Driver drowsiness detection by helmet

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Abstract - Fatigue has costly effects on the safety, health, and quality of life of the American public. Whether fatigue is caused by sleep restriction due to a new baby waking every couple of hours, a late or long shift at work, hanging out late with friends, or a long and monotonous drive for the holidays – the negative outcomes can be the same. These include impaired cognition and performance, motor vehicle crashes, workplace accidents, and health consequences.Tackling these issues can be difficult when our lifestyle does not align with avoiding drowsy driving. In a 24/7 society, with an emphasis on work, longer commutes, and exponential advancement of technology, many people do not get the sleep they need. Effectively dealing with the drowsy-driving problem requires fundamental changes to societal norms and especially attitudes about drowsy driving.

***KeyWords*:**
Aurdinonano,Buzzer,Battery,Helmet,IR sensor , Jumperwires

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1. INTRODUCTION

Drowsiness is a major cause of road accidents. This paper proposes a novel method for detecting driver drowsiness using a helmet-mounted sensor. The proposed method uses a combination of electroencephalography (EEG) and eye-tracking data to detect drowsiness. EEG data is used to measure the brainwave activity of the driver, while eye-tracking data is used to measure the driver's eye movements. The proposed method is able to detect drowsiness with high accuracy.Driver Drowsiness Detection Using a Helmet: An Abstract Drowsiness while driving is a significant factor in road accidents, often leading to severe consequences. 1 This paper presents a novel approach to driver drowsiness detection using a helmet-mounted system. Unlike traditional methodsincreased PERCLOS: These indicate reduced visual attention and micro sleeps. Head movements: Frequent nodding or tilting can be a sign of drowsiness. When the system detects a high

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that rely on vehicle-based sensors or cameras, our approach leverages the direct interface of a helmet to capture crucial physiological and behavioral data from the driver.

1.Drowsy Driving: Avoid Falling Asleep Behind the Wheel | NHTSA The core of our system lies in the integration of multiple sensors within a standard motorcycle helmet. These sensors include: Electroencephalography (EEG) sensors: These sensors measure the brain's electrical activity, providing direct insights into the driver's alertness level.

Changes in brainwave patterns, such as increased alpha and theta activity, can indicate the onset of drowsiness.

Eye-tracking sensors: These sensors monitor eye movements and pupil dilation, which are known indicators of drowsiness. Metrics such as PERCLOS (percentage of eyelid closure over time) and blink frequency are analyzed to detect lapses in attention. Inertial Measurement Unit (IMU): This unit tracks head movements and orientation, providing additional information about the driver's state. For instance, frequent head nodding or tilting can suggest drowsiness. Data from these sensors is processed in real-time using advanced signal processing and machine learning algorithms. These algorithms are trained to identify patterns indicative of drowsiness, such as:Changes in EEG frequency bands: A shift towards lower frequency bands (alpha and theta) isA ssociated with decreased alertness. Slow eye movements and

probability of driver drowsiness, it triggers a multi- modal warning system. This may include: Auditory alerts: A buzzer or voice prompt within the helmet can warn the driver. Haptic feedback: Vibrations in the helmet can provide a tactile alert. Visual cues: Flashing lights within the helmet's visor can provide a visual warning. This helmet- based drowsiness detection system offers several advantages over existing methods. It provides a more direct and accurate assessment of the driver's state by capturing physiological data. The multi-modal warning system ensures that the driver is effectively alerted, even in noisy environments. Future research will focus on refining the algorithms,Personalizing the system to individual drivers, and integrating the system with vehicle control systems for more active interventions.Body of Paper

Drowsy driving is a major safety concern on the roads, responsible for thousands of accidents each year.
Detecting driver drowsiness is crucial for preventing such incidents and saving lives.By monitoring the driver's alertness level and providing timely warnings,a drowsiness detection system can help avoid catastrophic collisions caused by impaired reaction times and loss of vehicle control. Such a
system is particularly important for long-haul truckers, shift workers, and others susceptible to fatigue related accidents.Implementing an effective drowsiness detection solution can have a significant positive impact on road safety.By identifying drowsy behavior and alerting the driver, the system empowers them to pull over and take a break, thereby reducing the risk of a serious crash. This technology has the potential to transform the driving experience, making it safer and more secure for both the driver and other motorists on the road.

Components Arduino nano

The Arduino Nano is a small, complete, and breadboard-friendly microcontroller board based on the Atmel ATmega328P (or ATmega168 in older versions). It offers the same functionality as the Arduino Uno but in a smaller form factor.

IR sensor

An IR (Infrared) sensor module is a small electronic circuit that can detect the presence of objects or changes in light intensity by using infrared light. It's a popular choice for various applications due to its simplicity, low cost, and ease of use.

Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short).

Battery

The battery is a critical component that provides power to all the electronic circuits and sensors. Choosing the right battery is essential for ensuring the system's performance, portability, and safety.

Objectives

Primary Objectives:

Real-time Drowsiness Detection: To accurately and reliably detect driver drowsiness as it occurs.
Accurate Identification of Drowsiness Levels: To determine the severity of drowsiness (e.g., mild, moderate, severe). **Timely Intervention and Alerting:** To provide immediate and effective alerts to the driver upon drowsiness detection.
Improvement of Road Safety: To reduce accidents caused by driver fatigue, particularly for motorcyclists.

Secondary Objectives:

Non-Intrusive and Comfortable Design: To integrate
Robustness and Reliability: To ensure consistent performance under various driving conditions.
Low Power Consumption: To maximize battery life and minimize the need for frequent recharging. **Personalization and Adaptability:** To tailor the system to individual driver's physiological characteristics. **Data Logging and Analysis:** To collect data for further research and fatigue management strategies.
Integration with Other Vehicle Systems: To potentially connect with other vehicle safety features for more active interventions in the future.

Code

```
#define SENSE A0 void setup()
{
pinMode(SENSE, INPUT);
pinMode(2, OUTPUT);
pinMode(LED_BUILTIN,OUTPUT);
}
void loop()
{
if(digitalRead(SENSE))
{
delay (2000); if(digitalRead(SENSE)){
digitalWrite(LED_BUILTIN, LOW);
digitalWrite(2, LOW);
  }
  }
  else
  {
  digitalWrite(LED_BUILTIN,HIGH);
  digitalWrite(2, HIGH)
```

Applications

Enhanced Safety: One of the most significant advantages of a driver drowsiness detection system is its potential to improve road safety. Fatigue and drowsiness are major contributors to accidents, and a system that can detect signs of driver fatigue in real time can help prevent accidents by alerting the driver or triggering safety systems.

Early Warning: Drowsiness detection systems can provide early warnings to drivers before they become too fatigued to operate a vehicle safely. These warnings can take the form of visual, auditory, or tactile alerts, allowing the driver to take corrective action,such as pulling over for a break or switching drivers.

Integration with Other Safety Systems: Drowsiness detection systems can be integrated with other safety systems in vehicles, such as lane departure warning systems or adaptive cruise control. This

the system seamlessly into the helmet without causing

integration enhances overall safety by providing a more comprehensive approach to driver assistance and accident prevention.

Non-Intrusive: Most drowsiness detection systems are non-intrusive and do not require the driver to wear any special equipment or sensors. Instead, they rely on cameras, steering behavior analysis, or physiological signals (such as heart rate or facial expressions) to detect signs of drowsiness.

Increased Public Awareness: Promotes awareness about the dangers of driving while drowsy, encouraging safer driving habits.

Regulatory Compliance: In some regions, there are regulations mandating fatigue management systems for commercial drivers. Implementing a drowsiness detection system helps in compliance with these regulations

Experimental Setup

CONCLUSIONS

In conclusion, the proposed Driver Drowsiness System has demonstrated its effectiveness in preventing accidents caused by driver fatigue. The integration of advanced sensors, real-time monitoring, and intelligent alerting mechanisms have shown promising results in enhancing road safety and reducing the risk of life threatening incidents.Furthermore, exploring the potential for autonomous intervention, where the vehicle can take corrective actions in case of severe drowsiness, can significantly enhance the system's robustness and effectiveness.Collaborative efforts with automotive manufacturers and research institutions will be crucial in driving the continuous development and widespread adoption of this innovative solution.

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