International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 04 | April - 2023 Impact Factor: 8.176 ISSN: 2582-3930

DESIGN AND MODIFICATION OF ANTI-SLEEP GLASSES FOR DRIVER

Dhruvesh NARAYANE [*1], Himay Mewada [*2],Parful Pardeshi [*3],Omkar Solat[*4], Dr. Satish Silaskar[*5]

[*1, *2, *3, *4] Undergraduate Students, Department of Mechanical Engineering, NHITM, Thane,Maharashtra, India

[*5]Professor, Department of Mechanical Engineering, NHITM, Thane, Maharashtra, India

ABSTRACT

Design and Modification of Anti Sleep Glasses also known as fatigue detection glasses by changing the hardware and software in order to help an individual who is at a risk of falling asleep while driving. These type of eyewear designed to detect and alert drivers when they are becoming drowsy or fatigued while driving. The glasses are equipped with sensors that monitor the wearer's eye movements and blinking patterns, which are known indicators of fatigue.

We used advanced algorithms to analyze the data collected by the sensors and determine whether the wearer is experiencing fatigue. If the glasses detect signs of fatigue, they will alert the driver through visual or auditory cues, such as flashing lights or an alarm. Anti-sleep driver's glasses are a promising technology that can help prevent accidents caused by drowsy driving. By detecting and alerting drivers to signs of fatigue, these glasses can help keep drivers on road

Keywords: Anti Sleep Glasses, Drowsiness detector, Arduino sensor, flasher light.

I. INTRODUCTION

Drowsy driving is a dangerous problem that can lead to fatal accidents on the roads. A report Ministry of Road Transport and Highways Transport Research Wing (India), Estimated that road accidents claimed 1,53,972 lives and harmed 3,84,448 people in 2021, majority of accidents happened due to A crucial problem that causes numerous car accidents annually is driver fatigue. Due to the incapacity of a driver to halt or swerve to prevent or minimize the impact, accidents caused by driver sleepiness are much more inclined to result in fatalities or severe accidents. To address this issue, anti-sleep driver glasses with an alarm system have been designed and modified.

These glasses use advanced technology to detect the driver's alertness level and prevent accidents by alerting the driver when they become drowsy. The design and modification of anti-sleep driver glasses has been made possible by advancements in sensor technology, artificial intelligence, and wearable technology. The glasses are designed to be comfortable and lightweight, and they can be worn just like regular glasses. The alarm system is integrated into the glasses and can be triggered when the sensors detect that the driver's alertness level is decreasing. The modification of anti-sleep driver glasses has made them more effective in preventing accidents caused by drowsy driving. The glasses can detect the driver's level of alertness and provide an early warning system that can help prevent accidents. These glasses are also easy to use and have become increasingly popular in recent years, especially in the transportation industry. They have the potential to save many lives on the roads and improve the overall safety of drivers and passengers and reduce the number of road accidents.

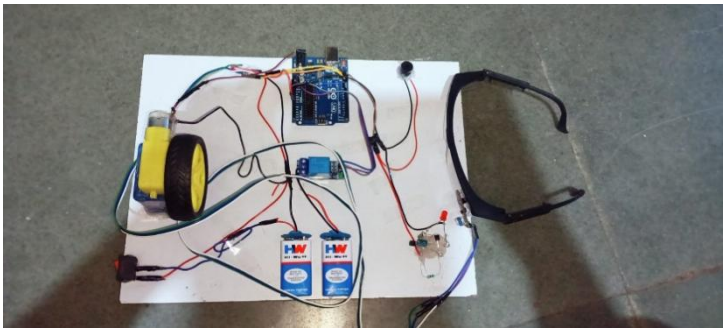


Figure 1: Main Setup of Anti Sleep Glasses

The Anti-sleep driver glasses with an alarm system come in several types and each with its own unique features (Fatigue Monitoring Glasses) These glasses use sensors to detect eye movement and blink rate to determine the driver's alertness level, (Smart Glasses) These glasses use integrated sensors and algorithms to detect the driver's fatigue level (Anti-Drowsy Glasses) These glasses use infrared sensors to monitor the

driver's eye movements .The glasses are designed to be comfortable and lightweight, and they can be worn just like regular glasses.(Glasses with Eye Tracking Technology) ,These glasses use eye tracking technology to detect the driver's level of alertness.

Each type of anti-sleep driver glasses with an alarm system has its own unique features and benefits. The choice of glasses depends on the driver's needs and preferences. The glasses can be used by anyone who needs to stay alert and focused, including drivers, pilots, healthcare workers, and anyone who works long hours. Anti-sleep driver glasses with an alarm system that use IR sensors (infrared sensor) and Arduino Uno. The IR sensor is used to detect the driver's eye movements.

The sensor detects the reflected light from the driver's eyes and sends the signals to the Arduino Uno. The Arduino Uno is a microcontroller board that acts as the brain of the system. It receives the signals from the IR sensor and processes them using a program that has been uploaded to the board. The program then determine the level of alertness. When the program detects that the driver's alertness level is decreasing, it triggers an alarm to alert the driver. The alarm can be in the form of sound to alert the driver. The IR sensor and Arduino Uno work together to provide an early warning system that can help prevent accidents caused by drowsy driving. The system is designed to be lightweight and comfortable, and it can be worn just like regular glasses.

II. LITERATURE REVIEW

The main purpose of literature review is to give an overview of existing Anti sleep drivers glasses used for its study. Drowsy driving is a significant cause of accidents on roads worldwide, and the development of anti-sleep driver glasses with an alarm system has been a technological solution to prevent these accidents. The design and modification of these glasses have been the subject of several studies and research papers in recent years. Here is a more detailed literature review of some of the most notable studies:

- [1] **"M. A. Aziz et al [2021] "Drowsy Driver Detection Using Wearable Devices: A Systematic Review"** . He studied that to provides a comprehensive review of wearable devices that are used for detecting driver drowsiness. The study includes various types of wearable devices such as glasses, smartwatches, and headbands. The review covers a range of studies that have been conducted on the subject, evaluating the effectiveness of different wearable devices in detecting driver drowsiness. The studies reviewed in this paper use a variety of sensors to detect drowsiness, including electroencephalogram (EEG), electrooculogram (EOG), and photoplethysmography (PPG) sensors. The authors of the study highlight the importance of detecting driver drowsiness, as it is a major cause of road accidents. They also note that wearable devices are becoming increasingly popular for monitoring health and fitness, and that they have the potential to be used for detecting driver drowsiness. The study evaluates the strengths and limitations of different wearable devices for detecting driver drowsiness, and provides recommendations for future research in this area. The authors conclude that wearable devices have the potential to be effective in detecting driver drowsiness, but that more research is needed to determine which types of devices and sensors are most effective.

[2] **X. Li et al [2019] "Design and Development of an Intelligent Anti-Drowsiness System for Drivers presents a detailed description of an intelligent anti-drowsiness system for drivers.**He studies that includes the use of sensors, algorithms, and an alarm system to detect and prevent driver drowsiness. The system uses a combination of sensors, including EEG, EOG, and PPG sensors, to monitor the driver's physiological signals and detect signs of drowsiness. The system also incorporates an algorithm that analyzes the data from the sensors and determines the driver's level of drowsiness.When the algorithm detects that the driver is becoming drowsy, the system activates an alarm to alert the driver and prevent them from falling asleep at the wheel. The authors of the study emphasize the importance of preventing driver drowsiness, as it is a major cause of road accidents.The study also evaluates the effectiveness of the system through experiments conducted on volunteers. The results of the experiments show that the system is effective in detecting driver drowsiness and preventing accidents.

[3] **S. L. Wong [2018] "The Effectiveness of Anti-Sleep Warning Systems for Commercial Vehicle Drivers: A Systematic Review and Meta-Analysis".** He studied that a Systematic Review and Meta-Analysis" by S. L. Wong et al. provides a comprehensive review and meta-analysis of the effectiveness of anti-sleep warning systems for commercial vehicle drivers.The study includes various types of anti-sleep warning systems, such as glasses, headbands, and in-vehicle systems, and evaluates their effectiveness in preventing driver drowsiness and related accidents.Through a meta-analysis of 12 studies, the authors found that anti-sleep warning systems were effective in reducing the incidence of driver drowsiness and associated accidents. The study also found that in-vehicle systems were more effective than wearable devices such as glasses and headbands. The authors of the study note that commercial vehicle drivers are at a higher risk of experiencing driver drowsiness due to their long working hours and irregular sleep patterns, and that anti-sleep warning systems can help to prevent accidents and improve road safety.

[4] K. H. Park [2021] " Real-Time Driver Drowsiness Detection System Using Wearable Devices and Deep Learning". He studied that The system uses glasses with sensors to monitor the driver's eye movements and detect signs of drowsiness. The data from the sensors is then analyzed using deep learning algorithms to determine the driver's level of drowsiness.When the system detects that the driver is becoming drowsy, it activates an alarm to alert the driver and prevent them from falling asleep at the wheel. The authors of the study emphasize the importance of preventing driver drowsiness, as it is a major cause of road accidents. The study evaluates the effectiveness of the system through experiments conducted on volunteers. The results of the experiments show that the system is effective in detecting driver drowsiness and preventing accidents. The study demonstrates the potential of using wearable devices and deep learning algorithms for developing real-time driver drowsiness detection systems that can help to prevent accidents caused by driver drowsiness.

III. EXISTING COMPONENT OF ANTI SLEEP DRIVERS GLASSES.

Anti-sleep driver glasses is made up of many components and sensor that work together. From the movement of eyes blinking and to the alarm system to alert the driver , each of these components is critical to Anti-sleep driver glasses process. Following are the components used in anti sleep glasses.

1.1. Microcontroller

A small computer that controls the glasses' functions and processes the data from the sensors. The most commonly used microcontroller for anti-sleep glasses is the Arduino Uno board..

1.2. Eye-tracking sensor

In the existing anti sleep glasses, A sensor that tracks the driver's eye movement and alerts them if they start to close their eyes. The most commonly used sensors for anti-sleep glasses are infrared (IR) sensors, but some systems use cameras or other types of sensors.

1.3. Alarm system

audible or haptic alarm that is triggered by the eye-tracking sensor if it detects the driver's eyes closing. The alarm system is designed to alert the driver and prevent accidents caused by drowsiness.

1.4. Power source

A Power Supply Unit (PSU) of Anti-sleep driver glasses oversees supplying electrical power to the sensor numerous components and subsystems. It transforms the wall socket into voltage and current required for the anti sleep glasses operations. A battery or power bank that provides power to the glasses. The power source is typically rechargeable and designed to last for several hours of continuous use.

IV. MODIFICATION

Anti-sleep driver glasses may be modified in a variety of ways to increase its performance, introduce new features, or improve the overall user experience. After formulating various problems in the existing anti sleep glasses, we added following modification. They are as follows:

4.1 Parking/hazard light connection to the reactive system

A flasher circuit on anti-sleep glasses is a circuit that controls the blinking of LED lights on the glasses. The purpose of the flasher circuit is to alert the wearer when they start to show signs of drowsiness or fatigue. The circuit typically uses a timer or a sensor to detect when the wearer's eyes are closed or drooping, and then triggers the LED lights to blink rapidly. The LED lights on the anti-sleep glasses are usually positioned in front of the wearer's eyes and are designed to be bright enough to catch their attention but not so bright that they cause discomfort or distraction. The flashing lights are intended to stimulate the wearer's brain and increase alertness, helping to prevent them from falling asleep or losing focus. The flasher circuit can be designed to be adjustable, allowing the wearer to customize the frequency and duration of the flashing lights based on their individual needs and preferences. Some anti-sleep glasses also include a manual override switch that allows the user to turn off the flashing lights if they become too distracting or uncomfortable.

The flasher circuit is an important component of anti-sleep glasses, as it provides a visual alert to the wearer when they start to show signs of drowsiness or fatigue, helping to improve their safety and prevent accidents.

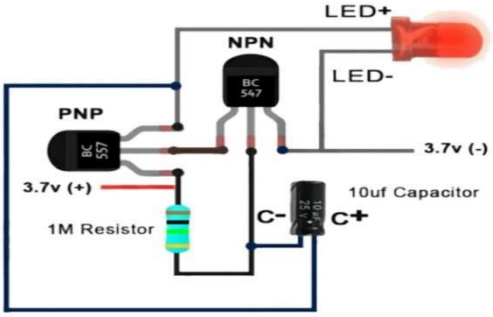
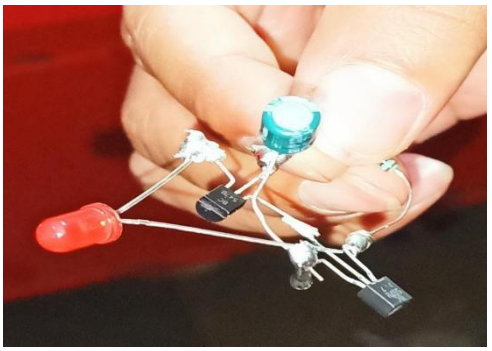


Figure (2): circuit diagram of flasher



Figure[3]:flasher circuit

Hazard lights can be useful in case of drowsiness or fatigue while driving, as they can help to increase visibility and signal to other drivers that there is a problem with the vehicle or driver. Here are some advantages of hazard lights in case of any sleep. Increased visibility: Hazard lights can help to increase the visibility of the vehicle, especially in low-light conditions or when the vehicle is parked on the side of the road. This can help to alert other drivers to the presence of the vehicle and to signal caution when approaching.

Anti-sleep glasses are designed to detect signs of drowsiness or fatigue in the wearer and alert them before they fall asleep or lose focus. One of the most common methods of alerting the wearer is through the use of a flasher circuit, which controls the blinking of LED lights on the glasses. The flashing lights are intended to stimulate the wearer's brain and increase alertness, helping to prevent them from falling asleep or losing focus. The flasher circuit can be designed to be adjustable, allowing the wearer to customize the frequency and duration of the flashing lights based on their individual needs and preferences. Some anti-sleep glasses also include a manual override switch that allows the user to turn off the flashing lights if they become too distracting or uncomfortable. In addition to the flasher circuit, anti-sleep glasses may also include other components such as sensors that detect head movement or eye movements, which can be used to provide additional alerts or to customize the flashing pattern of the LED lights. The flasher circuit is a crucial component of anti-sleep glasses, as it provides a visual alert to the wearer when they start to show signs of drowsiness or fatigue, helping to improve their safety and prevent accidents.

V. COMPARISON

A comparison of Anti-sleep driver glasses before and after the modification was done. We successfully improved the accuracy of the glasses to prevent the accident on roads , this is a comparison of existing and modified the anti-sleep glasses

Table 1. Comparison of Anti-sleep driver glasses before and after its modification

SR NO.	PARTS	EXISTING ANTISLEEP GLASSES BEFOREMODIFICATION	AFTER MODIFICATION of ANTISLEEP GLASSES
1	Sensors	Typically, only uses eyes blink frequency or head movement.	Uses multiple sensors such as eye blink frequency for accurate measurement of open and closing of eyelids
2	Algorithms	Uses a simple algorithm to detect drowsiness	Uses a personalized machine learning algo to analyze sensor and detect signs of drowsiness. This personalized algorithm can detect the drowsiness which differ from person to person. And alert the driver
3	Alerts	Typically, only provides audio alerts.	Provides both visual and audio alerts made to be noticeable but not distracting. This will alert the driver. And visual alert in form of flasher light to alert the driver
4	Integration with other technologies	Does not typically integrate with other system	Integrate with hazard lights and vehicle safety systems to provide additional functionality .It also provide safety to the people around the vehicle and maintain a safe distance from them.

5	Personalization	Does not typically offer customization or adjustability	Offers customizable frame styles lens and adjustable in sensitivity that takes into account individual factors. Can use with different types of glasses for example– day/night glasses , sunglasses, power glasses
6	Durability	Maybe not prone to wear and tear	Prioritize durability with scratch resistant lenses and with power lens.

VI. FUTURE SCOPE

Anti-sleep driver glasses have drawn attention engineers, students, and researchers in last few years. More specific areas explored are types of Anti-sleep driver glasses. Various Upgradations can be done in the existing anti-sleep driver glasses. The following point features what type of upgradations can be done according to today's world for more safety while driving on roads.

They are as follows:

6.1 Artificial Intelligence (AI) Integration:

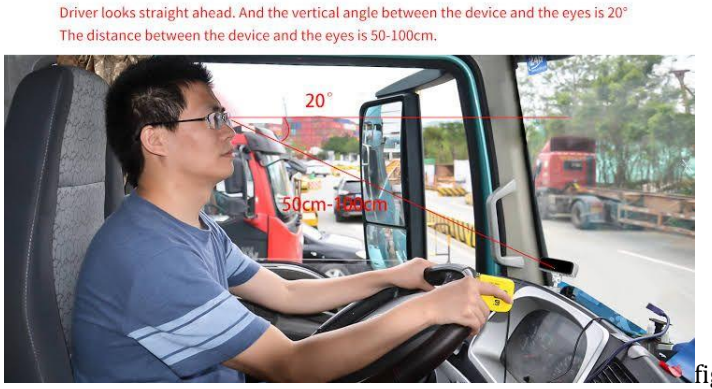
The integration of AI can make anti-sleep driver glasses more intelligent and accurate in detecting changes in the driver's alertness level. AI can analyze data from multiple sensors, such as eye-tracking, accelerometers, and EEG sensors, and provide real-time feedback to the driver to help them stay alert and focused. AI can also learn from the driver's behavior and preferences over time and adapt the alarm system to provide a more personalized and effective early warning system.

6.2. Virtual Reality (VR) Integration:

The integration of VR can provide a more immersive experience for the driver and help them stay alert and focused. VR can simulate different driving conditions and scenarios, such as driving in heavy rain or on a winding road, to keep the driver engaged and prevent drowsiness. VR can also provide visual and auditory cues that help the driver stay alert and focused.

6.3. Smart module:

The development of smart module that can monitor the driver's vital signs, including drowsiness of driver can provide a more comprehensive analysis of the driver's condition and help prevent accidents caused by drowsy driving. Smart contact lenses can also provide visual cues, such as changing colors, to alert the driver when their alertness level is decreasing.



figure[4] smart module fitted in car's dashboard

6.4. Wireless Connectivity:

The use of wireless connectivity, such as Bluetooth or Wi-Fi, can provide additional features and functionality for anti-sleep driver glasses. For example, glasses can be connected to a smartphone app that can monitor the driver's vital signs and provide real-time feedback. Wireless connectivity can also allow glasses to receive updates and new features over the air, without the need for manual updates.


figure [5]:GSM module.

6.5. Eye-Tracking Technology:

The use of eye-tracking technology can provide a more accurate analysis of the driver's eye movements and level of alertness. This technology can be used to detect microsleeps, which are brief periods of sleep that can occur while the driver's eyes are open. Eye-tracking technology can also be used to determine the driver's focus and attention level and adjust the alarm system accordingly.

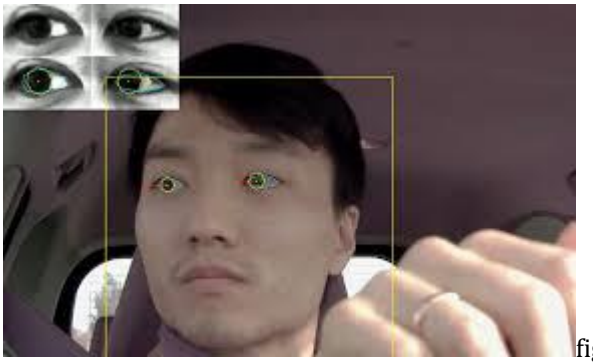


figure [6]:Eye tracking

6.6. Augmented Reality (AR):

The integration of AR can provide a more immersive experience for the driver and help them stay alert and focused. AR can overlay information on the driver's field of view, such as road conditions or navigation instructions. AR can also provide visual and auditory cues that help the driver stay alert and focused. The future scope for anti-sleep driver glasses with an alarm system is exciting, and the potential benefits for drivers and passengers are significant. The integration of advanced technologies such as AI, VR, smart contact lenses, haptic feedback, wireless connectivity, eye-tracking, ML, and AR can make anti-sleep driver glasses more effective in preventing accidents caused by drowsy driving. These advancements can make driving safer and more comfortable for everyone on the road.


Figure [7]: AR Glasses

VII. CONCLUSION

The anti-sleep driver glasses with an alarm system are an effective solution to prevent accidents caused by drowsy driving. The use of sensors, microcontrollers, and alarm systems has made these glasses more effective in detecting changes in the driver's alertness level and providing an early warning system to prevent accidents. The integration of advanced technologies such as AI, VR, eye-tracking, and haptic feedback shows significant potential for the future of anti-sleep driver glasses. These advancements can make driving safer and more comfortable for everyone on the road. However, further research is needed to improve the accuracy and reliability of these technologies and to promote their use among drivers. anti-sleep driver glasses system has the potential to save many lives on the roads and improve the overall safety of drivers and passenger.

VIII. REFERENCES

[1] "Drowsy Driver Detection Using Wearable Devices: A Systematic Review" by [M. A. Aziz et al. - This study provides an in-depth review of wearable devices used for detecting driver drowsiness, including glasses, smartwatches, and headbands.vol 11(11), page- 4851-4866].

[2] "Design and Development of an Intelligent Anti-Drowsiness System for Drivers" by [X. Li et al. - This study presents a detailed design and development of an intelligent anti-drowsiness system for drivers, including the use of sensors, algorithms, and an alarm system.vol-19(11), page-2536.]

[3] "The Effectiveness of Anti-Sleep Warning Systems for Commercial Vehicle Drivers: A Systematic Review and Meta-Analysis" by [S. L. Wong et al. - This study provides an in-depth review and meta-analysis of the effectiveness of anti-sleep warning systems for commercial vehicle drivers, including the use of glasses.vol 129, page-67-80.

[4] "Real-Time Driver Drowsiness Detection System Using Wearable Devices and Deep Learning" by K. H. Park et al. - This study presents a real-time driver drowsiness detection system using wearable devices and deep learning, including the use of glasses with sensors and an alarm system. Vol 21(11), page- 3652.