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Driver Drowsiness Detection and Alert System

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ABSTRACT: In this paper we present the development of a solution to detect a driver's drowsiness in real time and issue alerts to avoid any possible traffic accidents. We proposed to reduce the accidents caused by driver fatigue and thus improve road safety. The significant increment in the percentage of road accidents is mainly due to drowsiness. The work is based on behavior analysis, high end installation and Machine Learning algorithm to detect the possible coordinate to identify eyes and mouth. Based on real time data capturing and analysis, eye blinking and yawn detection are considered important parameters to detect drowsiness and fatigue of the driver and ring the alarm accordingly.

KEYWORDS: Advanced Vehicle Safety, Driver safety, face detection, Eye tracking system, Driver performance.

I. INTRODUCTION

By recognizing the accurate eye position, the effective eye detection methodology is proposed to enhance the accuracy of fatigue detections and the machine learning and image gradients based schemes are utilized for the driver drowsiness detection design.In eye and neck angle based approach, the distance of neck angle and eye iris angle is calculated using Euclidean distance formula. Recent studies show that the methods using distance calculation between driver's eyes (whether they are open or closed) can achieve better reliability and accuracy of driver drowsiness detection compared to other methods.Eyes are not symmetrical on face and there are plenty of applications of eye detection. Here, the eye detection is used to check the driver fatigue, i.e. if the driver is drowsy or not. The main concept behind this project is to proposea system which can sense drowsiness of the driver and issue a timely warning. Driver Fatigue is the main reason for majority of road accidents. The detection can be done in many different ways and by using various parameters. Proposed system uses the parameter of behavior. The behavioral parameter includeseye openness, yawning, eye blinking, jaw position etc. The camera is fixed in the vehicle which captures the live video. The video is segmented into frames and then the images from those frames are selected. By taking individual image, noise from the image is cleared.

II. LITERATURE SURVEY

"Drowsiness Detection of a Driver using Conventional Computer Vision Application" Hitendra Garg. The proposed work tried to contribute in reducing the increased number of road accidents while keeping the methodologies simple and intact. In the proposed work, Smart Vehicle System (SVS) is implemented to detect the drowsiness and fatigue of a driver in real-time based on the image captured. The work is based on behavior analysis, high end camera installation and conventional algorithm to detect the possible coordinate to identify eyes and mouth. Existing state of art methods are computationally complex as compare to our proposed method. Based on real time data capturing and analysis eye blinking and yawn detection are considered important parameters to detect drowsiness and fatigue of the drive and ring the alarm accordingly.

"Learning based Driver Drowsiness Detection Model" Dr Jagendra Singh. The purpose of this paper is to devise a way to alert drowsy drivers while driving. This study attempted to address the issue by creating a module i.e. drowsy eyes detection. The CNN based detection method has high detection accuracy, however, it requires a long processing time. It takes several seconds to process one frame in the current DSM system which does not have high performance GPUs. This work of Young and Sheena incorporates types of eye development, attributes of the eye and the ways to deal with the estimation of eye development. The system is for a number of peoples under different lighting conditions, having different distances from the webcam. The systems made for driver assistance are the limelight of the decade with tons of ideas coming together to build the safest product possible.

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"Real-time Drowsiness Detection Algorithm for Driver State Monitoring System": Jang WoonBaek, Byung-Gil Han, Kwang-Ju Kim, Yun-Su Chung, Soo-In Lee. The proposed algorithm can be used for real-time driver drowsiness detection without using expensive GPUs. There is more space for improvement of the system performance, where the future work focuses on detecting the yawning and distraction of driver. The proposed algorithm detects the driver's face in the image and estimates the landmarks in the face region. In order to detect the face, the proposed algorithm uses an Ada-Boost classifier based on the Modified Census Transform features and the proposed algorithm uses regressing. The deep learning model was trained and tested on the standard datasets: Closed Eyes in the Wild (CEW) database.

"Eye Tracking based Driver Fatigue Monitoring and Warning System" HardeepSingh , Mr. J.S Bhatia ,Mrs. Jasbir Kaur . If the classified objects contain a mobile phone as an object, the system generates an alert to the driver to be cautious. The algorithm is applied on consecutive frames for calculation of time that an eye takes to close. By general logic, the time taken by a drowsy driver to close the eyes will be greater than the time taken by the driver who is generally blinking. The system detects when the driver is keeping their eyes closed for a prolonged time.

"The Smart Automobile: Application Based on Driver Drowsiness Detection, Alcohol Detection, Vital Sign Monitoring & Lane Based Auto Drive To Avoid Accidents" Prof.Dr. Bhawani Shankar Chowdhry. Many researchers have implemented such techniques that are either only workable as prototypes or are unable of providing real time results. Some were only alerting the driver and only reducing the aftereffects of crashes as those were not efficient enough in preventing the crash. These technologies are used for detecting drowsiness and alcohol consumption by the driver for preventing the road accidents. Some technologies prevent road accidents by detecting the health parameters of the driver and contacting the rescue system.

"Drowsy Driver Detection Using Two Stage Convolutional Neural Networks" Aishwarya Biju and Anitha Edison. In this method, detection and localization of face region is done using the YOLOv3 real-time object detection algorithm, while the Inception-v3 pre-trained neural network is used to classify the detected face as either drowsy or non-drowsy. Detection of the face region from the incoming video stream is performed using the deep learning based real-time object. Drowsiness detection methods can be generally classified into three main categories; parameter-based, vehicular parameter-based and physiological parameter-based technique. Behavioral parameters are non-invasive measures that can be acquired for detecting drowsiness.

III. RELATED WORK

A. MACHINE LEARNING:

Machine learning can identify an object as a digital image, based on the intensity of the pixels in black and white images or colour images.This system accepts input in the form of live dataset. We know that we're doing data processing and train the dataset on the system, therefore we're employing modules: Pre-processing, Feature extraction, and classification, all of which use our CNN/Haar Cascade algorithm.

So First, Input is taken as a Live dataset, then pre-process the dataset (pre-processing step is to clean the Image and Remove Blur part). After that, the system extracts the parameters or features in the extraction section. Then, in classification, we utilize our CNN/Haar-Cascade algorithm to Detect Drowsiness or not.

B. SDLC MODEL:

This is a combination of different phases such as designing, implementing and deploying the project. These different phases of the software development model are described in this section. The SDLC model for the project development can be understood using the following figure 1.1. The chosen SDLC model is the waterfall model which is easy to follow and fits bests for the implementation of this project.

Requirements Analysis: At this stage, the business requirements, definitions of use cases are studied and respective documentations are generated.

Design: In this stage, the designs of the data models will be defined and different data preparation and analysis will be carried out.

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Implementation: The actual development of the model will be carried out in this stage. Based on the data model designs and requirements from previous stages, appropriate algorithms, mathematical models and design patterns will be used to develop the agent's back-end and front-end components.
Testing: The developed model based on the previous stages will be tested in this stage. Various validation tests will be carried out over the trained model.
Deployment: After the model is validated for its accuracy scores, it is ready to be deployed or used in simulated scenarios.

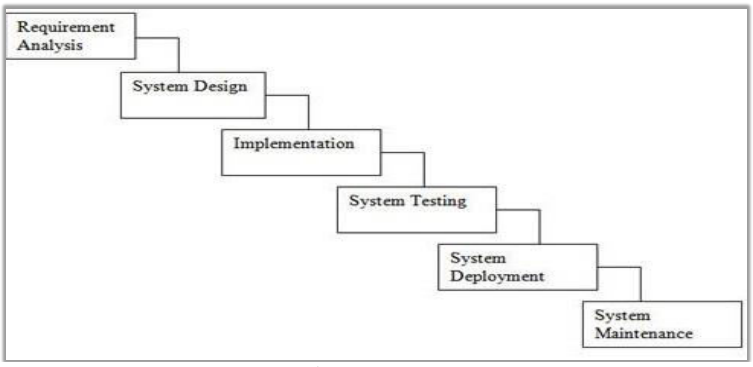

Fig 1.1 SDLC

IV. PROPOSED METHODOLOGY

A. OBJECTIVE: -

In this System, the driver assistance system is presented in order to decrease the number of road accidents caused due to driver fatigue and hence improve road safety. On the basis of visual information and artificial intelligence, this systemtreats the automatic detection of driver drowsiness. We locate, track and analyze both the driver face and eyes by calculating distance between eye iris and neck angle.

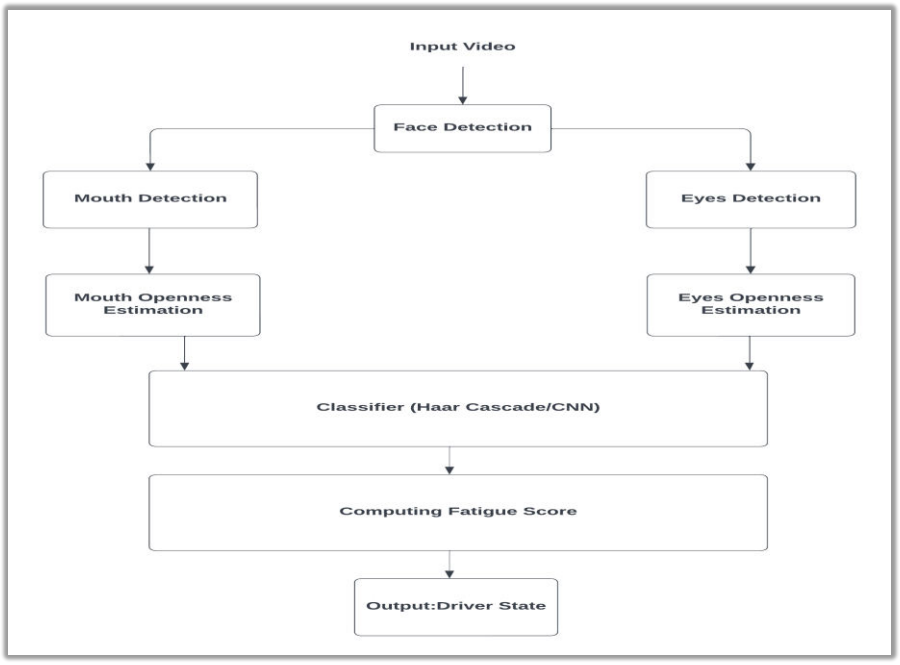

Fig 1.2 Proposed System Architecture

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V. PROPOSED ALGORITHMS

A. CNN: A convolutional neural network is used to detect and classify objects in an image.These are the steps used to training the CNN.
Fetch the trained model from Layer.
Loading the image of the same size as the one used in the training images.
Convert the image into an array.
Transform the numbers in the array to be between 0 and 1 by dividing by 255.

B. HAAR CASCADE: This algorithm uses Haar features to determine the likelihood of a certain point being part of an object. It makes sure to optimize against false negatives for Haar cascades. Use Open-cv for implementing a Haar cascade model yourself.

VI. MOTIVATION

As AIIMS Neurology India's research has found, more than 20% of all road accident victims are found suffering from sleep disorders. Another study revealed that more than 23% of truck drivers have sleep deprivation. Clearly, these drowsy drivers can cause fatal accidents on roads.
Hence, there is a need to develop a system that will detect and notify a driver of his/her psychological condition, which can significantly help in reducing the number of fatigue related car accidents.

VII. CONCLUSION

The prevention of such accidents is a major focus of effort in the field of active safety research. People in fatigue show some visual behaviours easily observable from changes in their facial features like eyes, head, mouth and face. Computer vision can be a natural and non-intrusive technique to monitor driver's vigilance. Faces as the primary part of human communication have been a research target in computer vision for a long time. The driver fatigue detection is considered to be one of the most promising commercial applications of automatic facial expression recognition. Automatic recognition of facial expression consists of three levels of tasks: face detection, facial expression, information extraction and expression classification.

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