Driver Drowsiness Alert System

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Abstract

Driver Drowsiness is a grave issue resulting in many road accidents each year. To evaluate the exact number of sleep related accidents because of the difficulties in detecting whether fatigue was a factor and in assessing the level of fatigue is not currently possible. In this paper the camera will be placed besides the rear view mirror of car in such a way that it is in clear view of the frontal face of the driver. This camera will continuously capture the video of driver’s frontal face while driving. The system will detect the frontal face in the image and later the eyes. Depending upon the conditions the system will generate an alert. The focus will be on the system that will accurately monitor the open or closed state of the driver’s eyes in real-time. By monitoring the eyes, it is believed that the symptoms of driver fatigue can be detected early to avoid accidents.

Keywords: Driver Fatigue, Face Recognition & Detection, Haar Cascade

I. INTRODUCTION

The development in the automobile industry over the last few years have made our automobiles more robust, easy to drive and control and more environmentally friendly. Driver Drowsiness is a grave issue resulting in many road accidents each year. To evaluate the exact number of sleep related accidents because of the difficulties in detecting whether fatigue was a factor and in assessing the level of fatigue is not currently possible.

Steering for unrestricted time causes extreme tiredness which in turn makes the person sleepy or loose alertness. With the fast increase in the number of accidents seems to be increasing daily. Therefore a need occurs to design a system that keeps the driver earnest on the road. Statistics on road accidents in India are collected by Transport Research Wing of Ministry of Road Transport & Highways.

The motivation behind designing this system is to develop a framework of Drowsy Driver Alert System. The focus and concentration will be placed on designing the system that will accurately monitor the open and closed state of the driver’s eye in real time. By continually monitoring the eyes, we can determine that the symptoms of driver tiredness can be detected soon enough to avoid an accident. This detection can be done using a sequence of images of eyes as well as face and head movement. The constant surveillance of eye movement will be used. Devices to detect when drivers are falling asleep and to issue notification to warn them of the risk, or even control the vehicle’s movement, have been the subject to much research and development.

II. LITERATURE SURVEY

Driver drowsiness monitoring is one of the most demanded technologies for active prevention of severe road accidents. Electroencephalogram (EEG) and several peripheral signals have been suggested for the drowsiness monitoring. However, each type of signal has partial limitations in terms of either convenience or accuracy. Recent emerged concept of in-ear EEG raises expectations due to reduced obtrusiveness. It is yet unclear whether the in-ear EEG is effective enough for drowsiness detection in comparison with on-scalp EEG or peripheral signals. In this work, we evaluated performance of the in-ear EEG in drivers' alertness-drowsiness classification for the first time. The drawback of this system is there is need of wearing the EEG kit which can be uncomfortable for driver as it may end up adding more burden over driver. The major disadvantage is the wearing of such kit may result in violation of traffic rules[1]. In the consecutive steps of this algorithm, skin color regions are selected, then edge detection is done and visible contours are masked by selected regions. Later, Hough transform is applied to find face ovals. Using color information, it is not possible to separate the objects of interest from even very complex background as opposed to grey level only images. The color space transformations, in general, do not improve face and non-face classes’ separability. Statistical properties of spaces remain almost unchanged. The face skin color distributions in TSL and normalized r-g spaces are most compact and yield the best fit to the unimodal Gaussian model. Physiological measurement is prevailing on the research
because of its accuracy. The work described in neural network based system to detect face, mouth and head position[2]. The warning or alarm system is also described to raise driver alertness. L.Yufeng and W. Zengcai proposed that face region detection/can be attained using the difference between two images. The distance between the midpoint of nostrils and chin is then used to detect yaw of the driver [6]. Another Reference has proposed that Viola-Jones face detector with motion analysis of Shi-Tomasi salient features within the face can be used successfully to find the driver’s state of alert[6]. The work presented in paper suggested that fatigue can be identified considering the driver’s facial pose[7]. Head tilts can be detected by analyzing facial orientation. All the first generations of lane detection systems were edge-based. They relied on thresholding the image intensity to detect potential lane edges, followed by a perceptual grouping of the edge points to detect the lane markers of interest[8]-[10]. The work in one paper proposed that region of interest (ROI) can be extracted for lane departure[10]. Hough transform is used to detect the lines of the road in ROI. A lane departure decision is made using the distance of Hough origin and lane-line midpoint.

III. PROPOSED SYSTEM

A. Haar Cascade Classifiers

The core basis for Haar classifier object detection is the Haar-like features. These features, rather than using the intensity values of a pixel, use the change in contrast values between adjacent rectangular groups of pixels. The contrast variances between the pixel groups are used to determine relative light and dark areas. Two or three adjacent groups with a relative contrast variance form a Haar-like feature.

Haar-like features are used to detect an image. Haar features can easily be scaled by increasing or decreasing the size of the pixel group being examined. This allows features to be used to detect objects of various sizes.

Classifiers Cascaded Although calculating a feature is extremely efficient and fast, calculating all 180,000 features contained within a 24 × 24 sub-image is impractical. Fortunately, only a tiny fraction of those features are needed to determine if a sub-image potentially contains the desired object. In order to eliminate as many sub-images as possible, only a few of the features that define an object are used when analyzing sub-images. The goal is to eliminate a substantial amount, around 50%, of the sub-images that do not contain the object. This process continues, increasing the number of features used to analyze the sub-image at each stage. The cascading of the classifiers allows only the sub-images with the highest probability to be analyzed for all Haar-features that distinguish an object. It also allows one to vary the accuracy of a classifier. One can increase both the false alarm rate and positive hit rate by decreasing the number of stages. The inverse of this is also true. Viola and Jones were able to achieve a 95% accuracy rate for the detection of a human face using only 200 simple features. Using a 2 GHz computer, a Haar classifier cascade could detect human faces at a rate of at least five frames per second.

- Image Acquisition: Image is captured by using camera. The camera will be placed in front of the driver so that it can capture the frontal face.
- Preprocessing: This module preprocesses the frames acquired. The system can only work on grayscale images. Preprocessing includes the converting color image into the grayscale image, so that the system can perform operations on it.
- Face Detection: The face detection function takes one frame at a time from the frames provided by the frame grabber, and in each and every frame it tries to detect the face of the automobile driver. This is achieved by making use of a set of pre-defined Haar cascade samples.

![Flowchart of proposed system](image-url)
IV. CONCLUSION

The Haar cascade classifier can detect the face with high speed and accuracy. This method uses pre-acquired data, thus it requires less processing time and less storage. Further system can be enhanced and improved by applying the Haar cascades on eyes, so that the accuracy of system can be improved.

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