It also serves to isolate the control circuit from the device or system being controlled, and A DC Motor, A DC motor is an electrical machine that converts electrical energy into mechanical energy. In a DC motor, the input electrical energy is the direct current which is transformed into mechanical rotation, and an Eye Blink Sensor [7]. Eye Blink Sensor is a relatively simple sensor used to detect eye blinks. It uses a simple infrared sensor to detect if the person’s eye is closed and the corresponding data received can further be processed by any logic as required for the application. The eye blink system comes with an IR sensor mounted on glasses which the user can wear like regular glasses, as shown in the picture above, And Battery for Power Supply, ensuring an uninterrupted power source, the battery plays a vital role in sustaining the module's operations. It provides the necessary energy to drive the microcontroller and other components.

Collectively, these meticulously selected and intricately interconnected components form a comprehensive system that synergistically addresses driver safety and engagement. The Arduino Uno serves as the orchestrator, utilizing inputs from the eye blink sensor to make informed decisions. If a heightened blink rate is detected, signifying potential drowsiness, the microcontroller activates the buzzer, issuing a distinctive auditory warning to the driver. In case of no response within a predefined timeframe, the relay module intervenes, controlling the DC motor to initiate a controlled stoppage of the vehicle. This amalgamation of technology culminates in an intelligent and responsive module, designed to enhance road safety and driver vigilance.

Fig1 depicts the essential block diagram of our innovative project's organizational structure. It showcases the interconnected modules, starting from input sources, progressing through critical stages, and culminating in valuable outputs. This visual representation underscores the seamless integration of components, fostering efficiency and informed decision-making. Overall, Fig1 encapsulates the cohesive essence of our model's execution.

![Block diagram of the proposed system](image-url)
The integrated module comprises several key components meticulously orchestrated to deliver sophisticated functionality. These components include an Arduino Uno [6], a buzzer, a relay module [8], a dc motor, an eye blink sensor [7] and a battery for power supply.

### III. PROPOSED METHODOLOGY

Fig 2 outlines the operational methodology of our proposed model. It demonstrates the sequential flow of data from input to output through specialized modules, emphasizing iterative processes and feedback loops for enhanced accuracy. This visual representation succinctly illustrates the working principle of our model, showcasing its systematic approach to achieving desired outcomes.

Upon vehicle ignition, the eye blink sensor initiates its vigilant monitoring of the driver's blink patterns [1][2][3][4][5]. If the initial blink assessment returns a low indication, the system interprets this as a false reading and engages in a continuous evaluation loop. However, when the eye blink analysis yields a high reading, signifying a genuine blink, the system triggers a positive response. Swiftly, the resonating sound of the activated buzzer fills the air, delivering a piercing yet crucial alert through its resounding alarm.

![Fig 2: System flow of the proposed accident prevention system](image)

In the event that the driver's acknowledgement remains absent for a span of three seconds, decisive action is taken. The vehicle, acting upon this inaction, promptly initiates a controlled cessation of its operations. Thus, this comprehensive system ensures both driver awareness and road safety, seamlessly integrating sensor data, real-time analysis, and proactive intervention to enhance the driving experience.

### IV. RESULTS AND DISCUSSION

The eye blink sensor uses infrared (IR) rays. This sensor consists of two parts: an IR transmitter and an IR receiver. The transmitter emits IR rays towards the driver's eye. When the eye is closed, the sensor outputs a high signal, and when the eye is open, the output is low. This output is connected to an alarm system both inside and outside the vehicle. Inside the vehicle, an alarm will sound if the driver's eyes remain closed for too long, alerting them to the potential danger. The alarm will continue until the driver regains consciousness and takes control of the vehicle. If the driver is still unable to respond after a certain period of time, the alarm outside the vehicle will activate to alert others nearby and encourage them to assist the driver.

In addition, this eye blink sensor can also be linked to the vehicle's braking system, allowing it to automatically reduce the vehicle's speed when drowsiness is detected, further enhancing safety measures.
Fig 3: Working model of drowsy driving accident prevention system

V. CONCLUSION

This new module is a smart addition to vehicles that makes transportation safer. It's especially helpful in preventing accidents caused by drivers getting too tired. What's great is that we can adjust how it works to fit different needs. It runs on a system based on Arduino, which is like a computer brain that's easy to understand. This choice not only makes it user-friendly but also lets people learn how it all works. Overall, this module makes travel smarter and protects us better on the road, thanks to its ability to stop accidents from tired driving, its flexibility, and its simple technology.

In conclusion, the introduction of this innovative module represents a significant advancement in vehicle technology, contributing to enhanced safety during transportation. Its primary advantage lies in its remarkable capacity to avert accidents stemming from driver fatigue – a prevalent cause of road mishaps. A key highlight is its adaptability, allowing customization to suit diverse requirements. Operating on an Arduino-based system, akin to an easily comprehensible computer brain, this module not only ensures user-friendliness but also facilitates a deeper understanding of its functioning.

By and large, this module ushers in a smarter era of travel while bolstering our protection on the road. Its prowess in mitigating fatigue-induced accidents, coupled with its flexible nature and user-friendly technology, cements its pivotal role in promoting safer journeys.

VI. REFERENCES


