Drowsiness Detection System

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Overview

Introduction

- Driver fatigue is a major factor in vehicle accidents, with 1,200 deaths and 76,000 injuries annually. To counter its effects, technologies must be developed to detect and avoid drowsiness at the wheel.
- Drowsiness detection is a safety technology that can prevent accidents caused by drivers and watchmen, and help students stay alert and focus on their studies.
- The project "drowsiness detection" is based on deep learning concepts, which mimic the human brain's activity and enable it to learn from massive amounts of data.
- Drowsiness detection systems use cameras, sensors, and wearable devices to monitor the driver's eye movements, head position, and facial expressions, and provide an alert if drowsiness is detected.

Problem Statement

While engaging in tasks that require constant concentration, like driving a car, studying online being drowsy might be risky. Driving when sleepy increases drowsiness, which increases the risk of accidents. The main challenge is detecting the user's condition and deciding whether or not they are drowsy. The primary idea of this project is to create a deep learning-based alert system i.e. drowsiness detection system. The objective is to create a tool that can accurately assess whether or not a user is sleepy. The concept majorly impacts the automotive industry, improving driving safety and reducing the number of fatalities brought on by drowsy driving.

Literature Survey

No	Paper Name, Author(s), Year of publishment	Methodology and Technologies	Observations/Findings and Remarks
1	Driver drowsiness detection using ANN image processing Vesselenyi, T., Moca, S., Rus, A., Mitran, T., &Tătaru, B. Year: 2017	This paper has 3 types of methods that are used for detecting drowsiness of drivers using ANN image processing. They are: driver image analysis, EOG signal processing and EEG. It is related to pictures captured during driving and analysing the driver 's eyes that are opened or closed or half-opened.	The classification success rate was increased with the training of the respective networks. Cropping of images and down sampling is not possible for image processing.
2	Fatigue state detection based on multi-index fusion and state recognition network Y. Ji, S. Wang, Y. Zhao, J. Wei, and Y. Lu Year: 2019	This paper has built a drowsy situation recognition-based technique. Firstly, the human face will be detected using MTCNN (multitask convolutional neural network). Some open-source libraries were used for locating the facial points with help of DLIB that is used to extract the drowsiness symptoms.	This technique has a 93% average accuracy rate in identifying essential facial features. Creating an information fusion model and gathering different types of information is challenging.

Literature Survey

3	Comparative Analysis of Driver Drowsiness Detection using Machine Learning Techniques Neha Bhondve, Ashutosh Dalvi, Vinit Dhande, Neerav Bhamare, Prof. Shikha Pachouly Year: 2019	The system uses images for detection of drowsiness using machine learning. Metrics such as eye closure analysis, eye blink rate are considered. A model will be constructed using CNN and a dataset containing the images of the driver. This dataset will contain both drowsy as well as non-drowsy images. Once the model is trained, the system will start capturing images of the driver while driving.	This technique has a 95.18% average accuracy rate in identifying essential eye features and is also reliable and accurate. The result can be affected by the lighting conditions and presence of sunglasses /spectacles can interrupt the functioning.
4	Real-Time Fatigue Detection System using Computer Vision Rishika Tiwari, Drashti Patel, Shruti Pandey, Prof. Rushikesh Nikam Year: 2020	The system works on Computer vision. It has been proposed using Image Processing and Machine Learning. It focuses mainly on facial expressions. It has 5 stages - Face detection, Facial landmark detection, Feature extraction, Eye closure status, Lip opening status for yawn detection.	The results are accurate and reliable for detection of eyes & mouth. It extracts and detects the features in real-time. System provides a 90.88% average accuracy rate. There are chances some frames will be missed and not fulfil real-time category

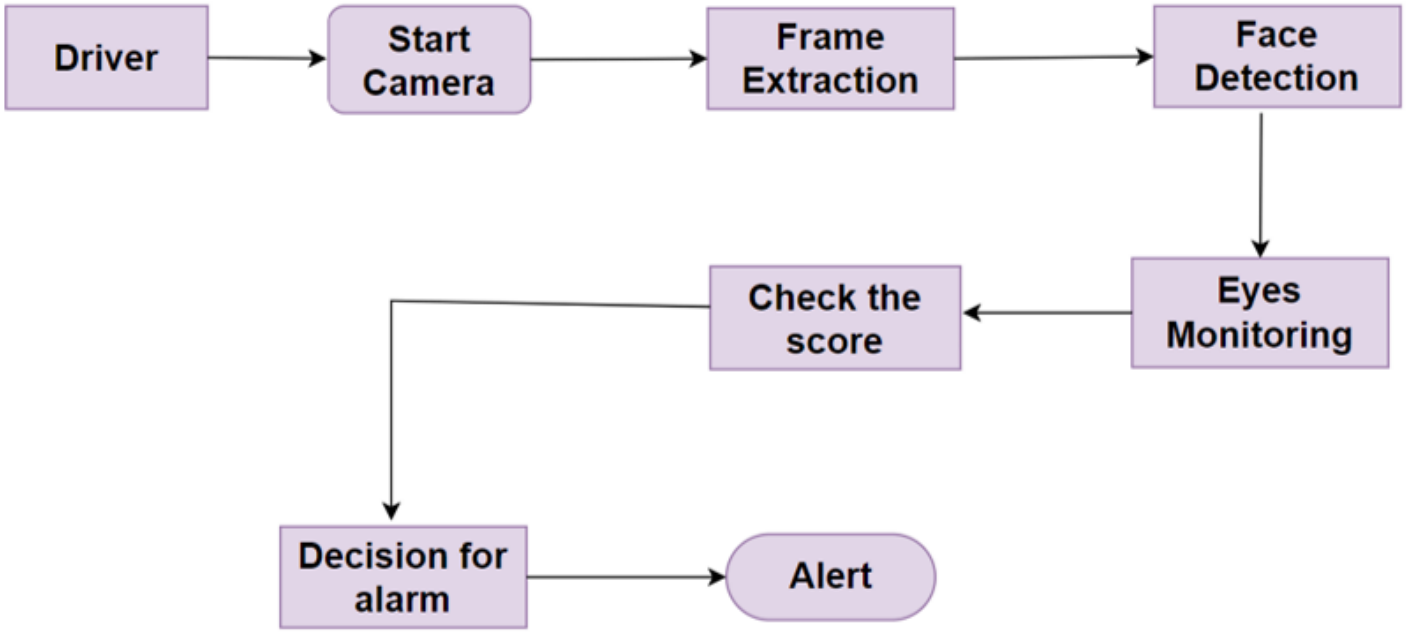
Literature Survey

5	Real-time driver drowsiness detection system based on convolutional neural network. Hashemi, M., Mirrashid, A., & Beheshti Shirazi, A. Year: 2020	This system holds a stream of frames in its initial phase. Coming to the pre-processing unit, the system landmarks facial points to access ROI in the image. And the eye region is selected. And that will be input to the FDNN network which classifies whether the person is drowsy or not.	FDNN, VGG-16, VGG-19 gives an accuracy of 98.15%, 95.45% and 94.96% accuracy. The parameters or hidden layers extracted with good performance will require larger datasets using more hidden layers of deeper networks.
6	Intelligent Driver Drowsiness Detection for Traffic Safety Based on Multi CNN Deep Model and Facial Subsampling. M. Ahmed, S. Masood, M. Ahmad, and A. A. A. El-Lati Year: 2021	An ensemble model is proposed which consists of two modules that will feature extraction of eyes along with mouth samples that were taken with MTCNN from face pictures and the result of the system determines if the driver is drowsy or not.	Precision, sensitivity, and F1 scores are 97.38%, 97.54%, 99.2%, and 97.46%, respectively, for the overall training accuracy. Face detection is not always possible for working with maximum accuracy on all samples of input and also there are some chances of missing frames that can contain important data.

Existing System

- Eye-Tracking Systems
- Steering Wheel Sensors
- Facial Expression Analysis
- EEG Systems
- Smart-phone based system
- Heart Rate Monitors

Proposed System



Algorithm

Step 1

In the first step, the video is extracted through a webcam using OpenCV and then the video is divided into frames.

Step 2

Process of conversion of image to grayscale has been held for faster processing using OpenCV. After converting into grayscale, it will check the eyes are opened/closed.

Step 3

A frame is displayed capturing the face, and the eyes are monitored. If it gives 1 then eye is opened because 1 is assigned to opened and 0 for closed.

Algorithm

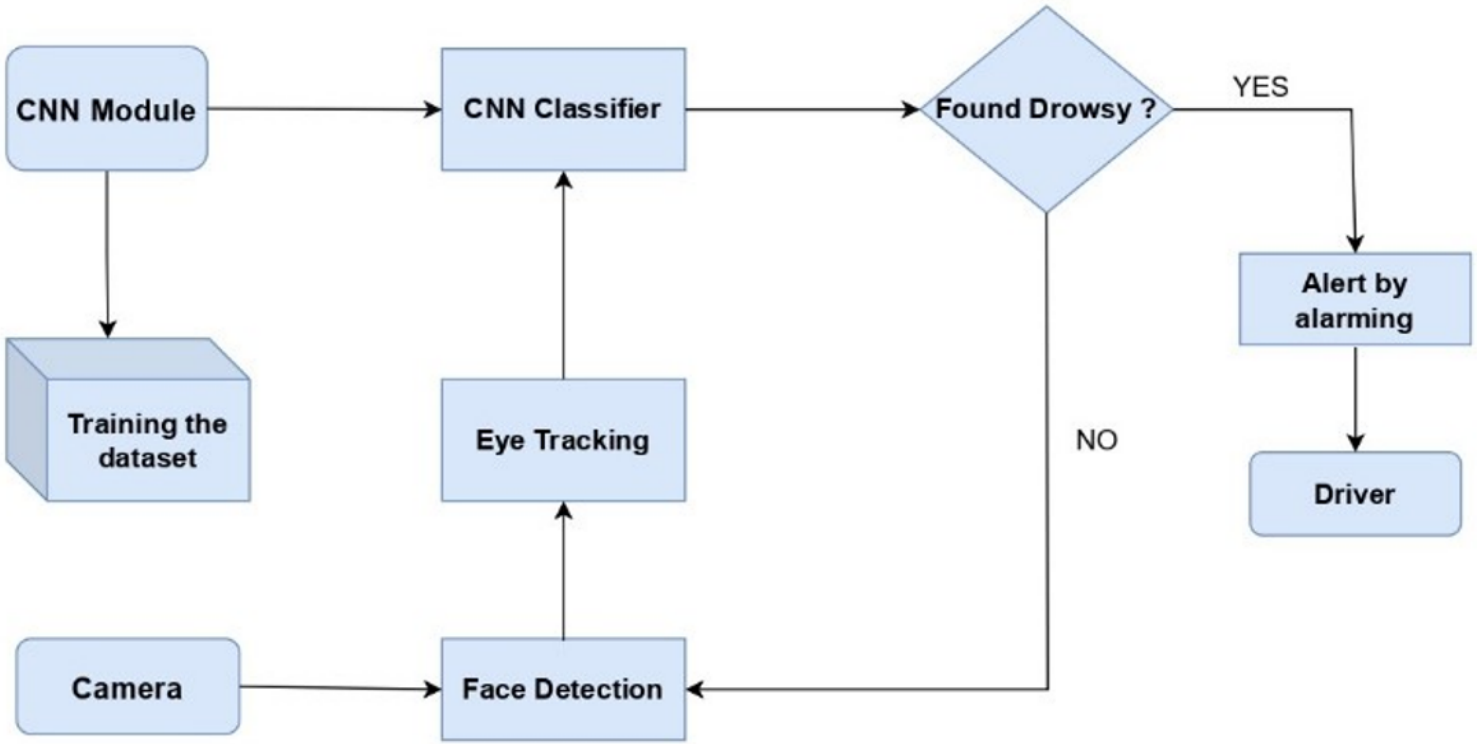
Step 4

The score increment/decrements based on eye state. If both eyes are closed increment the score, and if opened decrement the score. The system will determine whether there are any signs of drowsiness in the closed state of eyes for continuous frames.

Step 5

If eyes are closed for score greater than 16 and any unwanted object detected then the system will sound an alarm using the play sound library to alert the user, else more frames to process.

Architecture



Hardware and Software requirements

Hardware

1. System Processor: Pentium IV processor or higher
2. RAM: Minimum 64 MB primary memory
3. Hard disk: Minimum 1 GB hard disk space.
4. Display: SVGA Monitor
5. Key board: Windows compatible.
6. Web Camera

Software

1. Coding Language: Python
2. Operating System: Windows 7 or above
3. Libraries Used: Keras, OpenCV, Numpy, Playsound, Pygame.
4. Tool: VsCode and Jupyter Notebook.
5. Web Technologies: HTML, CSS
6. Web Framework: Flask

IMPLEMENTATION

Future Scope

- Integration with AI and machine learning: AI and machine learning algorithms can be used to improve the accuracy and reliability of early warning systems, leading to more effective early warning systems.
- Wearable technology: Wearable devices can be integrated with drowsiness detection systems to monitor drowsiness levels in real-time, particularly useful for high-risk jobs.
- Expansion into new industries: Drowsiness detection systems could be used in new industries to reduce accidents and injuries caused by worker fatigue.
- Integration with autonomous vehicles: Drowsiness detection systems could help ensure the safety of passengers in autonomous vehicles by monitoring the driver's drowsiness and alerting the vehicle's control system.

Conclusion

Drowsiness detection systems are an important technology for promoting safety and preventing accidents caused by drowsiness. They use sensors and algorithms to detect signs of drowsiness such as changes in eye movement, blinking patterns, and head posture. However, they are not foolproof and may not detect all instances of drowsiness or fatigue. Therefore, they should be used in conjunction with other strategies for preventing drowsy driving and working, such as getting enough sleep and taking breaks during long shifts.

THANK YOU