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DRIVER DROWSINESS DETECTION SYSTEMS

Girish Ananda Patil[1], Dr.Kapil Misal[2]

[1]Dept of MCA, Trinity Academy of Engineering, Pune, India

[2]Associate Professor,MCA Department, Trinity Academy of Engineering, Pune, India

ABSTRACT

Car accidents are frequently caused due to many reasons like drowsiness, drunkenness or tiredness, which has serious consequences for traffic safety. Numerous factors, such as fatigue, intoxication, or drowsiness, commonly contribute to car accidents, which have detrimental effects on traffic safety. Many fatal collisions might be avoided if sleepy drivers were warned beforehand. Many sleepiness detection technologies are available to identify and warn drivers of any indications of inattention while driving. Sensors in self-driving cars must be able to detect whether a driver is sleepy, agitated, or experiencing sharp emotional fluctuations. Thus far There have been numerous recommendations for enhanced warning systems to prevent sleepy driving. When these systems detect a significant lane departure, a change in the headway distance, or other indications of subpar driving, they sound an alarm. These systems rely heavily on machine learning algorithms, which allow them to learn and adjust to unique driving patterns and characteristics. In supervised learning, models are trained on labelled datasets to discriminate between awake and sleepy states. These approaches are widely used for classification tasks. Unsupervised learning techniques are also applied for anomaly detection, which finds departures from typical driving behaviour. The incorporation of cutting-edge sensors like facial recognition cameras and brainwave sensors, which offer more thorough insights into the driver's condition, has recently improved driver sleepiness detection systems. Moreover, these systems are more accurate and responsive when real-time data processing and cloud-based analytics are used.

KEYWORDS

Drowsiness-detection, Driver-Fatigue, Computer Vision, Real Time, survey, Eye Tracking Technology, Automotive Safety Systems, Driver Assistance Systems, Real-time Drowsiness Detection, Alertness Monitoring.

INTRODUCTION

In real life, one of the primary causes of genuine auto accidents is sleepiness. News reports state that driver fatigue accounts for 40% of accidents in India. Each year, customers lose 16.4 billion due to sleepiness in the form of time, missed productivity, medical bills, and property damage. Move. In India, traffic accidents result in losses equivalent to 3.14% of the nation's GDP. India is expected to incur costs of ₹ 91.16 lakh per fatality, ₹ 3.64 lakh every critically injured person, and ₹ 77,938 for minor injured person. Traffic accidents have increased as a result of drivers nowadays being less aware of their surroundings, which has raised severe concerns for society. There are several things to consider. An further factor contributing to the events is the driver's physical state. But we can connect these kinds of accidents to the driver's weariness. One of the most likely to be important elements is driver weariness, especially in auto accidents that can occasionally result in both driver and passenger injuries and

fatalities. A survey claims that, on average, fatigue is the reason behind 32.2% of yearly traffic accidents. This shown that driving is more hazardous while drowsy, leading to a 21.4% rise in car accidents.

In today's fast-paced world, where time is of the essence and multitasking is often the norm, driver drowsiness has emerged as a critical concern on the roads. The consequences of drowsy driving are severe, leading not only to property damage but also to loss of lives and substantial economic costs. In countries like India, where road safety remains a pressing issue, the impact of driver fatigue on road accidents cannot be overstated. News sources reveal a staggering statistic: approximately 40% of accidents in India are attributed to drivers dozing off behind the wheel. The repercussions of these accidents extend beyond mere numbers, with an annual cost to consumers amounting to a significant 16.4 billion rupees, encompassing property damage, medical expenses, lost productivity, and time.

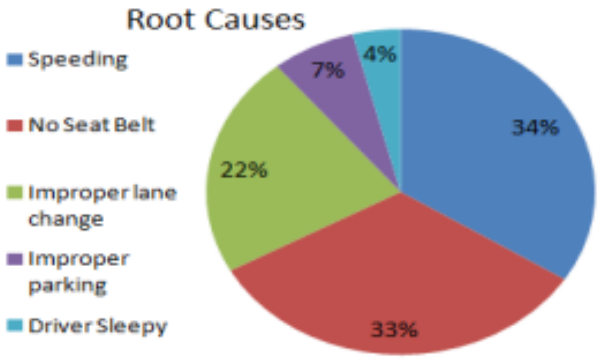

Figure 1: Pie Chart Representing the statistics of accidents

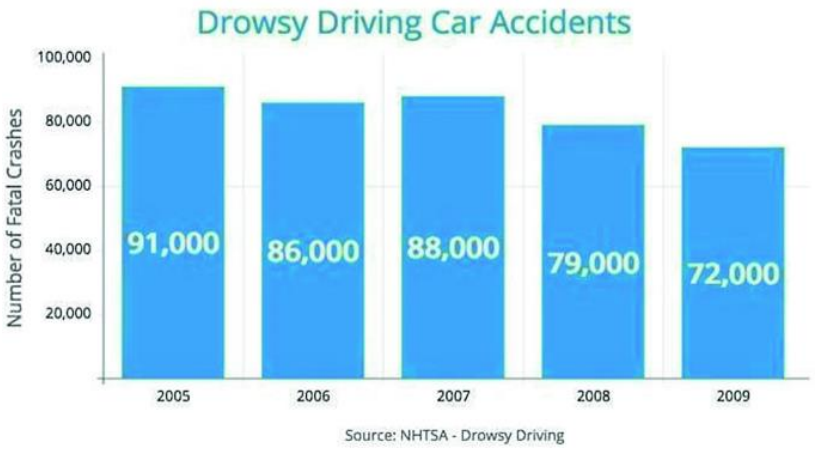

Figure 2: Accidents due to drowsines

This research paper aims to explore the landscape of Driver Drowsiness Detection Systems, examining their efficacy, implementation challenges, and potential impact on road safety. By critically analysing existing approaches and advancements in this field, we endeavour to contribute to the development of effective strategies for combating drowsy driving and fostering safer roads for all.

LITERATURE REVIEW

1] In this study, the authors created a system that analyses video camera photos of the driver's face using image processing technologies. Based on how much the driver's eyes are open or closed, diminished attentiveness is identified. This sensing gadget provides a noncontact method of assessing different levels of driver attentiveness and allows for the early identification of a decline in driver awareness while driving. The driver is facing a tiny CCD camera that takes pictures of his face. The facial image data are first transformed to binary image data and then transmitted to the image processor's frame memory. Each image is stored in the frame memory in 512x432 format, using eight bits of memory space for each pixel. The image processing process is managed and the processed results are evaluated by a personal computer that is linked to the image processor. The instrument panel has an infrared lamp to make it easier to take face photos when driving at night.

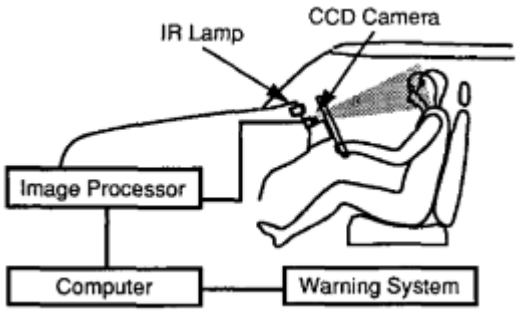

Figure 3: Proposed Model [1]

- Data Acquisition: Gathering pertinent information from the driver is the first step in the suggested architecture. Sensors like a camera, heart rate monitors, electroencephalography (EEG) sensors, and steering wheel sensors can be used to do this.
- Image processing: Computer vision algorithms are used to process the visual data obtained from the camera sensor. The photos that are taken are examined to identify certain facial expressions that are suggestive of sleepiness, like yawning, head nodding, and drooping eyelids.
- Machine Learning: A machine learning model is then fed the extracted characteristics in order to classify the data. A labelled dataset is used to train supervised learning algorithms, such as support vector machines (SVM), random forests, or deep neural networks, to find trends and reliably forecast the driver's degree of drowsiness.

[2] The purpose of this research is to provide a collection of indicators relating to driving performance and physiology that may be used to monitor driver sleepiness and are simple to assess. 32 participants participated in a 336 km long simulated highway journey, which was used to collect performance and physiological data. Two sets

of indications are presented by the examination of these data: a group of performance metrics whose changes correspond to those mentioned in the literature. They make sure
that during the experiment, sleepiness is detected. Second, a group of physiological indicators: the dispersion of head motions. This has shown to be a fairly accurate indicator since it develops similarly to performance indicators over time while being little affected by the road.

[3] A video-analysis-based system is suggested to detect driver fatigue or drowsiness. The primary focus of this study is the technique for obtaining driver yawning data. A real-time face detector is used to locate the driver's facial region. Next, the facial region is tracked using the Kalman filter. Furthermore, the mouth window is targeted inside the facial region in order to identify drivers who yawn, and the mouth features are used to retrieve the degree of mouth opening. The system will reset in the event of an impediment or a miss-detection. Experiments are conducted to assess the practicality of the proposed method.
[4] In this study, the musical style and composition of each piece of music were analyzed to measure its impact on drowsiness. Four musical patterns were chosen based on the pace and preference (high-low) scales (fast-slow). The experiment lasted for ten minutes. The subjects were exposed to musical stimuli throughout each session. The findings revealed that "high preference - fast tempo" music was preferred. made a positive impact on the subjects' vigilance on the "Low preference - slow tempo" music, on the other hand, promoted The sedative effect reduces the subject's level of attentiveness. These findings imply that musical preferences and tempo the music were effective stimuli for a driver's arousal level, and thus his/her level of vigilance.

[5] A new Advanced Driver Assistance System (ADAS) for automatic driver sleepiness detection based on visual input and Artificial Intelligence is provided in this research. This system operates in steps to achieve full automation. Furthermore, the goal of this programmed is to locate and track the face and eyes in order to compute a sleepiness index. Examples of several driver photos captured over a real vehicle are provided to confirm the real-time technique

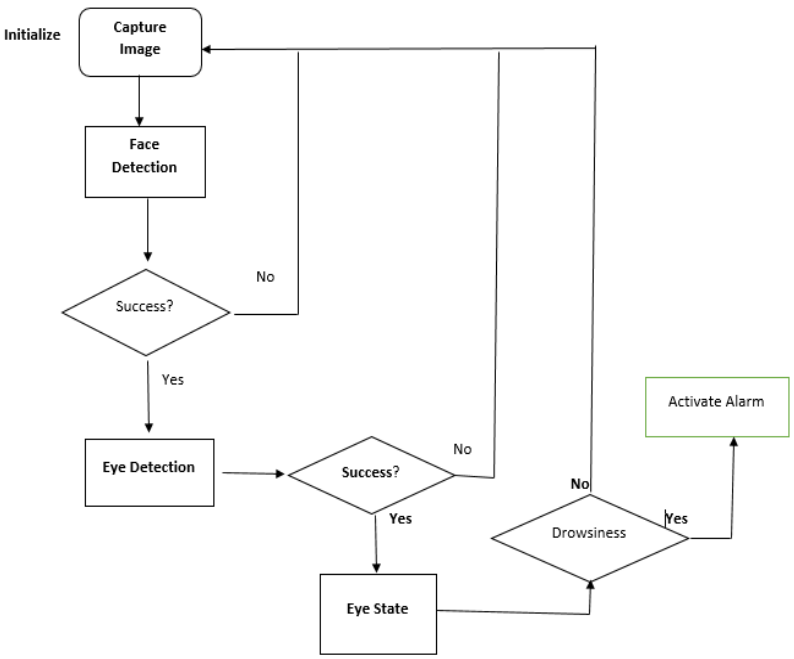

Figure 4: System Architecture [5]

[6] he technology proposed in this study monitors the driver's eyes using a camera and creates an algorithm to identify signs of driver drowsiness in time to prevent an accident. Because of this, our technology is able to identify driver fatigue beforehand and emit warnings, such as vibrations in the seat belt and sound, at frequencies between 100 and 300 Hz. Moreover, the warning will be manually deactivated instead of being disabled automatically.

[7] Before injecting the series of images into the system as input, the proposed hardware in the system is utilised to obtain them. The four stages that comprise the system are face identification, facial component extraction, facial component tracking, and drowsiness detection.

• The background picture is made first. The background subtraction approach is used to identify the facial region in the image.

• Next, the mouth, eye, and eyebrow that were identified in the face from the previous phase are retrieved.

• In the tracking step, a reference template and a template matching technique are used to track each of the facial components.

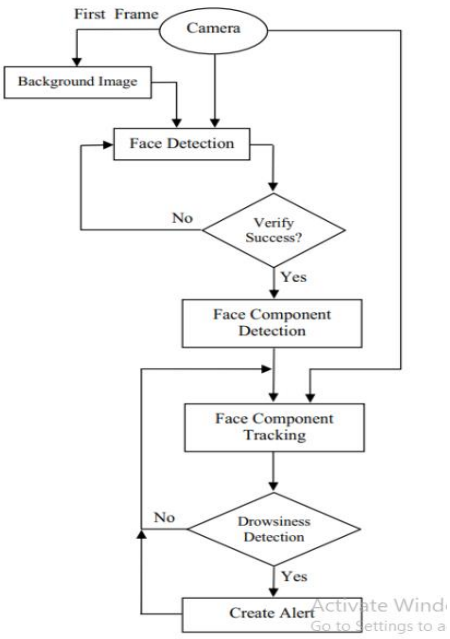

Figure 5: Model [7]

[8] In order to identify fatigued drivers, the technique first extracts the driver's face from a series of videos, and then uses that extracted face to find the driver's eye. Second, the system detects the blink rate while concurrently determining whether the pupil is there in the detected eye. The system assesses these traits in order to identify the loss of awareness prior to the driver losing complete focus. Since the recommended system is meant to be less expensive than industrial installations, all parameters have been analysed in a lab environment, and fairly cost cameras have been used to record the frames.

[9] The suggested study uses facial expressions to create an emotion recognition algorithm based on Support Vector Machines (SVM). The algorithm performed more accurately than recent research when evaluated under settings of varying brightness. They have successfully detected changes in facial expression at an 83.25% rate.

[10] An integrated strategy is suggested in this study and is dependent on the PERCLOS (Eye and Mouth Closure Status) as well as the computation of the new proposed vector FAR (Facial Aspect Ratio), which is comparable to EAR and MAR (Mouth Aspect Ratio). This aids in identifying the status of closed eyes or an opened mouth, such as when yawning, as well as any frames with hand motions like nodding or covering an open mouth with the hand, which are instinctive human behaviours used to manage tiredness. The system also combined techniques and gradient patterns based on textural information to locate the driver's face in various angles and recognize sunglasses on the driver's face. Scenarios such hands covering the driver's eyes or lips while nodding or yawning were also identified.

REASON FOR DRIVER DROWSINESS

Drowsy driving is a serious issue. The risk, danger, and frequently deadly outcomes of driving when fatigued are worrisome. Driving while sleepy or fatigued is referred to as drowsy driving. The most common cause of this is insufficient sleep, although other causes include untreated sleep problems, drugs, drinking alcohol, or working shifts.
Nobody can pinpoint the precise moment when sleep takes over their body. Although it is obviously dangerous to fall asleep while driving, being sleepy still has an impact on your ability to drive safely. Drowsiness.

- reduces your ability to pay attention to the road.
- impedes quick steering or braking responses.
- impedes your ability to make wise decisions

CONCLUSION

Driver fatigue when operating a vehicle is the primary cause of accidents. On the subject of detecting tiredness while driving, a comprehensive analysis of the literature is done, and the various methods are contrasted. This report offers an analysis of multiple works on driver fatigue. Investigations were conducted on the effects of musical stimuli on drivers as well as various methods for identifying and categorizing weariness, such as PERCLOS, CNN, SVM, and CCD cameras.

FUTURE SCOPE

Future work will include improving the existing system. Also we can add music according to the preference of the driver to prevent the drowsiness. In the future, we can also add commands that direct the motor vehicle's ECU to slow down or limit its speed while also turning on its danger lights to alert other traffic

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