Active Driving Assistant and Alert System

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Abstract—This paper presents the study to examine two separate approaches, each of which aims to enhance the safety of drivers while they are behind the wheel. The first system is a driver fatigue detection system that uses the powerful computer vision frameworks dlib and OpenCV to evaluate facial expressions and eye movements in real-time. In contrast to conventional drowsiness detection systems, this technology identifies and alerts the driver if they are exhibiting signs of fatigue through the use of image processing techniques. The second system mentioned in this paper is an email notification system for emergencies meant to determine the precise location of the driver in the event of an emergency. A driving safety warning system is integrated into the system to monitor the driver's behaviour. This technology delivers a warning if the driver begins to become tired or inattentive. If the driver fails to respond to the alert system, the emergency email system will be activated. It will establish the driver's location and relay it to the local emergency services so that aid can be provided as quickly as feasible. Both of these systems are designed to work together to provide drivers with a full safety solution. With the assistance of the driver drowsiness detection system, accidents caused by driver drowsiness can be avoided, while the emergency email system ensures that drivers receive prompt medical care in the event of an emergency.

Keywords: Facial Landmarks, Computer Vision, Real-Time Monitoring, Geo-Location, Emergency Email Notification System, Eye Movements.

I. INTRODUCTION:

Driver fatigue poses a huge threat to the safety of transportation systems. Drowsiness can result in accidents and fatalities; hence it is crucial to recognize and inform drivers when they exhibit drowsiness symptoms. Conventional driver sleepiness detection systems rely on machine learning algorithms that require significant amounts of training data, which can be time-consuming and computationally costly. In this article, we discuss two systems developed to improve driving safety. The first system used dlib and OpenCV computer vision libraries to detect driver drowsiness in real-time. Our system combines image processing techniques to assess facial expressions and eye movements, thereby providing a non-invasive, cost-effective, and efficient method for detecting tiredness. The second system is an emergency email system that extracts the location of the driver in the event of an emergency. Included into our system is a driver safety warning system that analyses the driver's behaviour and provides an alert in the event of tiredness or distraction. If the driver does not respond to the alert system, the emergency email system extracts the driver's location and sends it to neighboring emergency services so that they can provide rapid medical aid. Our systems collaborate to give drivers with comprehensive safety solutions. The driver drowsiness detection system aids in the prevention of accidents caused by driver fatigue, while the emergency email system guarantees that drivers receive timely medical assistance in the event of an emergency. The evaluation of our technologies utilizing real-world scenarios demonstrates their efficacy in improving driver safety.

II. LITERATURE REVIEW

P. Baby Shamini[1] In this research the authors explain, sleepy driving is a serious concern for motorists and other road users. Machines designed to monitor motive force abnormalities can spot signs of exhaustion, illness, and sleepiness. The existing system is missing some crucial component(s) that are necessary to provide the desired results. Cameras are positioned in front of people so they can track them as they enter and exit a building. It was created with the aim of detecting driver fatigue via tracking eye closure rates. Spectacle-wearing drivers will find that this technology performs admirably, and it also functions well in dim environments. A facial landmarking system is based on the information gathered by an image processing system. Counting the amount of times a driver's eyes are closed continuously, this technique determines how alert the driver is.

M. M. El-Barbary[2], In this research, the author suggests the technology that might be installed in cars to prevent accidents caused by drowsy drivers. The suggested system consists of a camera-based facial features extraction algorithm and a touch sensor that can be seamlessly incorporated into the steering wheel's surface area. Drowsiness is recognized and recorded based on the driver's hand grip strength on the steering wheel and the estimated value of EAR. Results from both experiments indicated promise for verifying drivers' levels of tiredness and preventing inaccurate reports. The EAR value, which measures the depth to which the eyes are opened, verified that the amplified induced voltage detected was an accurate estimate of grip strength on the steering wheel, and so supported sleepiness detection sitting or sleeping by observing the effects of a person movement ambient wireless links.

V. Kavathekar[3] In this research the authors A comprehensive Drowsiness Detection and warning system has been built by the author to ensure the well-being of drivers and cut down on the increasing incidence of traffic accidents. By incorporating facial recognition into the system, we were able to make it practical for a wide range of motorists. The system keeps a close eye on the
driver, noting any signs of fatigue or drowsiness. If it detects that the driver has been yawning for longer than four seconds, an alarm will sound. The driver can leave the system after his trip is over. If the system detected that the driver was nodding off while driving, it would save the driver's exiting image to a "dataset" if the motorist was asleep at the wheel.

S. Mohamed[4] Here, the author presents a technique for detecting tiredness while behind the wheel in real-time using a visual cue from the eyes, namely the ocular aspect ratio. First, the facial region in each frame is localized using the proposed technique, which is then applied to movies taken from a publicly available sleepiness detection dataset. Subsequently, a facial landmarks detector is used to zero in on the area around the eyes and extract it as the region of interest. The next step is to compute, examine, and catalogue each image's eye aspect ratio value. Finally, three distinct classifiers—a linear support vector machine, a random forest, and a sequential neural network—are used to enhance the accuracy of detection. Data is then categorized to ascertain whether the driver's eyes are closed or open based on the retrieved data. If the driver's eyes close for more than a certain amount of time, an alarm will go off to wake them up.

A.T Gaikwad[5] The author of this study developed a method for the prediction and detection of a driver's level of tiredness while they were operating a motor vehicle. This technique is essential for saving not only the life of the driver but also the lives of the other passengers and pedestrians. The researchers in this study were able to build a system that could identify tiredness in drivers in a very rapid and accurate manner by making use of facial features such as the eyes and the lips. This system was one of the most significant contributions to the field of biometrics. The technology is able to recognize yawns in real time and calculate how long a driver's eyes have been closed for at any given point in time. The alarm will go off as soon as the system detects that the driver's eyes are closed. This is done in order to prevent the driver from falling asleep at the wheel and causing an accident. As soon as the alert goes off, the driver will snap back to his normal level of awareness to alert the driver whose is in drowsiness state.

III. PROPOSED SYSTEM
We propose the Emergency Email System, a vital instrument for safeguarding the safety and security of individuals in emergency situations. A potential upgrade to this Active driving assistant and alert system would be the incorporation of a geo-location component that would enable first responders to quickly and correctly find drivers who are unresponsive or unable to report their whereabouts in case of any emergency. In order to implement this functionality, a driver drowsiness system might be used as if the driver doesn't respond to the alert system that already exists in the system to automatically gather and broadcast the driver's geo-location data to emergency stations during a sleepiness occurrence. This data might be acquired via sensors or other technology in the future as it will be embedded into the hardware components that follows the vehicle's movements and location, and would be communicated automatically to emergency responders if the driver does not respond to the drowsy system's alert. This would allow emergency responders to swiftly and precisely locate the driver in the case of an accident or other emergency, and could potentially save lives by lowering response times and ensuring that assistance is supplied as promptly as feasible.

3.1. Proposed Architecture

![Proposed Architecture Diagram]

3.1 Proposed Architecture
IV. METHODOLOGY
The development of a Active driving assistant alert system and emergency email system necessitates a thorough process that takes into account the project's unique requirements. Video Capture And Image Segmentation, Drowsiness Detection Using Eye Moments, and Emergency Mail Notification System are three essential modules that must be designed and incorporated into the system. Following is a methodology breakdown for each module.

4.1 Video Capture And Image Segmentation

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<td>Step 2: Accessing the camera.</td>
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<td>Step 4: Segmentation of video into frames using python module OpenCV.</td>
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In the module of driver drowsiness detection, image acquisition using OpenCV. First, a camera records video of the driver's face and eyes, followed by OpenCV pre-processing, which divides the video into frames, and image analysis later to determine the driver's level of attentiveness.

4.2 Drowsiness Detection Using Eye Moments

| Step 1: The frames that are segregated using OpenCV will be used by Dlib. |
| Step 2: Then the pre-trained 68 Facial Landmarks are marked on frames continuously |
| Step 3: By using the EAR, or Eye Aspect Ratio, is a method for detecting the presence and position of eyes in an image depending on certain ratio. |
| Step 4: If the ratio of EAR finds the driver feels drowsy immediately the alert system activates. |
4.2 Drowsiness Detection Using Eye Moments

4.2.1 Facial Landmarks
The 68 facial landmarks are trained by machine learning network using a vast dataset of facial photos. The model analyses the input image and predicts face landmarks using a deep convolutional neural network (CNN). A NumPy array stores the 68 facial landmarks from 0 to 67. Each landmark represents a facial feature, such as the eyes or nose. These markers can track facial expression changes and detect facial features. Points 36-47) Eye landmarks the inner and outer corners, top and bottom eyelids, and eyebrows are identified by these landmarks.

4.2.2 EAR (Eye Aspect Ratio)
The EAR, or Eye Aspect Ratio, is a measure of the openness of the eyes and is used in computer vision tasks such as detecting blinks and monitoring drowsiness. EAR is defined as the ratio of the distance between the horizontal landmarks of the eye to the distance between the vertical landmarks of the eye. A low aspect ratio indicates that the eyes are open and alert, while a high aspect ratio indicates that the eyes are closed or drowsy.

\[
\text{EAR} = \frac{|p_{38} - p_{43}| + |p_{39} - p_{41}|}{2|p_{37} - p_{40}|}
\]

4.2.3 Person Status
In this proposed system there are three of driver status

4.2.3.1 Active Status
In this driver is currently in Active status. This means that the system is fully operational and monitoring the driver's behaviour for any signs of drowsiness or fatigue. The system may use Dlib to detect the driver's eye movements, to determine the level of alertness.
4.2.3.1 Active Status

4.2.3.2 Drowsy Status
In this driver is currently in Drowsy status. This means that the system has detected some signs of drowsiness or fatigue in the driver's behaviour and is warning the driver to take action.

4.2.3.3 Sleepy Status
The driver drowsiness system is currently in Sleepy status. This means that the system has detected severe signs of drowsiness or fatigue in the driver's behaviour and is taking action to prevent an accident. Then the system uses an alarm to alert the driver. If the driver doesn't respond to the alert, it will automatically do Emergency Mail Notification System containing the Geo-Loc ion.
4.3 Emergency Mail Notification System

Step 1: If the driver does not respond to the alert system, the Emergency Mail Notification System is triggered.

Step 2: Then the emergency mail system uses the API which provides the accurate location of the person.

Step 3: As the data of geo-location collected and automatically.

Step 4: Then by using SMTP (Simple Mail Transfer Protocol) the collection location data will be sent to nearby emergency services through mail system.

RESULT

4.2.1. Emergency Mail Notification System

The emergency mail system is activated when the individual fails to respond to the system's existing alert system. Although the emergency mail system employs a portion of the APIs utilised to provide the precise location of a person using cellular data, it is able to determine the individual's precise location. As these data are collected in JSON format, they will be retrieved and mailed to the nearest emergency service.
The primary objective of this system is to offer the precise geolocation of a person who is in an emergency situation, such as an accident or person does not respond to the alert system. Immediately emergency mail notification system delivers mail to local emergency services informing them of the incident's location with a small message.

CONCLUSION
The Driver Drowsiness System Alert System is a crucial safety feature that can prevent accidents caused by drowsy or fatigued drivers. The system continuously monitors the driver's behavior and uses various sensors and algorithms to accurately determine the driver's alertness level. The system can alert or warn the driver to take action before it's too late, providing an extra layer of safety and security on the road. However, in some cases, the driver may not respond to the alert system, which can be a cause for concern. In such cases, the Emergency Mail Notification feature can be extremely helpful. If the system detects that the driver is not responding to the alert system, it can automatically get the accurate geo-location and send an email notification to the designated nearby emergency services, informing them the location of the vehicle. This feature can help ensure that help arrives quickly and efficiently, potentially saving lives. The Driver Drowsiness System Alert System and Emergency Mail Notification feature work together to provide a comprehensive safety solution for drivers on the road. By investing in these technologies, drivers can take proactive steps to prevent accidents and ensure that help arrives quickly in case of an emergency. It is highly recommended for all drivers, especially those who drive long distances or operate heavy machinery, to consider these features and prioritize safety on the road.

REFERENCES: