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Driver's Anti Sleep Devices using IOT

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Abstract: ***Drowsy driving is a serious issue that causes a lot of accidents on the road all around the world. Due to the driver's inability to stay awake while driving, many accidents happen. The existing techniques utilised to do so are ineffective, and it is difficult to spot drowsy drivers. So, in order to prevent accidents, there is a need for a gadget that can recognise driver drowsiness in real-time and inform the driver. The design and development of a driver's anti-sleep device employing a Node MCU, an IR sensor, a gyroscope, and a buzzer are presented in this work. The proposed device can detect the driver's drowsiness level by analysing the driver's eye blinking pattern and body posture. The device triggers the buzzer to alert the driver in real-time, preventing a potential accident due to driver drowsiness. The device's importance lies in the fact that it can save lives and prevent injuries caused by drowsy driving. It is a cost-effective solution for detecting driver drowsiness and can be integrated into all types of vehicles. The device's real-time monitoring and detection system can significantly reduce the number of accidents caused by driver drowsiness. Furthermore, the proposed device is user-friendly and can be easily installed in any vehicle. It is portable and can be carried from one vehicle to another. The device can also be customized according to the driver's specific needs, making it highly adaptable and versatile. Overall, the proposed Driver's Anti-Sleep Device using Node MCU, IR Sensor, Gyroscope, and Buzzer is a highly efficient, cost-effective, and user-friendly solution for detecting driver drowsiness in real-time. The device has significant potential to reduce the number of accidents caused by drowsy driving and enhance road safety.***

Keywords: Drowsiness detection, driver safety, real-time monitoring, road safety, driver drowsiness, user-friendly, cost-effective, driver monitoring system, Body Posture, eye blinking pattern.

I. INTRODUCTION

There is an urgent need for a trustworthy and effective driver monitoring system that can identify tiredness in real-time and notify the driver to probable accidents given the rise in traffic accidents caused by sleepy drivers. Emerging technologies like driver monitoring systems, which use cutting-edge sensors and algorithms to identify driver drowsiness, have recently been added to traditional strategies like rest breaks, caffeine consumption, and physical activity. Recent figures show that worldwide, drowsy driving is a major contributor to traffic accidents, injuries, and fatalities. For instance, in the United States, drowsy driving contributes to over 91,000 accidents and 795 fatalities each year, whereas in India, it contributed to 3.3% of accidents and 3.8% of fatalities in 2019.

Various methods have been proposed to address this issue, including regular breaks, caffeine intake, and physical activity, but these methods are not always effective, and it is difficult to identify when a driver is becoming drowsy. Therefore, there is a need for a more reliable and efficient driver monitoring system that can detect driver drowsiness in real-time and alert the driver to prevent potential accidents.

There have been intensive research works done to detect drowsiness of drivers, based on the above-mentioned gestures of body (i.e. eye motion detection and yawning detection), as we shall see in section II.

This thesis presents a novel approach to driver monitoring using a Driver's Anti-Sleep Device that integrates emerging technologies such as Node MCU, IR Sensor, Gyroscope, and Buzzer to detect driver drowsiness in real-time. The proposed device uses advanced algorithms to analyse the driver's eye blinking pattern and head position to determine the level of drowsiness. If the driver is found to be drowsy, the device triggers the Buzzer to alert the driver, preventing a potential accident.

The proposed Driver's Anti-Sleep Device is cost-effective, user-friendly, and can be easily integrated into all types of vehicles, including commercial vehicles. The device's real-time monitoring and detection system can significantly reduce the number of accidents caused by driver drowsiness, enhancing road safety. Furthermore, the device is portable and can be customized according to the driver's specific needs.

In summary, this thesis presents a significant contribution to the field of driver monitoring systems, offering a reliable and efficient solution to the problem of driver drowsiness. The proposed Driver's Anti-Sleep Device is an innovative solution that addresses the limitations of traditional approaches and stands out in the market as a cost-effective and user-friendly alternative for real-world scenarios.

II. RELATED WORK

The study in suggests using the difference image between two photographs to detect the face region. Based on the distance between the chin and the midway of the nostrils, the driver's yawn is then determined. identifies the face using the Gravity-Center template. The mouth corners are then detected using Gabor wavelets and grey projection.

LDA is then used to categorize feature vectors in order to detect yawning. shows a system that uses the Viola-Jones face detection approach to locate the face in a video frame. After that, a mouth window is removed from the face area, and lips are found using spatial fuzzy cmeans (s-FCM) clustering. takes advantage of two cameras: a low-resolution camera for the face and a high resolution one for the mouth. The driver's mouth is then recognised using haar-like traits, and yawning is determined by the ratio of mouth height to mouth breadth.

The research in also uses specific geometrical aspects of the mouth to identify yawning. In two ways, our work differs from the relevant literature.

In order to make our algorithm more resistant to changes in the subject, we start by reducing the high level of detection dependent on the facial shape. In order to have a realistic implementation within a real camera system in the car and maintain the same level of detection efficiency, we avoid the usage of complicated algorithms and classifiers. To make sure that our suggested approach is actually possible and practical for actual implementations, we have collaborated with Cognivue Corp., whose products include such in-car cameras.

III. LITERATURE SURVEY

1) *A Dedicated System for Monitoring of Driver's Fatigue K. Subhashini Spurjeon, Yogesh Bahindwar:* Describe the traffic collisions. The inattentiveness of the driver causes the traffic accidents. The author of this research describes a real-time system for monitoring a driver's degree of attention by analyzing video sequences of the driver. The author calculates the percentage of closed eyelids for this reason. The closing of the eyes serves as a sleepiness signal. The primary factors in traffic accidents on the road are driver weariness and drowsiness. Monitoring the driver's level of alertness and delivering a warning when he or she is not paying enough attention to the road is a potential technique to lower the accidents brought on by driver's factors. The fatigue monitoring are often starts with extracting visual parameters. this will be done via a computer vision system. within the purposed work, author purpose a true time robust methods for eye tracking under variable lighting conditions and facial orientations. during this paper the latest technologies in pattern classification recognition and in object tracking are employed for eye detection. The tracking is predicated on the eye appearance. Visual information is acquired employing a specially designed solution combining a CCD video camera with an IR illumination system. The system recognizes eye position and closure as well as recovering the gaze of the eyes. It is totally automatic. Real-world image experiments show how accurate and reliable the suggested solution actually. this might become an important part in the development of the advanced safety vehicle. Extraction of visual characteristics are often the first step in the tiredness monitoring process. an automatic computer vision system can accomplish this. The author's goal within the intended study is to develop real-time, reliable methods for eye tracking during a variety of illumination and facial orientation situations. the foremost recent developments in object tracking and pattern categorization identification are used to detect eyes in this research. The tracking is completed depending on how the eyes look. A specially developed system that mixes an IR illumination system and a CCD video camera is used to gather visual data. The system recognizes eye position and closure also as recovering the gaze of the eyes. it's totally automatic. Real-world image experiments show how accurate and reliable the suggested solution is. This might play a big role. in the development of the advanced safety vehicle.
2) *Drowsiness Warning System Using Artificial Intelligence, Nidhi Sharma, V. K. Banga:* The author of this study discusses numerous artificial intelligence techniques for system sleepiness detection. Driver sleepiness plays a significant role in protecting vehicles from collisions. As tiredness increases, so does driving performance, and the accidents that ensue are more severe. The interest in intelligent vehicles has increased recently. The way cars and drivers interact in the future will change as a result of current research into intelligent vehicles. The sensing system built into cars could aid with many accident avoidances. Driver fatigue is studied using a variety of ways. The majority of published research on computer vision methods for fatigue detection has been on the examination of blinks and head movements. Having just finished a long day of driving or not feeling particularly alert, the attention of driver starts to lose and that creates risks of accidents. These are the typical, extremely risky effects of weariness. Making the right selection in real time is crucial for image fatigue detection. The author of this paper explores numerous artificial detecting methods.

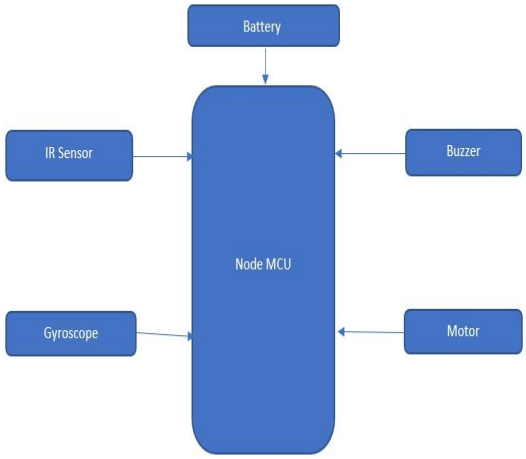
3) *A Yawning Measurement Method to Detect Driver Drowsiness, Behnoosh Hariri, et.al:* Identify the primary cause of vehicle accidents as being drowsy. Accident avoidance can be greatly aided by the use of assistive devices that track a driver's state of alertness and warn them if they become drowsy. In this study, the author set out to develop a novel method for measuring yawning in order to detect driver fatigue. This process includes a number of processes, such as the in-flight detection and tracking of the driver's face, the in-flight detection and tracking of the mouth contour, and the in-flight detection of yawning based on monitoring both the rate and number of changes in the mouth contour area. For the robust detection of yawning expression in the presence of lighting conditions and facial occlusions conditions, many approaches are used in this article lighting conditions and facial occlusions. The proposed system can effectively measure the aforementioned factors and recognize yawning as an indication of driver tiredness, according to test results.
4) *Development of a Drowsiness Warning System using Neural Network, Itenderpal singh1, Prof. V.K. Banga:* Describe the examination of face images. Because there are more cars on the road, accident-related issues have grown more complicated. The current transportation infrastructure is insufficient. Therefore, research into automobile safety is a hot topic right now. The author of this paper discusses safety warning systems. The public has been paying close attention to active warning systems for preventing road accidents. Today's societies are very concerned with safe driving. In a single day, thousands of accidents occur. Consequently, many people suffer injuries, and many of them pass away. The creation of a prototype sleepiness detection system is the goal of this paper. The major goal is to create a system that can correctly and instantly track whether the driver's eyes are open or closed. It is thought that the signs of driver fatigue might be identified early enough to prevent an automobile collision by keeping a watch on the eyes. The author used an image processing approach and neural network to create a car driver sleepiness warning system. It is based on facial image processing to alert the driver of fatigue or inattention to stop accidents on the road. The video camera that is mounted on the dashboard in front of the driver captures the driver's face images. The amount of weariness is to be determined by a neural network-based algorithm. The system gauges eye opening and closure and alerts the driver if necessary.

IV. METHODOLOGY AND DISCUSSIONS

The Driver's Anti-Sleep Device is a system that uses a combination of hardware and software components to detect driver drowsiness and alert the driver in real-time. The methodology for the development of the Driver's Anti-Sleep Device is as follows:

1) *Hardware Selection:* The first step in the methodology was to select the appropriate hardware components for the device. The Node MCU was chosen as the microcontroller for the device due to its low cost, small size, and easy programming. The IR Sensor and Gyroscope were selected as the sensors for drowsiness detection. The Buzzer was chosen as the alert mechanism to notify the driver in case of drowsiness detection. We chose to mount the IR sensor on glasses while the gyroscope on the stomach or back area of the body for more accurate results.
2) *Circuit Design:* The hardware components were assembled and connected to the Node MCU. The circuit design was developed using the Eagle software. The circuit design included the Node MCU, IR Sensor, Gyroscope, Buzzer, and power supply components.
3) *Software Development:* The software code was developed using the Arduino IDE. The code was designed to read the sensor data, process the data, and trigger the Buzzer in case of drowsiness detection. We used Embedded C for programming of the Node MCU and implemented IOT and SMS alertness on the project. The graph is prepared storing data about past processing's.
4) *Testing:* The device was tested in real-world scenarios to evaluate its performance. The testing was conducted on a sample group of drivers under different driving conditions, such as driving on a straight road, driving on a curved road, and driving on a bumpy road. The performance of the device was evaluated based on the accuracy of drowsiness detection, the response time of the alert mechanism, and the overall user experience.
5) *Data Analysis:* The data collected from the testing phase was analyzed to evaluate the performance of the device. The data was analyzed to determine the accuracy of drowsiness detection and the response time of the alert mechanism. The data was also analyzed to identify any limitations or issues with the device's performance.
6) *Improvement:* Any issues or limitations identified during the data analysis phase were addressed. The hardware or software components of the device were improved to enhance its performance. The device was tested again to evaluate its performance after the improvements were made.

Block Diagram



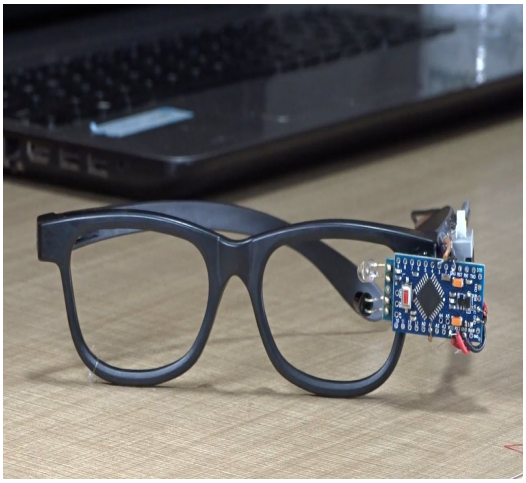
Discussion: The Driver's Anti-Sleep Device is an innovative solution to the problem of driver drowsiness, which is a major cause of road accidents. The device is designed to be low cost, easy to use, and highly effective in detecting driver drowsiness. The hardware and software components of the device were carefully selected and integrated to ensure that the device is reliable, efficient, and accurate in detecting driver drowsiness.

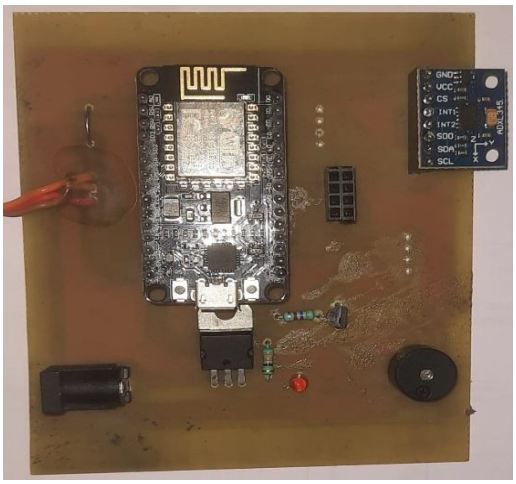
V. RESULT

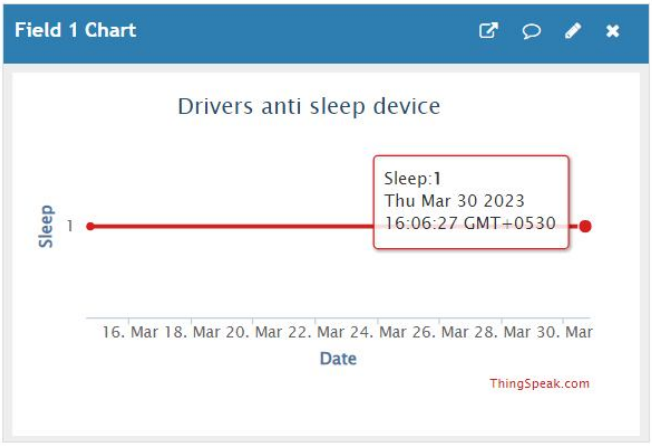
The project will be developed utilizing a variety of tools and applications. The project uses an IR sensor, buzzer, vibration motor, and Node MCU. People can use the alert time to fill the driver's sleeping hours, which helps to prevent dangerous accidents. A driver who falls asleep at the wheel risks catastrophic repercussions, including accidents and potential fatalities. Since this scenario occurs far more frequently than we realize, it is crucial to find a solution. We have therefore developed a Driver Anti-sleep Device to remedy this issue.

Head movement, hand movement, awareness, and tiredness are among the important factors. "The device will instantly alert the driver if it detects any worrying circumstances. If the motorist does not demonstrate any attentiveness after five seconds, a continuous beeping sound will begin. By recognizing both open and closed eyes, the programmed seeks to precisely determine the driver's level of tiredness. The Gyroscope is mounted on the device to continuously monitor the motion of the driver. If any worrying circumstances is detected it will instantly alert the driver.

Also, all the continuously monitored data will be stored on the server in the form of graph. Data can be used to study or conclude some results to avoid such conditions. The device will also send emergency message to the contacts selected by the driver.







The drowsy detecting method is created using proteus 8 and embedded C. The main power source of the Node MCU is a lithium battery, which supplies 12 volts to the gadget. The 20 cm range of the IR sensor, which operates on a 5-volt source, is more than enough for the glass frame eye detection. The buzzer and vibration motor works 4 volts and 3 volts supply. The buzzer has the frequency of ~2300 Hz and the vibration motor has up to 12500 rpm load speed.

VI. CONCLUSION

As for the software part, we fulfilled our goal successfully. The detection algorithm could not only work effectively and accurately at daytime, but also at night. The Eye portion extraction is smooth and in real time with no delays on the computer. In addition, there is a bonus function in the software part – detection with glasses. We experienced a few difficulties while installing the Node MCU library but were able to solve after some help from internet. It is apparent that the overall project success is not derived from one team member's mind but the keen coloration within our group. Each part is indispensable and every team member made the great dedication on the completion of this design project.

By using our Driver Sleep Detection and Alarming System, customers would be warned when his/her physical condition is not good enough for driving and thus prevents dangerous behaviours from happening. It is consistent with the safety and welfare of the public. By using Node MCU and related libraries, we try to develop and improve algorithm for eye closeness detecting. We are also using gyroscope sensor for better drowsiness detection. The IOT tools also to track data and to make communication to emergency contacts. We then apply this technology to our application in order to help drivers achieve a better and safer driving condition. We consult Professor for review advices and improve, seek online resources to help correcting errors, and properly cite the contributions of other people. We design our project using qualified components and follow proper safety rules, avoid wrong actions happening to other people.

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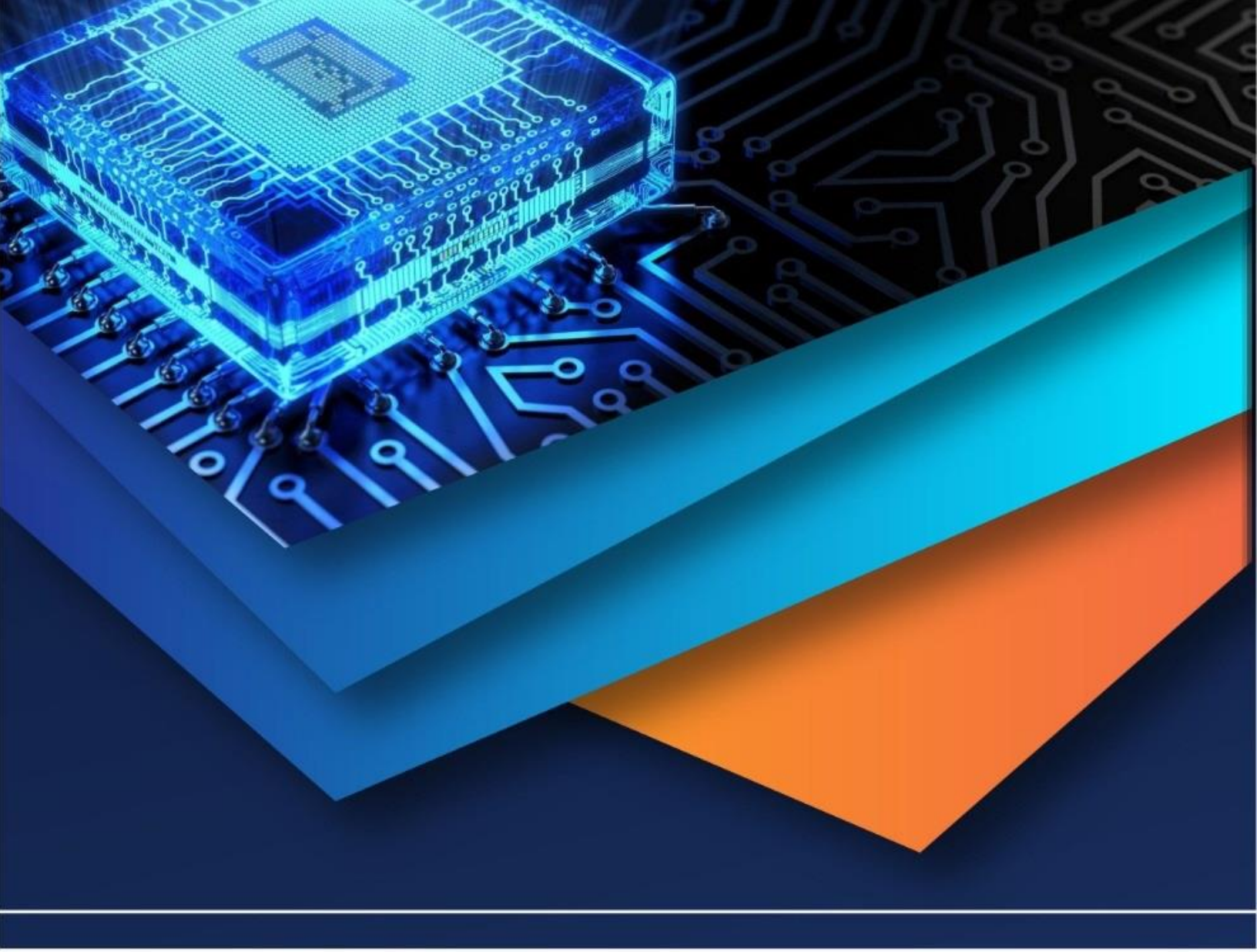

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