JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

# "Driver's Drowsiness Detection System"

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***ABSTRACT***

Nowadays, countless number of people drive on the highway day and night and people traveling long-distance suffer from lack of sleep. The maximum number of accidents happen due to the drowsiness of the driver. So, in order to prevent these accidents we will build a system using Python and OpenCV, which will alert the driver when he feels sleepy. Drowsiness detection system is a technology that can be used to prevent accidents that are caused by drivers who fell asleep while driving. This System will detect drowsiness and sleeping signs such as a person's eyes are closed for a few seconds, yawning etc. This system will notify the driver when it detects signs of drowsiness. This Driver's Drowsiness Detection system uses concepts of Python programming, OpenCV for image gathering and Deep Learning model for image classification to detect drowsiness.

***KEYWORDS***:- Driver drowsiness , eye detection, blink pattern; Dlib , image-based measures

## *1. INTRODUCTION*

According to a report on Road Accidents in India by Ministry of Road Transport and Highways presented in 2021, every time, roughly1.5 lakh people dies in road accidents in India, which restate, on an average, into 1130 accidents and 422 deaths every day or 47 accidents and 18 deaths every hour. A veritably important problem that causes multitudinous auto accidents every time is motorist fatigue. Due to the incapability of a motorist to halt or diverge to help or minimize the impact, accidents caused by motorist somnolence are much more prone to result in losses or severe accidents. Fatigue decreases alertness, alertness, and attention, which impairs the accomplishment of tasks taking attention similar as driving. Motorist doziness would be most likely to be. Solo driving on unstimulating roads may lead to dropped alertness, tedium, and advanced accident threat. The circadian measures dip during late night and late autumn hours heightens the threat of motorist fatigue. Those who sleep lower than six hours, suffer from sleep apnea or other sleep diseases, as well as youthful motorists, shift workers, and professional motorists, are particularly vulnerable. Feting these factors is pivotal for road safety, emphasizing the need for rest and alert in these high- threat groups to help accidents. There are many ways to attack this problem and one them is using AI and Machine literacy to descry motorist's somnolence and warn them in time. Using Systems that help in covering motorist fatigue, use detectors to observe a motorist's eye movements, breathing patterns, to descry when they're exhausted and advise them in time to help an accident. Ending eyes for further than many seconds, minimum eye movements, sleepy eyes are just a many suggestions of drowsy driving that should notify people to the need of stop driving and taking a break. India has the loftiest number of road accident losses encyclopedically, with around1.5 million lives lost every time, according to a report from the Federation of Indian Chambers of Commerce and Industry. Another report showed that in U.S.A, Drowsiness- related mishaps bring$60.4 billion annually, emphasizing the critical need for fatigue operation and forestallment. Due to doziness, it costs buyers about$16.4 billion in property detriment, well- being cases, time, and effectiveness mischances. Exploration from AIIMS Neurology India underscores the intimidating frequency of sleep diseases among road accident victims, affecting over 20. Likewise, the study indicates that over 23 of truck motorists suffer from sleep privation, pressing the critical need for interventions to alleviate

the threat of fatal accidents caused by drowsy motorists. Road safety measures and mindfulness juggernauts are pivotal to address this concerning issue. So waking motorist in time to take a break, to halt is veritably important and can be done through Artificial intelligence and Machine literacy by observing face and eye movements of motorist, to dissect it and shoot needed alert when necessary. Motorist's doziness discovery and alert system originally observes eye movements of the motorist and analyzes it. Motorist's doziness discovery and alert system helps to help fatal road accidents caused by motorist somnolence, fatigue, and this system can reduce number of road accidents passing.

## *2. LITERATURE REVIEW*

[1] In 2017, the National Highway Traffic Safety Administration (NHTSA) reported 91,000 auto accidents attributed to drowsy motorists, performing in 50,000 injuries. In 2019, there were 697 reported losses involving drowsy motorists.

[2]Drowsiness can be due to numerous reasons, similar as drug, working for long hours, sleep diseases, poor quality( or not having enough) sleep, and being awake for long ages Doziness while driving results from inadequate sleep or driving during usual sleep hours. The exploration in this field focuses on four types of fatigue discovery. The first is made up of the operators' physiological signals, similar as electroencephalogram ( EEG).

[4] According to a study conducted by the American Automobile Association's Foundation for Traffic Safety, it's estimated that there are over 320,000 drowsy driving accidents being annually. This includes roughly 6,400 fatal crashes caused by drowsy driving.

[5]In this eye blinking rate and eye check duration is measured to descry motorist's doziness. The system cautions the motorist by playing an alarm if eye blinking rate are suspected for a certain number of successive frames. Each uprooted frame is anatomized to study the pattern of facial features. On average, the eye blinks at a rate of 2 to 3 times per second, with each blink lasting between 0.1 to 0.4 seconds.

[6]In 2019, a study by Ramzan et al. conducted a comprehensive analysis of existing Drowsiness Detection and Detection (DDD) methods, shedding light on the state of the art in this field. The authors conducted a detailed examination of the commonly used classification techniques within the domain of drowsiness detection. Ramzan et al. the DDD techniques are classified into three categories: behavioral, physiological, and vehicular parameter-based methods. The primary goal is to create a system that accurately identifies a driver's drowsiness by monitoring factors like eyelid movement and yawning and provides timely voice alerts in real-time, ensuring driver safety [7]

[7] Statistics have shown that numerous accidents do due to drowsy condition of motorists. In a study conducted by National Sleep Foundation, it has been set up that about 20 of motorists feel drowsy during driving. These statistics paint a veritably scary picture. This paper proposes a system for motorist doziness discovery, in which the armature detects somnolence of motorist. Doziness refers to somnolence, frequently in unhappy situations [3]. Although the state of doziness may only last for a many twinkles, its consequences can be disastrous. The reason for entering such a state is generally attributed to fatigue, which diminishes attention and alertness situations.

[11] Khunpisuth et al. conducted a study involving ten volunteers to detect drowsiness levels in drivers. They monitored the frequency of eye blinking and head tilting and correlated these behaviors with the drivers' drowsiness state. To facilitate this, the authors developed an embedded device for drowsiness detection using a Raspberry Pi Camera and Raspberry Pi 3 Model B. This device collected image data, assessed drowsiness levels, and alerted the driver. Initially, the device employed the Haar cascade classifier to detect an upright face, head level.

[13][14] The implementation of strategies to enhance the efficiency and speed of sleepiness detection procedures, focusing on past methods and approaches. Specifically, it highlights the primary topic of the section, which revolves around various techniques used for identifying drowsiness. One of the methods described involves analyzing driving patterns, which encompasses factors such as vehicle characteristics, road conditions, and driving techniques. This method entails calculating aspects like steering wheel movement and deviations from the lane position, which serve as indicators to assess the driver's driving style and potential drowsiness.

[15] Drunkenness or exhaustion is a leading cause of car accidents, with severe implications for road safety. More fatal accidents could be avoided if fatigued drivers were warned ahead of time. Several drowsiness detection technologies to monitor for signs of inattention while driving and notifying the driver can be adopted. The sensors in self-driving cars need to keep an eye on the driver's face to see if they are feeling drowsy, angry, or going through intense emotional changes. By analyzing the driver's facial expressions and specific points on their face, the car can figure out how the driver is feeling and decide if they are driving safely. If the driver appears to be in a risky emotional state, the car can take appropriate actions to ensure safety.

Sunagawa et al. [16] developed a drowsiness detection framework based on Electrooculography (EOG) data. Initially, they identified eye squinting from the recorded EOG data and extracted relevant parameters related to eye movement. These eye movement parameters were then processed and characterized using Support Vector Machines (SVM), a machine learning technique. This approach aimed to detect drowsiness by analyzing changes in eye movement patterns, leveraging EOG data and machine learning algorithms for more accurate detection.

[17][18]To enhance road safety and prevent vehicle accidents, researchers have been working on developing advanced systems for monitoring drivers and assessing their distraction levels. These systems fall under various names, including Advanced Driver Assistance Systems (ADAS), Driver Inattention Monitoring Systems, and Driver Alert Control Systems. ADAS encompasses a range of technologies and features that assist

drivers in various ways, such as lane-keeping assistance, adaptive cruise control, and collision avoidance. Driver Inattention Monitoring Systems focus specifically on detecting signs of driver distraction or drowsiness through various sensors and algorithms. Driver Alert Control Systems aim to alert and potentially intervene when a driver exhibits behaviors indicative of reduced attention, promoting safer driving practices and reducing the risk of accidents. These systems leverage technology to enhance overall driver safety and mitigate the factors that contribute to accidents on the road.

[19]The system will next determine whether or not the eyes were open after detecting the eye. The alert would sound until the eyes were opened if the eyes were closed because the score would check to see whether it exceeded the predetermined score. As long as driver's eyes are open, the system will continue to track them. This paper acknowledges certain methodological challenges, including issues related to sample size estimation, data classification, and eyelid detection. Future research will focus on enhancing the methodology by incorporating the detection of yawning and eye movement, which will further enhance the accuracy of driver drowsiness detection.

Kiashari et al. [20] developed a non-intrusive system for drowsiness detection using facial thermal imaging. They conducted their study with 30 participants in a car simulator. Thermal images of the driver were captured, and from these images, they calculated the standard deviation and mean of respiration rate and inspiration-to-expiration time ratio. These metrics served as input features to train two machine learning classifiers: support vector machine (SVM) and k-nearest neighbor (KNN). Both classifiers successfully detected drowsiness, but SVM outperformed KNN, achieving a 90% accuracy, 85% specificity, 92% sensitivity, and 91% precision.

Budak *et al.* [21] recommend that observing the driver's head posture and introduction can give enough pieces of information to anticipate the driver's aim. The driver's face must be identified first to determine what the driver's head represents. This is a critical advancement in any conduct procedure that requires a subject's face to be checked. Oyini

Mbouna *et al.* [22] proposed face recognition calculation has turned into a reference after which other face location strategies can be fabricated and highly relevant to age detection projects. Researchers and practitioners in the field of demographic analysis from facial images can draw insights from this paper when developing age estimation models based on similar CNN architectures.

[23] The model's architecture is user-friendly. To use it, you just need to record the driver's face on a camera. The model then analyzes the frequency of eye blinks and sounds an alarm when drowsiness is detected.

## *3. PROPOSED SYSTEM*

This research paper, designing a driver drowsiness detection system requires careful consideration of various components and technologies to ensure accuracy and reliability.

### *1. Open CV*

OpenCV, or Open-Source Computer Vision, serves as a versatile tool for a variety of computer vision tasks, with its architecture being one of its most valuable and adaptable features and memory management. The highly optimized image processing function of OPENCV is used by the author for real-time image processing of live video streaming from the camera.

### *2. DLib*

Dlib is a modern C toolkit with algorithms and tools for machine learning to create complex C ++ software to solve real problems. It is used in a wide variety of fields in both industry and academia, including robotics, embedded devices, cell phones, and large, high-performance computing environments. Lib's open source licenses allow you to use it in any application for free.

### *3. Machine learning*

Machine learning (ML) plays a pivotal role in modern driver drowsiness detection systems, enhancing their accuracy and real-time responsiveness. These systems leverage ML algorithms to process and analyze a plethora of data sources, including physiological signals, image and video data, and vehicle sensor information. Here's how ML is utilized in driver drowsiness systems:

### *4. Real-Time Monitoring*

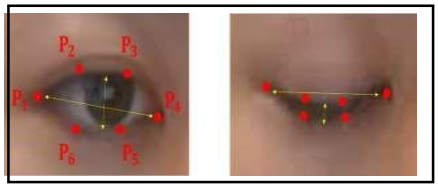
Trained models are deployed in real-time monitoring systems. These systems continuously capture and process data from the driver, making predictions about their alertness.

Alert Generation-When the ML model predicts drowsiness, it triggers alerts to wake up the driver or prompt them to take corrective actions.

### *5. Drowsiness Detector Module*

In this module it will detect the eyes from live webcam feed and apply algorithms on image to detect driver drowsy or not.

### *6. Eye Blinking based Technique*




Driver drowsiness is determined by tracking eye blinking rate and the duration of eye closure. Sleepy drivers exhibit distinct eye behavior. A remote camera captures video, and computer vision techniques identify the face, eyes, and eyelids to measure eye closure and blinking ratios. These metrics are used to detect driver drowsiness.

## *4. ADVANTAGES*

The driver drowsiness detection project offers several advantages, contributing to improved road safety and overall well-being. Here are the key advantages of implementing such a project**:**

### *1. Accident Prevention*

The primary advantage of the project is the prevention of accidents caused by drowsy driving. By alerting drivers when they are becoming drowsy, the system helps them take corrective actions, reducing the likelihood of accidents and potentially saving lives.

### *2. Reduced Injuries*

Drowsy driving accidents often result in severe injuries and fatalities. The project's proactive approach to drowsiness detection can significantly reduce the severity of accidents, minimizing the physical and emotional toll on individuals and families.

### *3. Enhanced Road Safety*

The project contributes to overall road safety by promoting alert and attentive driving behavior. Safer roads benefit all road users, including pedestrians and cyclists.

### *4. Customizable Alerts*

The project allows for customizable alerts tailored to the driver's condition. This ensures that alerts are effective in waking up drowsy drivers without causing unnecessary stress.

### *5. Real-time Monitoring*

Continuous real-time monitoring of the driver's condition ensures timely interventions. This is particularly important for preventing accidents during long journeys or late-night drives.

### *6. Technological Advancements*

The project drives innovation in fields such as machine learning, computer vision, and sensor technology. Technological advancements developed for drowsiness detection can have broader applications beyond driver safety.

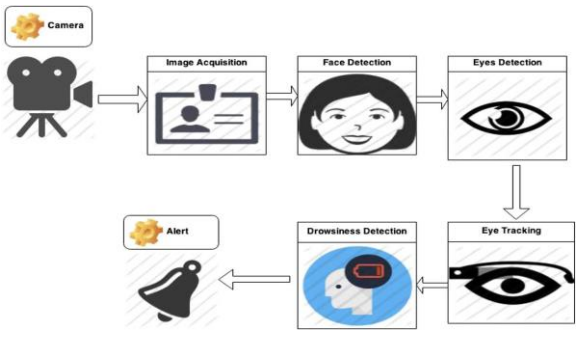



Fig:-The system diagram of eye blinking frequency analysis.

### 7. Economic Benefits

Lower accident rates associated with drowsy driving can lead to reduced insurance costs for individuals and businesses, potentially resulting in cost savings.

## 5. CONCLUSION

In this literature review of Driver Drowsiness Detection System, Accidents resulting from severe driver drowsiness have far-reaching consequences, affecting individuals, families, and society as a whole. Preventive measures, including education, technology, and medical screening, play a crucial role in reducing the incidence of such accidents. It is imperative that drivers prioritize their safety and that of others by recognizing the signs of drowsiness and taking proactive steps to prevent accidents on the road. Additionally, stakeholders, including government agencies, employers, and healthcare providers, should continue their efforts to raise awareness and implement strategies to combat severe driver drowsiness and its devastating consequences.

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