SLEEPINESS OR DROWZINESS AND FATIGUE DETECTION SYSTEM OF DRIVER IN THE ROAD NETWORK

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ABSTRACT:

On the basis of data, it is analyzed that drivers feeling drowsy are responsible for accidents on the roads.[3], posing a serious threat to public safety. To tackle this issue and take advantage of the mobile devices, a unique solution for Driver Drowsiness or sleepiness and fatigue Detection[2] system has been proposed. This solution utilizes Convolutional Neural Networks along with Flask for image/live input. By following this two-step technique, the mobile devices in the car record and evaluate the driver's current state while also ensuring their privacy. Then, boundaries verify sleepiness by comparing the data from the mobile client with the real-time input that was observed. The suggested framework uses a data fusion technique and is based on the distributed boundaries architecture, which ensures effective administration of the area of interest. This method uses flask manual input or real-time input of the car environment and the CNN model to identify driver fatigue locally based on facial expressions. With an impressive average accuracy, the framework's sleepiness detection performance is remarkable.

1 INTRODUCTION

Drowsy driving or Driving with sleepiness [1]is responsible for around 329,000 car accidents every year, causing roughly 17.5% and 10.1% of fatal accidents and injuries, respectively. Accidents occur when a person drives while feeling extremely sleepy or drowsy, and as a result, they are not alert enough to react to traffic events. To help reduce the accidents occurred due to driving in drowsy state , a real-time drowsiness or fatigue detection system can be used. The existing solutions are limited by the methodologies they use, which have certain drawbacks.

The three main methods that are used to detect driver status: vehicle behavior monitoring, physiological-based, and computer vision. Each method depends on various features to build the detection system.Vehicle behavior methods observe driving patterns such as activity or steering movement and vehicle position change relative to the features of road. However, these methods are less reliable because driver envioronment is not predictable and different driving habits of the different drivers.

Computer vision[4] methods rely on eye movement, yawning, and head orientation extracted from videos or images. They are the most user-friendly and accurate approaches as they do not require wearing any measuring devices and are relatively independent of the external environment. However, computer vision methods can be affected by varying light conditions and can be computationally expensive, making them inefficient for implementation on embedded systems.

1.1 OBJECTIVE

For the domain of driver's status detection, three primary methodologies are used. These include and computer vision approaches, vehicle behavior monitoring methods and physiological-based methodologies. Each of these methods relies on distinct features to build detection systems. Vehicle behavior methods use trends such as steering activity and vehicle position variability. The main goal of this project is to address the concerning data that indicates drowsy driving is a significant cause of fatal traffic accidents. To achieve this objective, we aim to create a sophisticated system that uses Flask technology and convolutional neural networks (CNN) to process images and live data in real-time to driver drowsiness detection[5]. Our goal is to offer a practical and private solution to the widespread problem of sleepy driving, which is a major factor in fatal traffic accidents. To improve the accuracy and user-friendliness of drowsiness detection techniques, we plan to combine facial expression analysis to overcome the limitations of current approaches.

1.2 SCOPE OF THE WORK:

To address the issue of drowsy driving, a new Driver sleepiness or Drowsiness and fatigue Detection system is proposed in this research. The project will use Flask and Convolutional Neural Networks (CNN) to process real-time image input from mobile devices via the website. The system will prioritize privacy by utilizing mobile devices in the car

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to monitor and record the driver's condition. The proposed framework will employ a distributed edge architecture and data fusion technique to efficiently manage the designated area, and it will demonstrate its adaptability by combining live and manual inputs for a comprehensive driver tiredness diagnosis.

1.3 PROBLEM STATEMENT

This work aims to address the issue of drowsy driving, which is a significant contributor to fatal traffic accidents at around 16%. Though there are existing drowsiness detection systems, they have limitations due to their methodologies. For instance, monitoring methods that rely on driving trends are limited by unpredictable environmental conditions and individual driving habits. On the other hand, computer vision methods are user-friendly and accurate but face challenges in varying light conditions and computational inefficiencies, especially for embedded systems. Therefore, there is a need for a system that detects the drowsiness and sleepiness of driver that is effective and can overcome these limitations. Such a system can be seamlessly integrated into modern vehicles to enhance public safety.

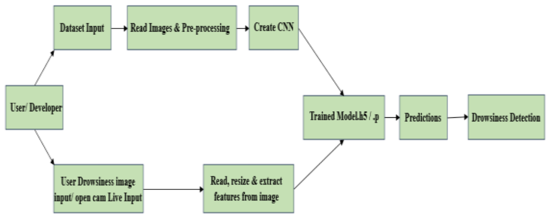
1.4 EXISTING SYSTEM:

In today's world, it is crucial to combat the threat of driving after drinking for the safety of everyone. However, current technologies often struggle to prevent accidents caused by drowsy drivers or drviers feeling sleepy. Although several solutions have been proposed, a recurring issue is the lack of a complete distributed architecture that meets the requirements of these applications while protecting drivers' privacy. Additionally, current approaches often fail to utilize advanced technology like smart edge computing to enhance the accuracy and speed of detecting sleepiness. As a result, it is still challenging to find the right balance between privacy concerns and the effectiveness of sleepiness detection systems.

1.4.1 Existing System Disadvantages:

It is requiring substantial computing power, the use of this technology on devices with limited resources[6] may be restricted. It can be challenging to manage occlusions or overlapping objects in scenes that are crowded.If image processing is limited to a single forward pass, accuracy may suffer for small or far-off objects.

1.5 SYSTEM ARCHITECTURE:



1.5.1 EXPLANATION:

We developed a system to get an input dataset containing 3000 images. We imported necessary libraries like Keras, Scikit-learn, PIL, Pandas, NumPy, Matplotlib and TensorFlow. After retrieving images and labels, we resized them to (64, 64). We built a convolution neural network using sequential models from the Keras/TensorFlow library. We achieved 97.8% average training accuracy and 98.7% accuracy on the test set. We saved the model in a .h5 or .p file using TensorFlow/pickle.

1.6 PROPOSED SYSTEM

Our proposed method provides a new and innovative approach to detecting driver drowsiness. The aim is to enhance public safety by reducing the chances of accidents caused by fatigued drivers. Our solution involves a two-stage approach, which uses Convolutional Neural Networks (CNN) along with Flask for image/live input. This approach takes advantage of the widespread use of mobile devices. The system covertly records and evaluates the driver's condition by using mobile devices within the car. It maintains privacy and validates sleepiness using a smart edge as a decision-maker. The system receives real-time data from the mobile client and compares it with observable input to detect drowsiness.

1.6.1 PROPOSED SYSTEM ADVANTAGES:

Preventing the need to gather, interpret, and send large amounts of visual data from the driver's environment.
Assisting in the quicker and more precise identification of fatigue, surpassing traditional techniques.
Having expertise in capturing complex facial traits leads to more accurate and subtle identification.

2 DESCRIPTION

2.1 GENERAL:

To create a reliable Driver Drowsiness Detection system, this project aims to seamlessly integrate Convolutional Neural Networks (CNN) with Flask. Mobile devices inside the car take real-time pictures of the driver's facial expressions to initiate the process. Flask, a micro web framework, simplifies the integration of live or manual input from the vehicle environment. The CNN model then locally processes the collected data, enabling early detection of signs of driver fatigue. This innovative framework leverages Flask's capabilities for quick and easy deployment, while also safeguarding privacy by performing data analysis on the mobile client. This makes it a viable option for practical application in improving road safety

2.2 METHODOLOGIES

2.2.1 MODULES NAME:

- Dataset
- Importing the necessary libraries
- Retrieving images
- Building the model
- Accuracy on test set
- Saving the Trained Model

Dataset

In module one, we created a system for acquiring dataset of 3000 images for driver drowsiness detection.

Importing the necessary libraries

We will use Python language for this project. Firstly, we will import required libraries such as Keras for building the main model, Scikit-Learn for dividing the training and test data, PIL for converting images into arrays of numbers, along with other libraries like Pandas, Numpy, Matplotlib and TensorFlow.

Retrieving Images

We will resize all images to (64,64) to ensure consistent recognition and retrieve their corresponding labels.

Building the model

To build our model, we'll use the sequential model from the Keras/TensorFlow library. We'll then add layers to create a convolutional neural network. In the first two Convo2D layers, we'll use 32 filters and a Kernel size of(5,5). In the MaxPool2D layer, we'll use a pool size of(2,2),, which means the maximum value of every 2 x 2 area of the image will be selected, reducing the dimensions of the image by a factor of 2. In the dropout layer, we'll set the dropout rate to 0.25, meaning that 26% of neurons will be randomly removed. We'll repeat these three layers with some changes in parameters. Then, we'll apply a flatten layer to convert 2D data to a 1D vector. This layer will be followed by a dense layer, dropout layer, and another dense layer. The last dense layer will output 2 & 2 nodes, representing closed eye or open eye for one trained CNN, and no_yawn or yawn for the other. This layer will use the softmax activation function, which gives a probability value and predicts which of the two options has the highest probability. We achieved an average training accuracy of 96.7%.

Accuracy on test set

We achieved an accuracy of 99.1% on the test set.

Saving the Trained Model

When we have completed training and testing your model and are ready to use it in a production environment, the first step is to save it as either a .h5 or .p file. You can use libraries like TensorFlow or Pickle to do this, but make sure they are installed in your environment first. Once we have confirmed this, you can import the module and save the model as a .h5 or .p file.

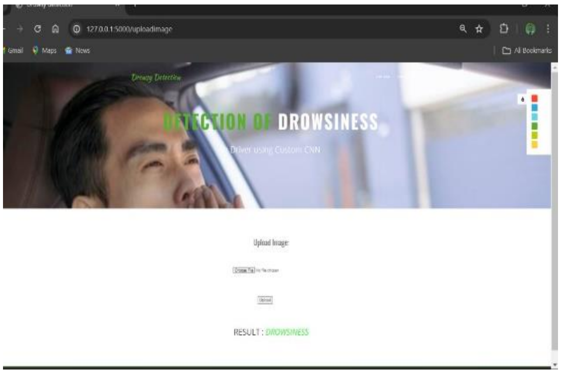
2.3 TECHNIQUE USED OR ALGORITHM USED

Convolutional Neural Networks(CNN):

Our proposed solution involves implementing a trustworthy detection system of drivers drowsiness or sleepiness that utilizes the boundaries. Our solution's primary element is the integration of Flask for image and live input, and Convolutional Neural Networks for actual facial expression analysis that detects gestures of sleepiness. This two-step approach discreetly records and analyzes the driver's condition using mobile devices inside the car while ensuring their privacy.

As a decision-maker, the intelligent boundaries validates fatigue by comparing the observed input image with real data from the mobile client. By providing a dependable and accurate means of detecting driver exhaustion, or sleepiness. This methodology significantly enhances public safety.

3 RESULT:



The system processes input images or live data of the driver face to detect the drowsiness signs such as eye movement, yawning, and head orientation.

It employs Convolutional Neural Networks (CNN) for image analysis, allowing for accurate detection of drowsiness without requiring wearable devices or intrusive monitoring.

The system achieves an impressive average accuracy of 97.8% in driver drowsiness detecting, indicating its reliability and effectiveness in identifying potential risks of driving with drowsiness. Overall, the system provides a promising solution to eliminate the threats related to the sleepy or drowsy or driving, offering high accuracy, privacy, and real-time monitoring capabilities.

4 FUTURE ENHANCEMENT

There will always the possiblities to improve the performance, efficiency, reliability and accuracy of driver sleepiness or drowsiness detection by incorporating additional metrics such as heart rate and sensor body measurements. This will provide a improved analysis about the driver's mental and physical condition, making the system more resilient and adaptable. The ongoing development of our framework has the potential to establish new standards for preventive traffic safety measures in the future.

5 CONCLUSION

In conclusion, Our proposed Driver Drowsiness or sleepiness and fatigue Detection system is an innovative approach that effectively identifies and reduces the dangers associated with driving while fatigued. Our solution addresses the limitations of centralized approaches by implementing a boundaries based architecture, ensuring efficient administration within the defined region of interest. We achieve an impressive accuracy rate of 97.8% by utilizing a two-step detection mechanism that involves facial expression analysis through CNN models for eyes and mouth classifiers. Moreover, our method prioritizes user privacy and enhances the user experience by integrating manual UI input via Flask. By the combination of near and far detections, our comprehensive strategy establishes a solid foundation for sleepiness detection and ultimately promotes road safety.

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