A DEEP LEARNING BASED APPROACH TO DRIVER SOPORIFIC DETECTION

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Abstract: Driver drowsiness is a significant contributor to traffic accidents that result in severe injuries. Effectively reducing the economic losses and casualties requires early detection of driver fatigue and the provision of driving help. A worldwide study found that between 3% and 30% of all traffic accidents are caused by drivers who are sleepy.which can be brought on by sleep disorders as well as a variety of sleep circumstances.Over 20% of drivers sense the need to stop driving at least once because they are sleepy.This typically occurs when a driver does not get enough sleep, but it can also occur as a result of untreated sleep disorders, medications, alcohol use, or shift employment.This research offers practical suggestions for preventing unfortunate accidents brought on by drowsiness.(*Abstract***)**

Keywords: **Deep Learning, Face recognition, Eye condition analysis, Automated Ambulance call & message And Automated Soporific Recognition *(key words)***

1. INTRODUCTION

One of the main factors in today's traffic accidents is driving when fatigued. It is common for long-distance drivers to fall asleep at the wheel. In this we'll show you how to create a drowsiness monitoring system that will let you know the moment the driver nods off. They raise the global death toll and fatality rate.

Drivers are supposed to make a number of facial and body gestures, including yawning, to indicate their tiredness and fatigue. These traits show the driver to be in poor physical condition. To reduce and avoid car accidents, drowsy driver alert systems have been developed. This can detect a driver's eyes as they close while they are operating a vehicle

setting off an alarm to wake them up.Another technique to avoid an accident is to have the car stop on its own when the devices can also send notice messages about the user's condition to the user's relatives and friends.Cameras, eye tracking sensors, and other hardware can be used by driver drowsiness detection systems to measure visual indicators. Drowsiness can be identified by yawning frequency, eye blinking frequency, eye gaze movement, head movement, and facial expressions.

According to police personnel monitoring the motorways and main roads here, sleep-deprived drivers continue to be at blame for 40% of traffic accidents. It's crucial to stop driving if you start to feel sleepy and take a break. Caffeine consumption and window opening may offer some solace, but they cannot replace sound sleep

Drowsiness is one of the major elements that contribute to auto accidents, hence a monitoring system is required to determine the level of drowsiness in a driver. Three types of information are typically detected by driver monitoring systems: biometric information, vehicle behavior, and driver's graphic information.

2. LITERATURE REVIEW

According to experts, drivers who do not take regular rests while traveling long distances run a greater danger of becoming drowsy, [1] a condition that they frequently fail to identify early enough.Two major contributing factors to traffic accidents and the resulting financial losses[2] are driver inattentiveness and distraction. As a result, scientists have been developing driver inattention monitoring devices for more than ten years. A Hierarchical Multiscale Long Short-Term Memory (HM-LSTM) network, at the[3] heart of our suggested methodology, is fed sequentially by identified blink features. According to the experimental findings, the baseline method outperforms human judgment based on detecting facial expression in terms of accuracy. Current vision-based systems are typically limited to employing visual signals, and need time-consuming[4] parameter adjustments that are inapplicable in certain situations.

Lack of publicly available datasets that can be used to compare the effectiveness of various approaches is another major problem.Sensitive information, including audio, video, location, and even health information, is [5]gathered by wearable technology and cellphones that are used to monitor the behavior and condition of the driver. Deep Learning (DL) is a potent tool for solving complicated issues in a variety of fields, including economics, medicine, and social sciences.

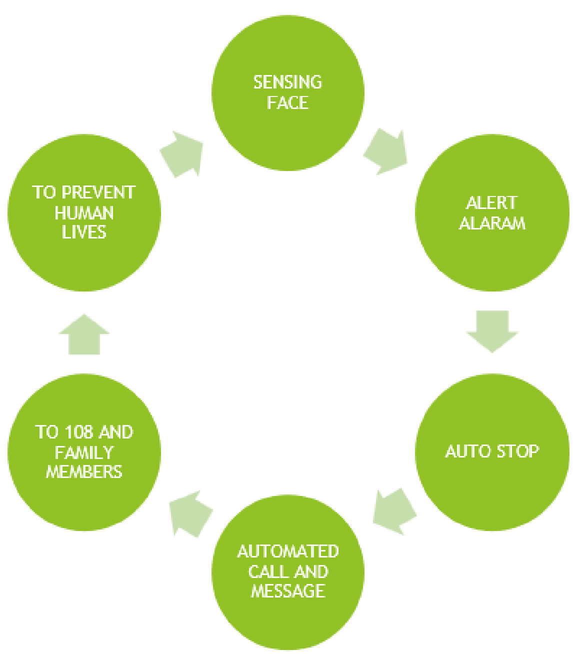

Figure 2.1 Soporific Detection Process

3.PROPOSED METHODOLOGY

Frontal photos of the driver are captured by a camera mounted on the car, and these images are evaluated using artificial intelligence (AI) methods like deep learning to determine whether or not the driver is sleepy. save human lives

3.1 FACE DETECTION

Any driver monitoring solution must first solve the issue of identifying the driver's face. Due to Alex Net's outstanding performance in the ImageNet Challenge in 2012, object identification and classification is a heavily researched area in deep learning. Localizing the object or objects and classifying them are the two issues that make up object detection and classification. Face detection has been approached as an issue with object recognition and classification. We developed a face detector that is resistant to a variety of lighting changes, ethnicities, occlusions, and expressions by training a deep neural network with face annotated photos.

3.2 HEAD POSE ESTIMATION

The 3D angular orientation of the head in the camera coordinate system is determined via head pose estimation. Yaw, pitch, and roll are the three angles used to depict it. Large differences in head poses and other environmental elements like illumination, occlusions, and expressions make estimating head poses a difficult process. With a single camera, we have created a head tracking system based on CNN that outputs 3D angles of the head depending on the image's recognised facial region.

3.3 EYE STATE ANALYSIS

Blink (rate and duration) and eye status information are provided via eye state analysis (open or close). These variables become crucial in identifying drowsy drivers. Blink rate and length are calibrated for each individual when the driver enters the car by executing a non-intrusive calibration procedure for a few seconds. Then, appropriate deviations from this are used to provide alerts. A somewhat smaller neural network has been used to achieve blink detection and eye open/close detection. An issue of binary categorization is eye open/close. The process

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of detecting a blink is a little more difficult and entails analyzing the previous few frames.

3.4 ALERTING

Drowsiness warnings are intended to inform you that you have started driving while drowsy; nonetheless, if you are drowsy, you shouldn't start driving in the first place. Choose a safe location for your break.Using the built-in GPS, some automobiles with drowsiness alerts may automatically warn you to rest stops nearby. Plan periodic driving breaks every two hours or so on lengthy journeys to reduce the likelihood of dozing off behind the wheel. If a drowsiness alarm system believes you are driving while drowsy, it will send a message encouraging you to take a rest. When it's safe to do so, certain systems with audio alarms may advise you to take a break if you feel like you might be getting sleepy. Certain vehicles with drowsiness warnings may vibrate your seat.

3.5 AUTOMATED MESSAGE

We offer supplemental services such as automatic automobile stopping based on facial expression recognition and automated messages sent to the ambulance, the patient's family, and friends if the driver doesn't awaken after a predetermined period of time. Accidents will be decreased as a result. and save human lives from road accidents.. It can do classification for images, videos, sounds, and texts.

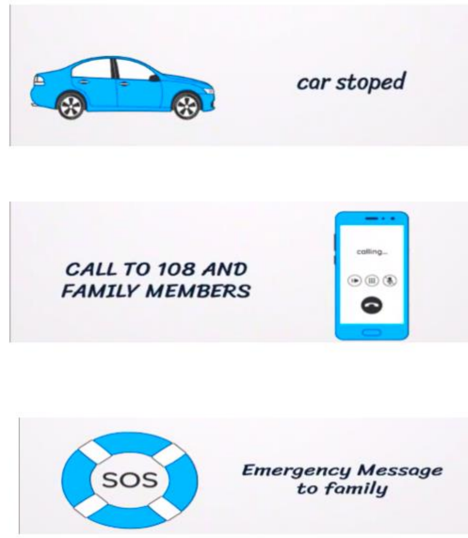

Figure 2.1 Proposed Methodology

4.DEEP LEARNING

Deep learning is a machine learning technique that makes computers do things like a human being, in other words is to learn by example. Starting by knowing the data and its features and also to start suggesting results step by step in the process. If it learns more it could be more effective, so more learn- ing means more efficiency. Here are some examples regarding how it can be working in our world, like Self- Driving Cars, smart devices like (Siri, Alexa, Google Assistant) and many more. How deep learning works: Deep Learning basically has a model and this model is learning to classify huge amounts of data to differentiate between them, which is very important. It can do classification for images, videos, sounds, and texts. These are some of the most famous real life things that deep learning can do experiments on, the model is always learning and the more data to be trained the more the model to be efficient and more accurate.

When it comes to accuracy, one of the main roles regarding Deep Learning is to calculate and produce ac-curacy rate in every learning round. Deep learning computer programmes go through a similar process to a young child learning to recognise a dog.Before using what it has learned to produce an output statistical model, every approach in the sequence of processes first applies a quadratic modification to the input data. Iterations continue until the result is sufficiently dependable. The number of computational layers that data has to navigate through led to the naming of Deep.

The learning process is typically supervised in machine learning, and the programmer must be extremely precise when telling the computer what kinds of data to look for to identify. whether or not an image contains a dog. Computer programmes that use deep learning go through a similar process to a young child learning to identify a dog. Before using what it has learned to produce an output statistical model, each algorithm in the order of operations first applies a nonlinear adjustment to the input data. Iterations are carried out up till the output is reliable enough. The name Deep was derived from the quantity of processing layers that data must go through. Future Work

There are two limitations facing this project: the first one is developing mobile apps and the second one is to encrypt and make user's data safe from being stolen. Developing mobile apps will be the smartest way in solving this problem because it is easy to use and can be in any user's pocket all time. Then developing a secure app is also important as a future work be-cause there is a risk when it comes to user's data, this can be done by encrypting the image itself after receiving it as input from the user.

Deep Learning is to calculate and produce ac-curacy rate in every learning round.Before using what it has learned to produce an output statistical model, every approach in the sequence of processes first applies a quadratic modification to the input data. Deep learning-based image identification has advanced to "superhuman" levels, outperforming human competitors in terms of accuracy. The first instance of it was the identification of traffic signs in 2011. The model is always learning and the more data to be trained the more the model to be efficient and more accurate. When it comes to accuracy one of the main roles regarding Deep Learning is to calculate and produce ac-curacy rate in every learning round Deep Learning.

5.ARCHITECTURE

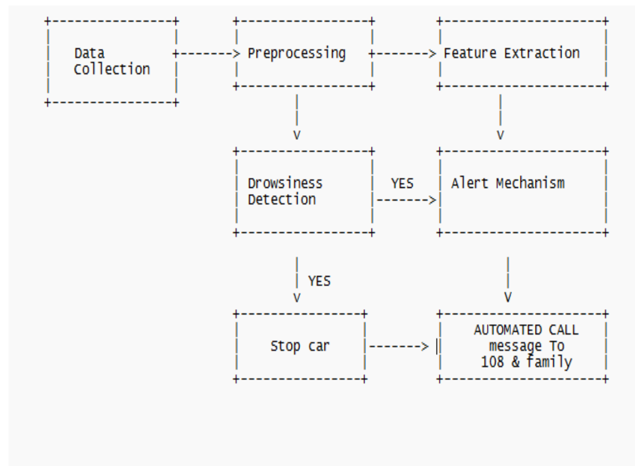

Figure 5.1 Architecture Diagram

6.IMPLEMENTATION

This project is centered on the identification of driver fatigue. It determines whether or not the driver is drowsy. The driver will be notified and the vehicle will be stopped in the appropriate place if the driver detecting system determines that they are drowsy. If the driver appears to be unconscious, the system will send a message to 108 and notify the driver's relatives of the situation.They raise the global death toll and fatality rate. Drivers are thought to show indicators of drowsiness and weariness by making a variety of facial and body motions, including yawning and having sleepy eyes. These traits show the driver to be in poor physical condition. To reduce and avoid car accidents, drowsy driver alert systems have been developed. This technology can detect a driver's eyes as they close while they are operating a vehicle, setting off an alarm to wake them up.Another technique to avoid an accident is to have the car stop on its own when the driver appears to be weary. This device can also send notice alarms.

7. RESULT AND DISCUSSION

In the computer vision problem of "facial landmark recognition," a model must forecast key points that correspond to areas or landmarks on a human face, such as the eyes, nose, mouth, and other features. Further computer vision tasks, such as head pose estimation, determining gaze direction, recognising facial movements, and switching faces, can be carried out using facial landmark identification as a basic job. There were 68 markers in total every frame, however we only kept the landmarks for the mouth and eyes (Points 37–68). We extracted the features for our model using these crucial data points.

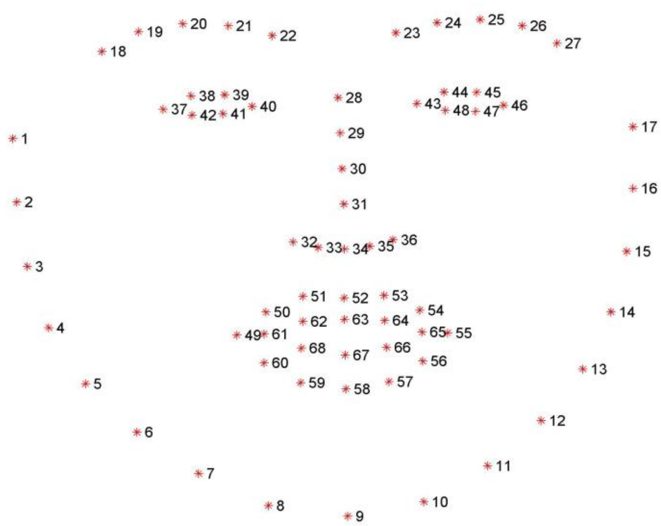

Figure 7.1 Facial Landmark

EAR, as its name suggests, is a measure of how long the eyes are in relation to how wide they are. In order to determine the length of the eyes, two distinct vertical lines across the eyes are averaged, as seen in the figure below. Our theory was that people who are sleepy will likely have smaller eyes and will blink more frequently. According to this theory, if an individual's eye aspect ratio over time continued to fall, i.e., their eyes started to become more closed or they were blinking more quickly, we anticipated that our model would classify them as being drowsy.

$$\mathbf{EAR} = \frac{\|P2-P6\| + \|P3-P5\|}{2\|P1-P4\|}$$

The MAR, which is computationally comparable to the EAR, measures the proportion of the mouth's length to width. According to our theory, when someone is tired, they are more likely to yawn and lose control of their mouth, which causes their MAR to be greater than usual.

$$\mathbf{MAR} = |EF| \,/\, |AB|$$

Drowsiness warnings are intended to inform you that you have started driving while drowsy; if you are aware of your drowsiness, you shouldn't start driving in the first place. Select a secure spot for your break. Using the built-in GPS, some automobiles with drowsiness alerts may automatically warn you to rest stops nearby.Plan periodic driving breaks every two hours or so for lengthy journeys to lessen the chance of falling asleep behind the wheel. If driving with other licensed drivers, consider taking turns.If a drowsiness alarm system believes you are driving while drowsy, it will send a message encouraging you to take a rest.

When it's safe to do so, certain systems with audio alarms may advise you to take a break if you feel like you might be getting sleepy. Certain vehicles with drowsiness warnings may vibrate your seat.We offer supplemental services such as automatic automobile stopping based on facial expression recognition and automated messages sent to ambulance, the patient's family, and friends.This is the main goal of the project to prevent human lives from accidents.

8. CONCLUSION

Driver SOPORIFIC detection systems can utilize cameras, eye tracking sensors, and other hardware to monitor visual cues, where drowsiness can be identified through frequency of yawning, frequency of eye blinking, eye-gaze movement, head movement, and facial expressions. and We offer supplemental services such as automatic automobile stopping based on facial expression recognition and automated messages sent to ambulance, the patient's family, and friends.This is the main goal of the project to prevent human lives from accidents.upon detection, the vehicle will stop automatically. A message regarding the situation will be sent and phone calls made to both

108 and the driver's family.Accidents would be reduced, and lives would be saved.

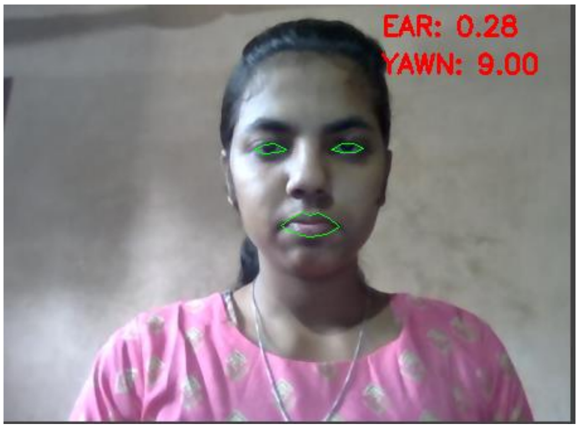

Figure 8.1 Ear & Yawn Count

Figure 8.2 Drowsiness Detection

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