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Driver Drowsiness System

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***Abstract*—Experts warn that drivers who fail to take regular breaks when driving long distances are at high risk of becoming drowsy, which can often go unrecognized until it is too late. Studies show that approximately 25% of all serious motorway accidents are caused by tired drivers who need rest, making drowsy driving a more significant contributor to accidents than drunk driving. To address this issue, Attention Assist is a system that can alert drivers to inattentiveness and drowsiness across a wide range of speeds. It can also provide drivers with information about their current level of fatigue and the time elapsed since their last break. The system offers adjustable sensitivity and can provide warnings to drivers, indicating nearby service areas where they can take a break if necessary. By helping drivers recognize and address their drowsiness, this system can improve road safety and prevent accidents caused by tiredness while driving.**

***Index Terms*— Vehicles, Face, Conferences, Cameras, Real-time systems , Face detection, Image edge detection.**

I. INTRODUCTION

Driver drowsiness detection technology is an essential safety feature in vehicles that helps prevent accidents caused by drowsy driving. Studies suggest that approximately 20% of all road accidents and up to 50% of accidents on certain roads are fatigue-related. These accidents can result in severe injuries and fatalities, with estimates indicating that 1,200 deaths and 76,000 injuries annually are caused by fatigue- related crashes. Given the risks posed by drowsiness on the road, developing technologies that can detect and prevent drowsiness in drivers is crucial in preventing accidents. Driver distraction and drowsiness can both lead to decreased driving performance, longer reaction times, and increased crash risk. Unlike driver distraction, drowsiness is characterized by a gradual withdrawal of attention from the road and traffic demands. To address these issues, the driver drowsiness detection system uses a camera to acquire video footage of the driver's behavior in real-time. This video is then processed to infer the driver's level of fatigue. If drowsiness is detected, the system activates an alarm to alert the driver and prevent accidents.

II. METHODOLOGY

A computer vision-based method that uses Haar cascade has been developed to detect indications of driving fatigue or drowsiness in a driver drowsiness system. Haar cascade is a popular object detection technique used to locate specific features in an image. In this case, the algorithm is trained to identify facial movement patterns that are indicative of fatigue or drowsiness. The system operates by using a camera placed on the dashboard or rearview mirror to capture video of the driver's face. The Haar cascade technique is then applied to analyze the

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collected images in real-time, searching for any signs of fatigue or drowsiness. The system can detect characteristics that are commonly associated with driver fatigue, such as droopy eyes or a slack jaw. When the algorithm identifies these indicators, the system will notify the driver through a visual or audio alert, advising them to take a break or stop driving altogether. The technology can also be tailored to individual drivers and their unique facial movement patterns. One of the advantages of using Haar cascade in a driver drowsiness system is its effectiveness and accuracy. The technique is computationally efficient and can operate in real-time on low-powered devices, making it an ideal choice for embedded systems in automobiles. While other types of driver drowsiness systems can detect changes in heart rate or body temperature as symptoms of drowsiness, this system may not be as effective in doing so.

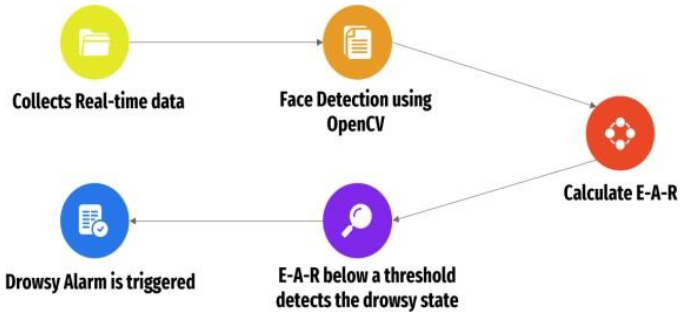

Figure 1. System Block Diagram

III. Eye Aspect Ratio

The Czech Technical University has introduced the Eye Aspect Ratio (EAR) as a measure of eye openness. To calculate the EAR, the coordinates of the eyes are detected in an image of a face, and the Euclidean distance between them is computed. This distance value is then used in a formula to obtain a scalar quantity that represents the EAR.

$$EAR = \frac{||p_2 - p_6|| + ||p_3 - p_5||}{2||p_1 - p_4||}$$

Figure 2. Points for Ear Aspect Ratio

Figure 3. Points for Ear Aspect Ratio

The Czech Technical University introduced the concept of Eye Aspect Ratio (EAR), which is a scalar value obtained by detecting facial features in an image, determining the Euclidean distance of corresponding eye coordinates, and applying the following formula. When the eye is open, the EAR value is relatively constant, but approaches zero as the eye closes. This value is not influenced by head posture or distance, and there are only slight individual differences when the eyes are open. Both eyes' EAR values are averaged since blinking is a synchronous movement of both eyes. While the formula is straightforward and provides excellent real-time performance and robustness, detecting irregular movements such as eye thinning or looking down is challenging, especially at the threshold. Although it is claimed to have high detection accuracy, sudden face movements or significant distances from the camera can reduce its accuracy. Converting face images to higher resolution using super-resolution techniques may mitigate resolution degradation due to distance, but this has not yet been explored.

IV. OUTPUT

Driver drowsiness detection technology is an essential safety feature in vehicles that helps prevent accidents caused by drowsy driving. Studies suggest that approximately 20% of all road accidents and up to 50% of accidents on certain roads are fatigue-related. These accidents can result in severe injuries and fatalities, with estimates indicating that 1,200 deaths and 76,000 injuries annually are caused by fatigue- related crashes. Given the risks posed by drowsiness on the road, developing technologies that can detect and prevent drowsiness in drivers is crucial in preventing accidents. Driver distraction and drowsiness can both lead to decreased driving performance, longer reaction times, and increased crash risk. Unlike driver distraction, drowsiness is characterized by a gradual withdrawal of attention from the road and traffic demands. To address these issues, the driver drowsiness detection system uses a camera to acquire video footage of the driver's behavior in real-time. This video is then processed to infer the driver's level of fatigue. If drowsiness is detected, the system activates an alarm to alert the driver and prevent accidents.

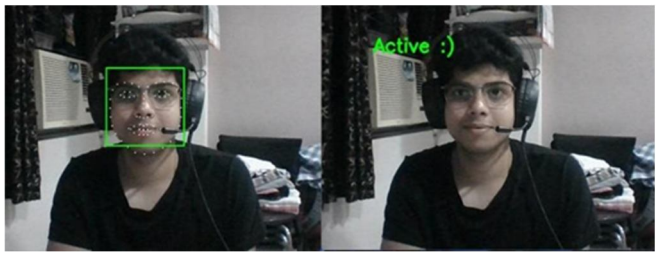

Figure 4. Active User

Figure 5. Drowsy User

VI. CONCLUSIONS

The utilization of driver drowsiness systems spans across various industries and applications. The scope of potential applications includes but is not limited to the automotive industry, transportation and logistics, healthcare, aviation, and industrial safety. The implementation of drowsiness detection systems in vehicles such as cars, trucks, and buses can contribute to a reduction in the frequency of accidents resulting from driver fatigue. Such technology warns drivers when they are about to doze off or become distracted, thereby promoting road safety. In the transportation and logistics industry, the integration of driver drowsiness solutions can foster driver awareness and focus, thereby reducing accidents and expediting delivery. In the healthcare industry, driver drowsiness systems can be employed to monitor patients who are prone to falling asleep while driving, such as those with sleep disorders. These systems can alert caregivers when patients become drowsy, ensuring that they receive the necessary care. The aviation industry can also benefit from drowsiness detection systems, as they can be used to monitor pilots and warn them of potential fatigue-related mishaps. Finally, the use of driver drowsiness devices in industrial settings like factories and construction sites can promote worker safety by ensuring employees remain focused on their tasks and preventing accidents. Given the broad range of potential applications, the prospects for driver drowsiness systems continue to expand even though the results are given.

REFERENCES

[1] Sagila Gangadharan, A.P Vinod, “Drowsiness detection using portable wireless EEG”, published in 2022.

[2] V B Navya Kiran, Raksha R, Anisoor Rahman, Varsha K N, Dr. Nagamani N P, “Driver Drowsiness Detection”, published in 2022I. S. Jacobs and C. P. Bean, “Fine particles, thin films and exchange anisotropy,” in *Magnetism*, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.

[3] Anis-Ul-Islam Rafid, Amit Raha Niloy, Atiqul Islam Chowdhury, Atiqul Islam Chowdhury, “A Brief Review on Different Driver’s Drowsiness Detection Techniques” published in 2022.
[4] Burcu Kır Savaş, Yaşar Becerikli, “Real Time Driver Fatigue Detection Based on SVM Algorithm” published in 2022
[5] Dr. Jayshree Pansare, Ranjeet Deshpande, Shubham Shingare, Harshal Deokar, Piyush Manwar, “Real-time Driver Drowsiness Detection with Android” published in 2022.
[6] Mahek Jain, Bhavya Bhagerathi, Sowmyarani C N, “Mahek Jain, Bhavya Bhagerathi, Sowmyarani C N” published in 2021.