



DRIVER DROWSINESS DETECTION SYSTEM USING MACHINE LEARNING

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Abstract

Road safety is a major concern in modern transportation systems. Many road accidents occur when drivers lose attention while driving, especially when they become sleepy or their eyes remain closed for a long period. Monitoring the driver's alertness can help prevent such dangerous situations and improve overall road safety.

This research presents a Driver Drowsiness Detection System, which uses machine learning and computer vision techniques to monitor the driver's facial features in real time. The system uses a camera to capture images of the driver's face and analyze eye movements and blinking patterns. If the system detects that the driver's eyes are closed for a longer duration than normal, it identifies this as a sign of drowsiness.

When drowsiness is detected, the system immediately generates an alert sound to notify the driver and help them regain attention on the road. The main goal of this system is to enhance driver awareness and reduce the chances of road accidents.

This system is simple, efficient, and can be integrated into vehicles to monitor driver behavior and improve road safety.

Keywords: Artificial Intelligence, Machine Learning, Computer Vision, Eye Detection, Driver Drowsiness Detection, Road Safety.

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1. Introduction

Road safety has become a major concern in modern transportation systems. Many road accidents occur because drivers lose attention while driving. Long driving hours, night driving, and continuous focus on the road can cause drivers to become sleepy. When a driver becomes drowsy, their ability to react quickly decreases, which increases the chances of accidents.

To improve road safety, it is important to monitor the driver's alertness while driving. With the advancement of technology, computer vision and machine learning techniques can be used to observe driver behavior in real time. These technologies allow system to analyze facial features such as eye movement and blinking patterns

The Driver Drowsiness Detection System is designed to monitor the driver using a camera. The system detects the driver's face and eyes and continuously checks whether the eyes remain closed for a longer duration. If the system detects signs of drowsiness, it immediately produces an alert sound to notify the driver.

This system helps improve road safety by warning the driver before a dangerous situation occurs.

1.1 Problem Statement

Road accidents caused by driver inattention are a serious problem across the world. Many drivers experience sleepiness while driving, especially during long journeys or late-night driving. When drivers become drowsy, their concentration decreases and they may fail to respond quickly to road conditions.

Several factors contribute to this issue:

- Long driving hours
- Night driving conditions
- Lack of proper rest
- Continuous focus on the road

Due to these reasons, drivers may unknowingly close their eyes for a short time, which can lead to accidents. Therefore, there is a need for a system that can detect driver drowsiness automatically and alert the driver immediately.

1.2 Aim of the Project

The main aim of this project is to develop an intelligent system that can detect driver drowsiness using computer vision and machine learning techniques and alert the driver to prevent road accidents.

1.3 Objectives of the Study

The objectives of this project include:

- To develop a system that monitors the driver using a camera.
- To detect the driver's face and eyes using image processing techniques.
- To analyze eye blinking and eye closure patterns.
- To identify drowsiness when the eyes remain closed for a long time.
- To generate an alert sound to warn the driver.
- To improve road safety by reducing accidents.

2. Methodology

The proposed system works by using a camera and computer vision techniques to monitor the driver in real time.

First, the camera captures the video of the driver continuously. The system processes each frame of the video to detect the driver's face. Once the face is detected, the system identifies the eye region using facial landmark detection.

After detecting the eyes, the system calculates the Eye Aspect Ratio (EAR) to determine whether the eyes are open or closed. If the eyes remain closed for a certain number of frames, the system recognizes this as drowsiness.

Once drowsiness is detected, the system activates an alarm sound to alert the driver and help them regain attention on the road..

2.1 System Architecture

The system architecture consists of several modules:

1. Video Capture Module – Captures real-time video of the driver using a webcam.
2. Face Detection Module – Detects the driver's face in each frame using OpenCV.
3. Eye Detection Module – Identifies the eye region using facial landmark detection.
4. Drowsiness Detection Module – Calculates the Eye Aspect Ratio to detect eye closure.

These modules work together to monitor the driver continuously and detect drowsiness in real time.

3. Results and Analysis

The Driver Drowsiness Detection System was tested using a webcam to monitor the driver's face. The system successfully detected the driver's eyes and tracked their movements in real time.

When the driver's eyes remained closed for a longer duration, the system identified it as a sign of drowsiness and triggered an alarm. The results showed that the system was able to detect eye closure accurately and respond quickly.

This demonstrates that the system can effectively monitor driver alertness and help prevent accidents caused by drowsiness.

4. Discussion

The implementation of the Driver Drowsiness Detection System demonstrates how computer vision and machine learning can be applied to improve road safety. The system provides real-time monitoring of the driver and gives immediate alerts when signs of drowsiness are detected.

However, certain limitations exist. The system depends on proper lighting conditions and a clear view of the driver's face. If the face is not visible or lighting is very poor, detection accuracy may decrease.

Future improvements can include integrating the system with vehicle sensors, using infrared cameras for night detection, and improving accuracy using deep learning models..

5. Conclusion

Driver drowsiness is one of the major causes of road accidents. Detecting signs of sleepiness in drivers can help prevent dangerous situations on the road.

The Driver Drowsiness Detection System uses computer vision techniques to monitor the driver's eyes and detect drowsiness in real time. When the system detects that the driver's eyes remain closed for a longer duration, it generates an alert sound to warn the driver. This system can play an important role in improving road safety and reducing accidents caused by driver inattention.

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