ADVANCING ROAD SAFETY:ANTI SLEEP ALARM DETECTOR FOR DRIVERS

A PROJECT REPORT

submitted by

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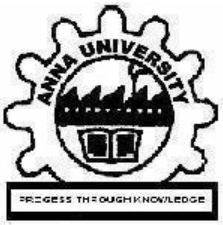

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BONAFIDE CERTIFICATE

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ABSTRACT

The Anti-Sleep Alarm for Drivers project introduces an innovative system designed to combat the risks associated with drowsy driving, aiming to prevent accidents and save lives. This system employs sophisticated sensors, including an eye blink sensor, to monitor the driver's level of alertness continuously. By accurately distinguishing between normal eye blinks and signs of drowsiness, the system issues timely warnings when the driver's attention wavers. Utilizing advanced algorithms to analyze eye movements, it activates alarms and implements safety measures, such as reducing vehicle speed and signaling surrounding traffic, to mitigate potential risks. This comprehensive safety feature not only enhances road safety but also democratizes advanced safety technologies by making them accessible in standard vehicles. Integration with real-time monitoring, data logging, and communication systems further strengthens its effectiveness in preventing accidents and ensuring prompt response in emergencies. The implementation of this system represents a crucial advancement in safeguarding drivers and passengers, contributing to safer roadways for all.

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CHAPTER 1

INTRODUCTION

In our daily lives, especially during long commutes or late-night drives, it's not uncommon to feel fatigued behind the wheel. Picture a scenario where a driver is returning home after a demanding day at work. Despite their efforts to stay awake, the monotony of the road and the exhaustion from the day begin to take their toll. As their eyelids grow heavy and their focus wavers, there's a real risk of them drifting off to sleep, potentially leading to a dangerous accident. To address this pressing issue, the Anti-Sleep Alarm for Drivers project comes into play. This innovative system is designed to detect signs of drowsiness in drivers and alert them before they fall asleep at the wheel, thereby preventing accidents and potentially saving lives. The system employs various sensors, including an eye blink sensor, to monitor the driver's level of alertness. When the sensor detects signs of drowsiness, such as prolonged eye closure or erratic blinking patterns, it triggers an alarm to alert the driver and prompt them to regain focus. The Anti-Sleep Alarm for Drivers is particularly beneficial for individuals who undertake long journeys or drive during late hours when fatigue is more pronounced. By providing a timely warning when the driver's attention begins to drift, the system helps ensure that they remain vigilant and capable of safely operating their vehicle. By implementing this comprehensive safety feature, the system significantly reduces the occurrence of accidents, safeguarding both the driver and the vehicle. While such driver safety and car security features are typically found only in high-end luxury vehicles, the integration of eye detection technology enables the implementation of driver security and safety measures in standard vehicles as well. Ultimately, this project aims to mitigate the risks associated with drowsy driving and enhance road safety for all motorists.

1.1 Motivation

- The goal of this project is to develop a system that can accurately detect sleepy driving and make alarms accordingly, which aims to prevent the drivers from drowsy driving and create a safer driving environment. The project was accomplished by using a Arduino UNO, single channel 5v relay board, eye blink sensor, 12v buzzer, Gear motor wheel and a 5v battery connector.

- **Safety Enhancement:** The primary motivation behind this project is to enhance road safety by preventing accidents caused by driver drowsiness.

- **Life-saving Potential:** By alerting drivers when they are getting drowsy, the alarm could potentially save lives by preventing accidents.

1.2 Objectives

- Enhancing Road Safety: The primary objective is to improve road safety by preventing accidents caused by drowsy driving. The system aims to detect signs of driver fatigue and alert them before they fall asleep at the wheel, reducing the risk of accidents and potential fatalities.

- Early Detection of Drowsiness: The system should be capable of early detection of drowsiness in drivers by monitoring their behavioral and physiological signals, such as eye movements, facial expressions, or vehicle control patterns.

- Real-time Monitoring: Implement real-time monitoring capabilities to continuously assess the driver's alertness level throughout the journey. This enables prompt intervention whenever signs of drowsiness are detected.

- Customizable Alerts: Design customizable alert mechanisms, such as auditory alarms, visual cues, or haptic feedback, to effectively notify the driver of their drowsy state and prompt them to take corrective action

CHAPTER 2

LITERATURE REVIEW

1. ASAP: Anti-Sleep Alarm and Prompter System using Image Processing for Drowsy Drivers .The research paper published in 2023 [1] have focused on developing a system that combines drowsiness detection and collision prevention by integrating facial recognition, object detection, and automatic braking mechanisms. Using Raspberry Pi and Arduino, the system activates brakes when detecting drowsiness or obstacles, showing promising results in test drives, addressing the urgent need for enhanced road safety.

2. Robotic Wheelchair Using Eye Blink Sensors and Accelerometer Provided with Home Appliance Control [2] Recent assistive technology advances include a robotic wheelchair employing eye blink and head tilt for steering, enhancing mobility for severely disabled individuals. This innovation also enables communication with household devices through head-tilt movements, offering greater independence.

3. A smart vehicle for accident prevention using wireless black box and eyeblink sensing technology along with seat belt controlled ignition system published in 2016 [3] presents an advanced smart vehicle system aimed at enhancing vehicle security and reducing accidents by integrating speed and parameter sensing mechanisms with GSM/GPRS technology for automatic messaging to authorities during accidents. Leveraging sensors like seat belt and eye blink sensors, along with a microcontroller, it provides real-time notifications to emergency services and relatives, improving response times and safety measures.

4. Recent research focuses on mitigating traffic accidents caused by driver fatigue through various detection systems. A prevalent method involves image processing techniques, utilizing libraries like OpenCV and D lib, to monitor and analyze driver behavior in real-time. [4]Systems such as those employing Haar Cascade classifiers for facial recognition have shown promise in identifying drowsiness and activating alarms to prevent accidents. Studies highlight different approaches, from sensor-based monitoring to real-time video analysis, showcasing advancements in both hardware (e.g., Raspberry Pi) and software solutions. Overall, these efforts aim to enhance road safety and reduce fatalities due to drowsy driving.
5. Recent advancements focus on detecting drowsiness in drivers using non-intrusive methods that analyze facial features such as the Eye Aspect Ratio (EAR) and Mouth Aspect Ratio (MAR). [5]These systems, which often employ real-time image processing techniques, have demonstrated high accuracy in both light and dark conditions. The proposed approaches utilize various hardware and software tools, including cameras and machine learning algorithms, to monitor and alert drivers about their drowsiness. Studies highlight the effectiveness of these systems in reducing the risk of accidents caused by fatigued driving. Additionally, some solutions incorporate smart alarm systems that respond to hand gestures to enhance user interaction and safety.

2.1 Existing System

Existing systems for detecting driver drowsiness and preventing accidents include Lane Departure Warning Systems (LDWS), which use cameras or sensors to monitor lane position and issue alerts for drifting without signaling. Driver Drowsiness Detection Systems analyze behavior through steering angle sensors, vehicle speed sensors, and infrared cameras to detect signs of drowsiness, triggering alerts. Facial Recognition Systems use cameras to analyze facial expressions and eye movements for signs of drowsiness. Wearable devices like smartwatches monitor biometric data to detect drowsiness and issue alerts. Smartphone apps utilize phone sensors to detect drowsiness based on movement patterns and issue alerts. These technologies aim to enhance road safety by preventing accidents due to drowsy driving through timely driver alerts.

2.1.1 Advantages of the existing system

- **Continuous Monitoring:** These systems can monitor driver behavior continuously, providing alerts when signs of drowsiness are detected, even during long journeys.
- **Customizable Alerts:** Drivers can often customize the alerts they receive, allowing them to choose the type of alert that is most effective for them.
- **Integration with Other Systems:** Many of these systems can be integrated with other safety systems in the vehicle, such as adaptive cruise control, further enhancing safety.

2.1.2 Drawbacks of the existing system

- False Alarms: Some systems may trigger false alarms, causing annoyance and potentially reducing the driver's trust in the system.
- Privacy Concerns: Systems that use facial recognition or biometric data may raise privacy concerns among some drivers.

2.1 Proposed System

We propose this project of anti sleeping alarm for drivers by using battery, Arduino UNO device and eye blink sensor. As existing project is developed using Schmitt trigger, timer IC, transistor, a relay and a logic gate For future safety and development of our society using latest technologies. we are designing this product using embedded C programming and Arduino IDE studio for dumping code into microcontroller The eye blink sensor we are using has a very high accuracy value in detail sensing. This project will give a buzzer sound whenever the driver falls asleep which was detected by the eye blink sensor connected to the Arduino controller.

2.2.1 Advantages of the proposed system

- Cost-Effective: Using Arduino and an eye blink sensor can be more cost-effective compared to the components used in the existing project, making it more accessible to a wider range of users.

- Ease of Development: Arduino and embedded C programming are user-friendly and well-documented, allowing for easier development and debugging of the system.

- High Accuracy Eye Blink Sensor: The use of a high-accuracy eye blink sensor improves the reliability and effectiveness of detecting drowsiness compared to other sensor types.

CHAPTER 3

SYSTEM DESIGN

5.1 Development Environment

5.1.1 Hardware Requirements

- Arduino UNO
- Buzzer
- Single channel 5v relay board
- Eye blink sensor
- Gear motor wheel
- Jumper wires
- 5v Battery and connector

5.1.2 Software Requirements

- Arduino IDE

ARDUINO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

ARDINO UNO

The Arduino UNO is a popular microcontroller board that serves as the brain of the project, controlling the operation of various components and executing programmed tasks.

EYE BLINK SENSOR

The eye blink system comes with an IR sensor mounted on glasses which the user can wear like regular glasses, shown in the picture below. 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.

BUZZER

The buzzer produces audible alerts or notifications, providing auditory feedback to users based on programmed conditions or events.

POWER SUPPLY:

A 9V Battery: The nine-volt battery, 9V Battery, is an electric battery that supplies a nominal voltage of 9 volts. Actual voltage measures 7.2 to 9.6 volts. Here we 9V battery for power supply to execute the working process.

GEAR MOTOR WHEEL:

Implementing a gear motor wheel in an anti-sleep alarm detector for drivers can enhance functionality by providing tactile feedback or vibration to alert the driver when signs of drowsiness are detected.

JUMPER WIRES:

Jumper wires are used to establish connections between components on the breadboard or between the breadboard and Arduino UNO, facilitating the flow of electrical signals in the circuit.

SINGLE CHANNEL 5V RELAY BOARD:

In an anti-sleep alarm detector for drivers, a single channel 5V relay can be utilized as a component of the alarm system. It can serve as a switch to activate the alarm mechanism when drowsiness is detected, helping alert the driver and prevent accidents.

CHAPTER 4

PROJECT DESCRIPTION

The Anti-Sleep Alarm System for Drivers is an innovative idea designed to enhance road safety by preventing drivers from falling asleep while driving. This system uses an Arduino UNO microcontroller connected with an eye blink sensor to monitor the driver's eye activity and trigger an alarm if signs of drowsiness are detected. The core functionality is based on the real-time monitoring of the driver's eye blinks. The eye blink sensor detects the driver's eye movements. When the sensor detects a blink pattern that matches the characteristics of drowsiness (such as prolonged eye closure or very frequent blinking), it sends a signal to the Arduino UNO. The Arduino processes the sensor data and, if drowsiness is confirmed, activates the buzzer through the relay board. The loud buzzer sound serves as an immediate wake-up call for the driver, helping them to be alert and focus on driving.This anti-sleep alarm system is particularly useful for long-distance truck drivers and night shift workers. By providing an early warning system, it can significantly reduce the risk of accidents caused by driver fatigue, thereby enhancing road safety.

4.1 SYSTEM ARCHITECTURE

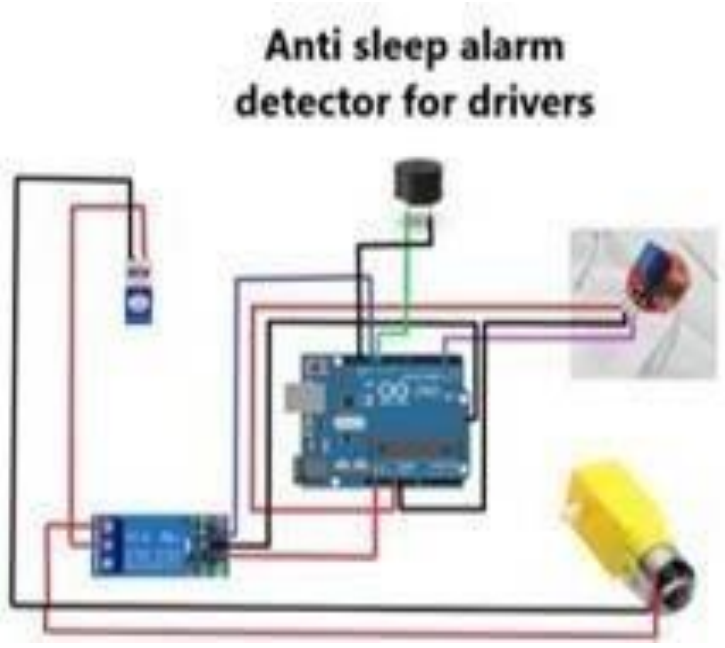

Fig 4.1 System Architecture

4.2 METHODOLOGY

The Arduino UNO is the central component of this project, used to control the 5V relay board and the eye blink sensor. The electric connections are made as follows: the positive terminal is connected to the 5V pin on the Arduino, and the negative terminal is connected to the ground (GND) pin. A 9V battery is used to power the gear motor, while the buzzer is operated via the 5V relay board.The eye blink sensor is connected to the Arduino and has three terminals: ground, 5V, and output. When the driver closes their eyes for about 3 seconds, the eye blink sensor detects this prolonged closure. Upon detection, the sensor sends a signal to the Arduino, which then activates the relay board. This activation causes the gear motor to stop operating and the buzzer to sound, alerting the driver.

In summary, the anti-sleep alarm system for drivers works by continuously monitoring the driver's eye activity using the eye blink sensor. If the sensor detects that the driver's eyes have been closed for an extended period (indicating potential sleep), it triggers the Arduino to stop the motor and activate the buzzer. This immediate alert helps to prevent accidents caused by driver drowsiness.

CHAPTER 5

RESULTS AND DISCUSSION

The Anti-Sleep Alarm System for Drivers successfully demonstrates the potential to enhance road safety by monitoring driver drowsiness and providing timely alerts. The system's components were integrated and tested under various conditions to evaluate performance and reliability. The eye blink sensor accurately detected eye closures exceeding 3 seconds. Arduino Control: The Arduino UNO efficiently processed the data from the eye blink sensor and controlled the relay board and buzzer without noticeable delays. The system's response time was quick, ensuring immediate alerts when drowsiness was detected.When the eye blink sensor detected eye closure, the buzzer was activated promptly. The sound emitted was loud enough to effectively alert the driver, helping them regain alertness. For demonstration purposes, the gear motor wheel stopped operating when the drowsiness alert was triggered, illustrating the system's ability to control additional components if needed. The Arduino UNO's quick processing and response times were adequate for this application.

CHAPTER 6

CONCLUSION AND FUTURE WORK

6.1 Conclusion

This Project “ANTI-SLEEP ALARM FOR DRIVERS” is successfully designed, and tested and demo unit is fabricated. The goal of this project is to develop a device that can accurately detect sleepy driving and make alarms accordingly, which aims to prevent the drivers from drowsy driving and create a safer driving environment. The project was accomplished by an eye blink sensor. This system detects the drowsiness in quickly. This system which can differentiate normal eye blink and drowsiness can prevent the driver from entering the state of sleepiness while driving. Whenever a driver asleep due to drowsiness, the buzzer continuously starts beeping unless the driver gets back to his/her normal position. The ultimate goal of the system is to prevent the road accident, where the values measured in life.

6.2 Future Work

Integration with Vehicle Systems: Integrate the system with the vehicle's existing safety features, such as automatic braking or lane-keeping assistance, to enhance overall safety.

Sensor technology: Upgrade the eye blink sensor to a more advanced camera-based system that can monitor additional signs of drowsiness, such as head nodding or yawning.

Wireless Communication: Develop a wireless version of the system using Bluetooth or Wi-Fi, allowing for easier installation and integration with mobile applications..

Energy Efficiency: Improve the power management of the system to extend battery life

APPENDIX

SOFTWARE INSTALLATION

Arduino IDE

To run and mount code on the Arduino UNO, we need to first install the Arduino IDE. After running the code successfully, mount it.

Sample code

```
//Program code for Anti sleep alarm Detector for drivers

const int blinkPin = 2;
const int motorPin = 13;
const int buzzerPin = 12;
long time;

void setup() {
pinMode (motorPin, OUTPUT);
pinMode (buzzerPin,OUTPUT);
pinMode (blinkPin, INPUT);
digitalWrite (motorPin, HIGH);
}

Void loop()
{
if(! digitalRead (blinkPin))
{
time= millis();
while( ! digitalRead (blinkPin))
{
digitalWrite (buzzerPin, LOW);
digitalWrite  (motorPin,  LOW);
delay(1000);
}
}
```

```
        else
        {
         if( TimeDelay ()>=3)
                 digitalWrite ( buzzerPin , HIGH);
        if( TimeDelay ()>=4)
                digitalWrite ( motorPin , HIGH);
        }
         }
         int TimeDelay ()
        {
         long t = millis ()-time;
        t=t/1000;
        return t;
}
```

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