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DRIVER DROWSINESS MONITORING USING CNN

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Abstract: Many safety connected driving supporter schemes decreased the danger of four-wheeler accidents, and investigations depicted weariness to be a major reason of four wheeler accidents. A car organization announced an idea that whole deadly accidents (17%) would be attributed to weary drivers. Many revisions showed by Volkswagen AG specify that 5-25% of all accidents are produced by the sleeping of driver. The lack of concentration damage steering actions and decrease response period, and revisions illustrated that sleepiness raises threat of crashes demand for a dependable intelligent driver sleepiness sensing system. The aim is to create an intelligent processing scheme to avoid road accidents. This can be done by period of time monitoring the drowsiness and warning driver of inattention to prevent accidents. Based on the literature survey, the driver's drowsiness can be detected based on three factors such as physiological, behavioral, and vehicle-based measurements. But these approaches pose some disadvantages in certain real-time scenarios. So, we aim to apply Deep Learning algorithms to this problem statement. Our methodology is to use a Convolutional Neural Network (CNN). CNN offers a computerized and effective way to categorize the driver as drowsy or non-drowsy correctly The advancement in computer vision has assisted drivers in the form of automatic self-driving cars etc. The misadventure is caused by driver's fatigue and drowsiness about 20%. It poses a serious problem for which several approaches were proposed. However, they are not suitable for real-time processing. The major challenges faced by these methods are robustness to handle variation in human face and lightning conditions. We aim to implement an intelligent processing system that can reduce road accidents drastically. This approach enables us to identify driver's face characteristics like eye closure percentage, eye-mouth aspect ratios, blink rate, yawning, head movement, etc. In this system, the driver is continuously monitored by using a webcam. The driver's face and the eye are detected using haar cascade classifiers. Eye images are extracted and fed to Custom designed Convolutional Neural Network for classifying whether both left and right eye are closed. Based on the classification, the eye closure score is calculated. If the driver is found to be drowsy, an alarm will be triggered.

I. Introduction

Driver drowsiness monitoring is an essential aspect of vehicle safety, aimed at preventing accidents caused by fatigued or sleepy drivers. With the advancements in computer vision and deep learning, Convolutional Neural Networks (CNNs) have emerged as a powerful tool for detecting and monitoring driver drowsiness in realtime. CNNs are a type of deep learning algorithm that are particularly effective at analyzing visual data, such as images or video frames. They are designed to automatically learn and extract features from raw input data, making them wellsuited for tasks like object detection, image classification, and facial recognition.

The Driver drowsiness monitoring using Convolutional Neural Networks (CNNs) is a popular approach for detecting and preventing accidents caused by drowsy driving.

Here's a high-level overview of the problem and a solution using CNNs:

Problem: Driver Drowsiness Monitoring

Drowsy driving is a major cause of road accidents, and it poses a serious risk to both the driver and other road users. Detecting driver drowsiness in real-time can help prevent accidents by alerting the driver or triggering automated safety systems.

Solution: CNN-based Drowsiness Detection

Convolutional Neural Networks (CNNs) are well-suited for image-based tasks, including analyzing facial features and detecting patterns. Here's a step-by-step solution using CNNs for driver drowsiness monitoring:

Dataset Collection: Collect a large dataset of labeled images featuring drivers with varying levels of drowsiness. This dataset should include images of drivers with open eyes, closed eyes, and partially closed eyes.

Data Preprocessing: Preprocess the collected images by resizing them to a consistent resolution, converting them to grayscale, and normalizing the pixel values.

II. Literature Survey

The existing system for driver drowsiness monitoring typically involves the use of simple sensors such as steering wheel sensors, lane departure sensors, or wearable sensors to detect the driver's drowsiness level. However, these systems have limited accuracy and reliability as they only detect indirect signs of drowsiness, such as the driver's steering behavior or head posture.

In contrast, the proposed system for driver drowsiness monitoring using CNN utilizes computer vision techniques and machine learning algorithms to detect the driver's drowsiness level in real-time by analyzing facial landmarks, eye closure, yawning, blink rate and head pose. The CNN model is trained on a large dataset of images of drowsy and alert drivers, which improves the accuracy and reliability of the system.

Overall, the proposed system for driver drowsiness monitoring using CNN is more accurate, reliable, and effective in detecting driver drowsiness compared to the existing systems that rely on simple sensors.

III. Design

UML diagrams

Sequence diagram

A sequence diagram is a type of interaction diagram in UML (Unified Modeling Language) that represents the interactions and order of messages exchanged between objects or components in a system over time. It provides a visual representation of the flow of events or actions in a specific scenario or use case.

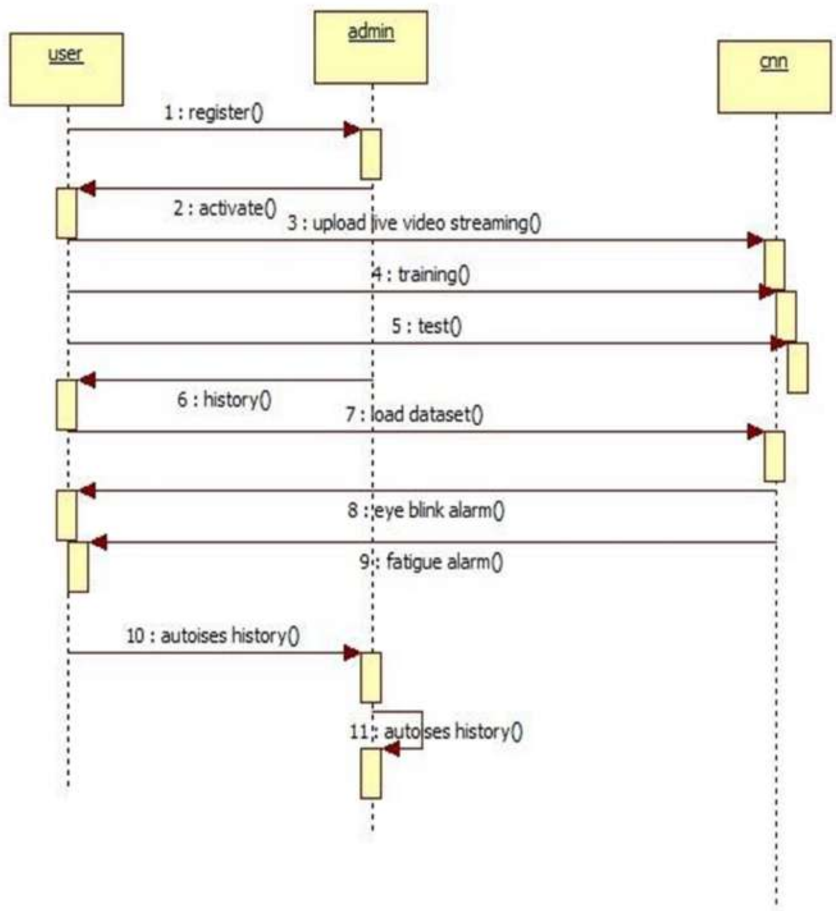


Figure 4.1: Sequence diagram

Activity diagram

An activity diagram is a type of behavioral diagram in Unified Modeling Language (UML) that depicts the flow of activities or processes within a system.

It represents the sequence of actions, decisions, and control flows in a graphical manner, making it easier to understand and communicate the system's behavior.

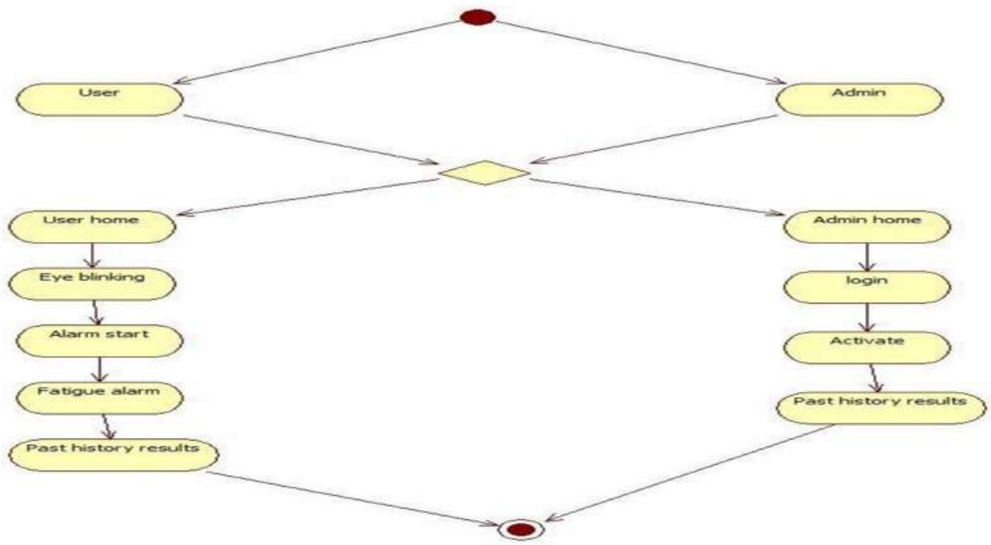
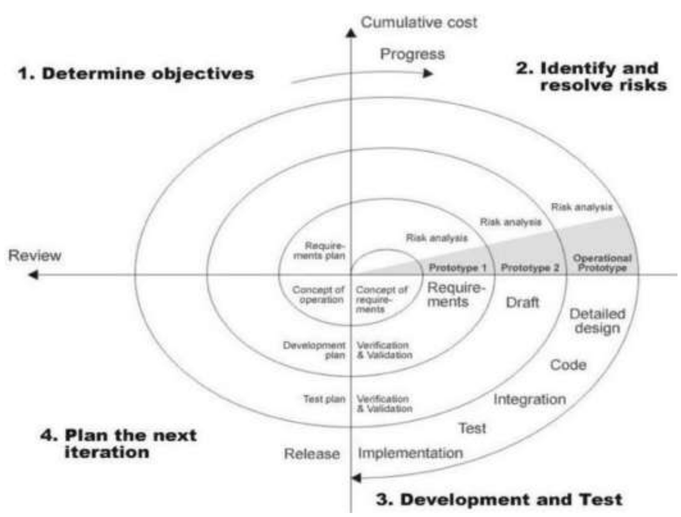


Figure 4.2: Activity diagram

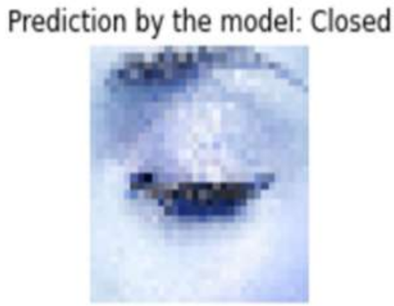
Process Model



IV. TESTING AND VALIDATION

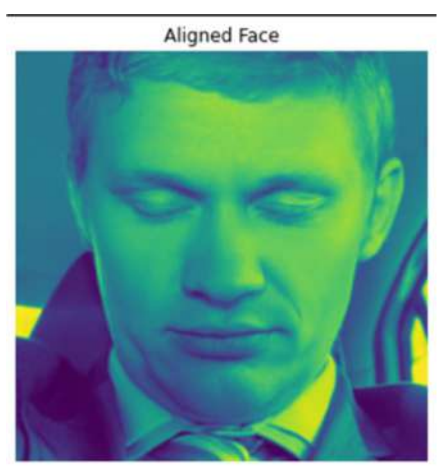
Testing the Model

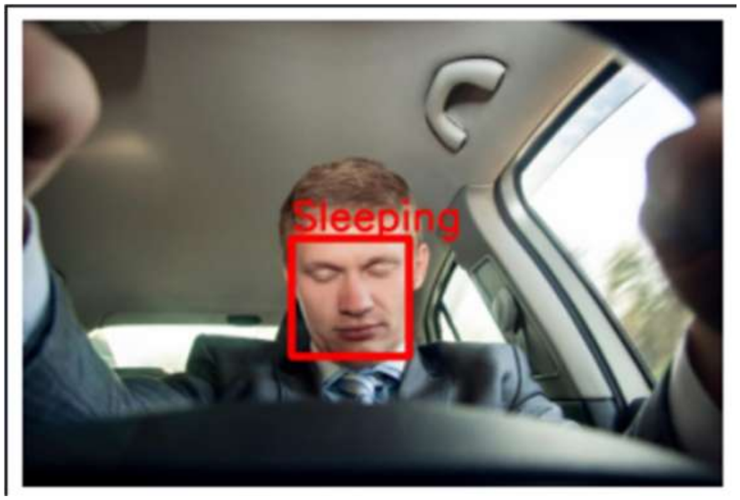
The predictions of the model on images of eyes can be seen in the following pictures —


Prediction by the model: Closed


Prediction by the model: Open


Prediction by the model: Open


Aligned Face



V. Conclusions and Future Scope

In conclusion, driver drowsiness monitoring using Convolutional Neural Networks (CNNs) has emerged as a promising solution for enhancing road safety. By analyzing real-time video frames of the driver's face, CNN-based systems can detect drowsiness cues such as closed eyes, drooping eyelids, or yawning, and provide timely alerts to prevent potential accidents.

The use of CNNs offers several advantages, including the ability to automatically learn relevant features from raw image data, robustness to variations in lighting conditions and driver appearance, and real-time processing capabilities. These systems can be integrated into vehicles or existing driver assistance systems, providing personalized and adaptive alerting mechanisms to maximize effectiveness.

However, it is essential to address certain limitations and challenges associated with driver drowsiness monitoring using CNNs. These include issues like variations in individual drowsiness patterns, the need for diverse and annotated datasets for training robust models, and the requirement for real-time processing capabilities on resource-constrained platforms.

To develop an effective system, both functional and non-functional requirements must be considered. Functional requirements encompass image acquisition, preprocessing, drowsiness detection, real-time processing, alert mechanisms, data logging, system integration, and user interface design. Non-functional requirements include performance, accuracy, reliability, scalability, usability, privacy, and maintainability.

REFERENCES:

[1] Dr.Priya Gupta, Nidhi Saxena, Meetika Sharma, Jagriti Tripati, Deep Neural Network for Human Face Recognition International Journal of Engineering and Manufacturing, vol.8, no.1, pp.63-71. January 2018.

[2] Jeyakar A, Vivek Ravi Iyengar, Based on Behavioral Changes using ResNet, International Journal of Recent Technology and Engineering(IJRTE), vol. 8, no. 3,pp. 2 5- 30