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Driver Drowsiness Detection System

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ABSTRACT
The attention level of driver degrades because of drowsiness, long continuous driving or any other medical condition like brain disorders etc. Several surveys on road accidents says that around 30 percent of accidents are caused by fatigue of the driver. When driver drives for more than normal period for human then excessive fatigue is caused and also results in tiredness which drives the driver to sleepy condition or loss of consciousness. With the ever-growing traffic conditions, this problem will further deteriorate. For this reason, it is necessary to develop driver alertness system for accident prevention due to Driver Drowsiness is a complex phenomenon which states that there is a decrease in alerts and conscious levels of the driver. Driver Drowsiness Detection is a safety technology that can prevent accidents that are caused by drivers who fell asleep while driving. The objective of this intermediate Python project is to build a drowsiness detection system that will detect that a person's eyes in real-time and check whether they are closed for a few seconds. This system will alert the driver when drowsiness is detected. In this Python project, we will be using OpenCV for gathering the images from webcam and feed them into a process which will whether the person's eyes are 'Open' or 'Closed'. The model we used is built with Histogram of Oriented Gradients + Linear SVM for face detection. Facial landmarks are applied to the drivers face and the landmarks of both eye sections are extracted and evaluated for drowsiness conditions based on Euclidean distance. Wheneverthe condition for drowsiness is true the system alerts the driver by means of alarm sounds thereby preventing the risk of accidents.
Key words: *Driver Drowsiness, Open CV, HOG andSVM.*

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I. INTRODUCTION

This paper has the potential to be useful in conditions in which conventional methods cannot be adopted. The drowsiness detection system uses visual characteristics of face like landmarks, colour edge trembling to discriminate them from other visible stimuli. There are various face detection techniques such as infrared sensor, pretrained driver sleepy faces etc. These methods are not always reliable as they do not always detect the drowsiness or sleepiness but detect one or more face expressions resulting from landmark movements, such as blinking, yawning, laughing etc, which could be produced in other ways and hence, produces many false alarms. By the help of machine learning mechanisms and image processing techniques, it is possible to get better results than conventional systems because images can provide more reliable information. The main objective of the proposed system is to reduce the road accidents caused by the drowsiness or sleepiness of the driver. The system provides easiness to drivers and have wide area of future enhancement. The focus in this paper is detection using a low-cost camera. This would mean that the program does not only work with expensive technology such as infrared cameras or other such cameras.

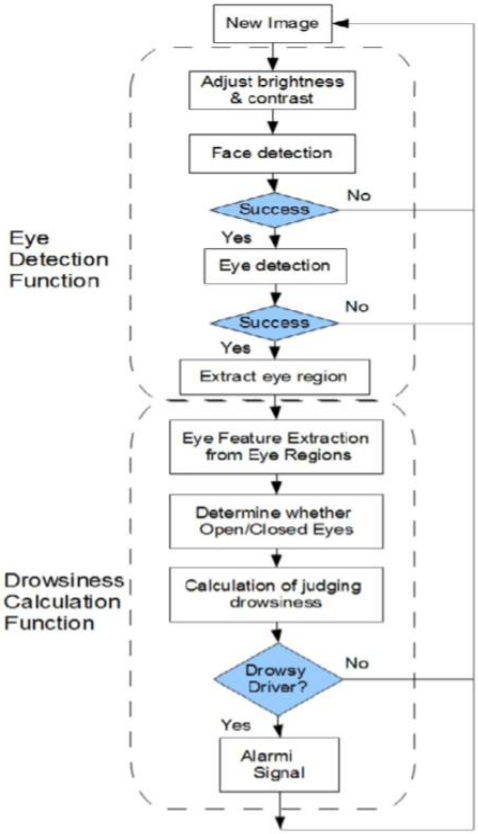
II. LITERATURE SURVEY

Driverdrowsiness detection systems are a recent addition to the range of equipment available to car security features, creating an effective and reliable means of detecting unconsciousness.By providing an early warning to the driver, accidents can be prevented. Driverdrowsiness detection system have a good record of performance and have demonstrated it can be effective in reducing the risk to life and car damage from accidents. The guide discusses how to manage them in use. and ensure that regulatory requirements are met. It introduces the components that are used and the types of system that are available to designers. In[1],describeda technique called Partial least square regression (PLSR) which monitors eyelid movement features and predicts drowsiness. It uses strong collinear relations among the eyelid movement features to predict drowsiness. The predictive precision of their model shows that it is a good method to use multi features together to detect the state of drowsiness. In [2],Chan-HeeJeong describes Discriminative Bayesian active shape model(ASM) by incorporating the Extreme pose case named as poseextended active shape model(PE-ASM). This model includes the HMM to detect facial features which are drowsy or non-drowsy. This technique evaluated on two facial databases such as Boston university face database and their custom-made driving database. This technique outperforms AAM and ASM. In [3], presents a method of drowsiness detection for the images obtained using web cameras under normal lighting conditions. The drowsiness detection method uses Haar based cascade classifier for eye tracking and combination of Histogram of oriented gradient (HOG) features combined with Support Vector Machine (SVM) classifier for blink detection. Once the eye blinks are detected then the PERCLOS is calculated from it. If the PERCLOS value is greater than 6 seconds then the system is detected as drowsy. The system obtained an accuracy of 91.6%.

III. METHODOLOGY

The implementation is one phase of software development. Implementation is that stage in the paper where theoretical design is turned into working system. Implementation involves placing the complete and tested software system into actual work environment. Implementation is concerned with translating design specification with source code. The primary goal of implementation is to write the source code to its specification that can be achieved by making the source code clear and straight forward as possible.This paper user various technologies to detect unconsciousness of driver like OpenCV, Edge Detection Algorithm withSVM and HOG.OpenCV is the huge open-source library for the computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even handwriting of a human.Edge detection techniques have been developed for extracting edges from digital images. Gradient based classical operators like Robert, Prewitt, Sobel were initially used for edge detection, but they did not give sharp edges and were highly sensitive to noise image. Laplacian based Marr Hildrith operators also suffers from two limitations: high probability of detecting false edges and the localization error may be severe at curved edges.Edge detection is a basic tool used in image processing, basically for feature detection and extraction, which aim to identify points in a digital image where brightness of image changes sharply and find discontinuities.

The purpose of edge detection is significantly reducing the amount of data in an image and preserves the structural properties for further image processing Implementation means the process of changing a brand new or revised system style into operational one. The implementation is the final stage and it's an important phase. It involves the individual programming, system testing, user training and the operational running of developed proposed system that constitute the application subsystems. One major task of preparing for implementation is education of users, which should really have been taken place much earlier in the project when they were being involved in the investigation and design work. During this implementation phase system takes physical shape. Depending on the size of the organization and its requirements the implementation is divided into three parts. Edge detection is an image processing technique for finding the boundaries of objects within images. It works by detecting discontinuities in brightness. Edge detection is used for image segmentation and data extraction in areas such as image processing, computer vision, and machine vision.



IV. EXPERIMENTS AND RESULTS

Our approach filters out image blocks based on facial landmarksface spatial features, starting with dividing the image into grayscale and extraction of face blocks from image, and face blocks are analysed to identify facial landmarks. Filtered facial landmark coordinates are analysed and the eye section landmarks are further extracted. These areas are then converted into numerical values and the Euclidean distance between the top section and bottom section are calculated and the calculated results are compared against a threshold which will decide whether the driver is conscious or sleepy or in a drowsy state, depending on the decision a corresponding alarm is triggered for a moment which will eventually wakeup the driver and brings his conscious back if he's unconscious. Toreduce errors due to external camera influences, Research algorithms have low computation time.

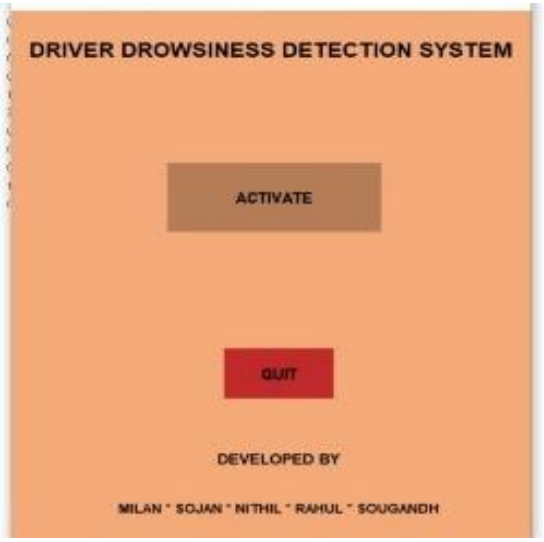


Fig 1: User Interface

Through a sequence of experiments, the result is consistent with the empirical evidence and shows that the detection rate of the proposed system exceeds previous studies and reduces false alarm rates under various environments.

V. CONCLUSIONANDFUTURESCOPE

This project proposes a drowsiness and sleepiness detection system based on driver behaviour. The role of the system is to detect facial landmark from images that are collected while the person is driving the vehicle by a camera module attached to the vehicle and deliver the obtained data to the trained model to identify the driver's state. Once the collected data is detected to be showing signs of drowsiness the person will be alerted using the speakers in the vehicle so that the person can stop the vehicle to avoid any accidents due to his drowsy state. However, there is still space for the performance improvement. The further work will focus on detecting the distraction and yawning of the driver.Also, accelerometer is to be incorporated to track the speed of the car.Our model is designed for detection of drowsy state of eye and give and alert signal or warning may be in the form of audio or any other means. But the response of driver after being warned may not be sufficient enough to stop causing the accident meaning that if the driver is slow in responding towards the warning signal then accident may occur. Hence to avoid this we can design and fit a motor driven system and synchronize it with the warning signal so that the vehicle will slow down after getting the warning signal automatically.

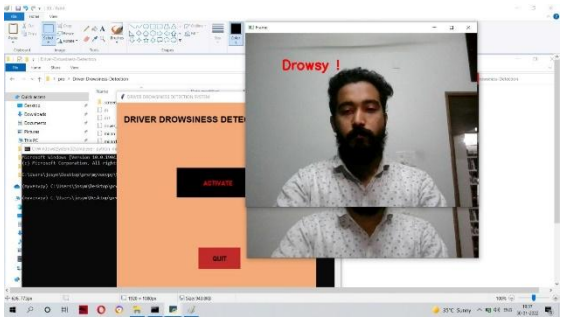


Fig 2: Whenever driver is drowsystate

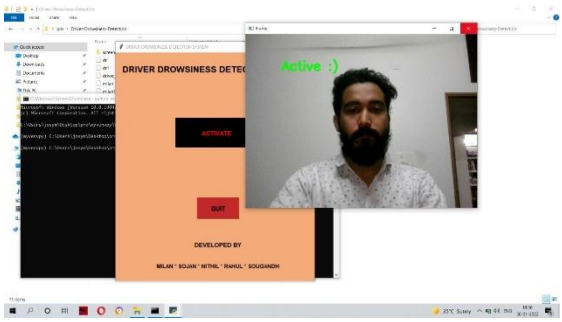


Fig 3: Driver is in his consciousstate

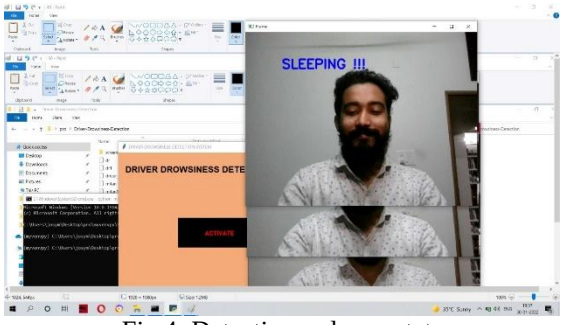


Fig 4: Detecting a sleepy state

Using this system, quick and reliable alert response is possible to initiate preventive measures to avert and minimize losses of life and property. This is a cost-effective detection system which performs reliably to ensure safety from road accidents due to drivers' sleepiness, and can be installed in motor vehicles very easily. Fig 2,3,4depicts the processing done at the internal level for facial landmark detection by the algorithm.Alarms should be supplemented with communications devices that allow you to wake up.

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