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Drowsiness Detection System

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***Abstract*: This Life is essential, and it is loaded with chance. Likewise, wellbeing safety measure ought to consistently be considered before any sort of disaster happens. Street accidents are one of the most common incidents that can be boldly noted these days, and drowsiness is a major cause of driver impairment that leads to crashes and fatalities. Research has established the ability to detect drowsiness with various kinds of sensory tools. We have researched drowsy driving during a high-fidelity driving simulator and calculated the power of a mobile, production-ready driver monitoring system to detect drowsy driving. It prompts to increases in the number of street accidents every year. The Drowsiness Detection System has been created, utilizing a sort of machine-vision based idea. Its framework utilizes a little camera that focuses accurately towards the driver's face and scans the driver's eyes to distinguish exhaustion and/ or sluggishness. For a situation, if a potential weakness is detected, a caution signal is given to make the driver aware of his state and come out of his exhausted or lazy state. Remarkably, the framework distinguishes the face and the eyes, and then decides if the eyes are shut or open. This framework basically uses the data acquired for the double form of the image to discover the edges of the driver's face, which limits the zone of where the eyes may exist. When the eyes are found, calculating the separations between the forces varies in the eye zone as it depends on whether the eyes are open or shut. If the system finds that the eyes are shut for at least 3 successive casings, the framework then find the idleness of the driver and infer that the driver is nodding off and gives an alert sign to wake him up.**

***Keywords*: Drowsiness detection system.**

1. Introduction

Driver drowsiness detection is a car safety technology which prevents accidents when the driver is getting drowsy or exhausted while driving. Various studies have suggested that around 20% of all road accidents are fatigue-related, up to 50% on certain roads. Driver fatigue is an important factor in a large number of vehicular accidents. Recent statistics estimate that annually 1,200 deaths and 76,000 injuries are often attributed to fatigue related crashes. The development of technologies for detecting or preventing drowsiness at the wheel may be a major challenge within the field of accident avoidance systems.

Because of the dangers that drowsiness can bring about on the road, various methods need to be developed for counteracting this disaster. The Driver's inattention might be the result of a lack of alertness when driving due to driver drowsiness and distraction. Driver distraction occurs when an object or event draws a person's attention far away from the driving task. Unlike driver distraction, driver drowsiness involves no triggering event but, instead, is characterized by a progressive withdrawal of attention from the road and traffic demands.

According to survey, driver fatigue results in over 50% of the road accidents each year. Using technology to detect driver fatigue/drowsiness is a stimulating challenge that might help in preventing accidents. In the past various efforts are reported within the literature on approaches for drowsiness detection of racer. In the last decade alone, many countries have begun to pay great attention to the car driver safety problem. Researchers are performing on the detection of automobile driver's drowsiness using various techniques, like physiological detection and Road monitoring techniques. However, all the research till date during this approach need electrode contacts on the car drivers' head, face, or chest making it non-implementable in world scenarios. The objective of this project is to develop a drowsiness detection system that can detect drowsy or fatigue in drivers to prevent accidents and to improve safety on roads. This system processes accurately to monitor the open and closed eye state of driver.

This System uses a direct approach that makes use of vision based techniques to detect drowsiness. The major challenges of the proposed technique include (a) Developing a real time system Face detection (b) Iris detection under various conditions like driver position, with/without spectacles, lighting etc (c) Blink detection and (d) Economy. The focus will be placed on designing a real-time system that will accurately monitor the open or closed state of the driver's eyes. By monitoring the eyes, it's believed that the symptoms of driver fatigue are often detected early enough to avoid a car accident. Detection of fatigue involves the observation of eye movements and blink patterns in n a sequence of images of a face extracted from a live video.

2. Literature Survey

The work conducted by Jian-Da Wu, Tuo Rung Chen in [1] Development of a drowsiness system based on the fuzzy logic images analysis developed and investigated a warning system while driving using image processing technique with fuzzy logic interface. This system was based on facial images analysis for warning the driver of drowsiness or inattention to prevent traffic accidents. The facial mages of driver were taken by a

CCD camera which was installed on the dashboard in front of the driver. A fuzzy logic algorithm and interface were proposed to determine the level of fatigue by measuring the blinding duration and its frequency and warn the driver accordingly. The experimental works were carried to evaluate the effect of the proposed system for drowsiness warning under various operation conditions. The experimental results indicated that proposed expect system was effective for increasing safe in dive. This study proved the feasibility of applies image processing technique to safety of vehicle. In this system besides judging the driver's level of fatigue, it also allowed the head of driver moving within an acceptable region.

Tiesheng Wang et. al., (2005) had developed a system based on yawning detection for determining driver drowsiness. A system had an aim to detect driver drowsiness or fatigue on the base of video analysis which was presented. The main objective of this study was on how to extract driver yawning. A real face detector was implemented to trace driver's face region. In this study, mouth window was traced. In which face region and degree of mouth openness was extracted to find driver yawning in video. This method was computationally capable because it ran at real-time on average. When the driver moved his head away by lack of concentration, the eyes and mouth might be occluded and might be detected. There was another situation should be reminded of the driver. For this other methods must be formed to deal with it, [2].

Mandalapu Sarada Devi et. al., (2008) had developed a system that can detect oncoming driver fatigue and issue timely warning could help in preventing many accidents, and consequently save money and reduced personal suffering. The authors had made an attempt to design a system that used video camera that points directly towards driver's face in order to detect fatigue if the fatigue was detected a warning signal was issued to alert the driver. The authors had worked on the video files recorded by the camera. Video file was converted into frames. Once the eyes are located from each frame, by measuring the distances between the intensity changes in the eye area one can determine whether the eyes were open or closed. If the eyes were found closed for 5 consecutive frames, the system draws the conclusion that the driver was feeling asleep and issued a warning signal. The algorithm was proposed, implemented, tested and found working satisfactorily. A driver monitoring system was implemented which detected the fatigued state of the driver through continuously monitoring the eyes of the driver. The basis of the method used by authors was horizontal intensity variation on the face. One similarity among all faces was that eyebrows were significantly different from the skin intensity, and that the next significant change in intensity, in the y-direction, was the eyes. This facial characteristic was the centre of finding the eyes on the face, which will allow the system to monitor the eyes and detect long periods of eye closure, [3].

3. Problem Description

Many vehicle accidents are caused by the driver of the vehicle becoming drowsy and then falling asleep. In many driving situations, drivers are not even aware of their sleepiness or drowsiness prior to actually falling asleep. It has been proposed to watch the facial characteristics of the vehicle driver, to anticipate when the driving force is becoming drowsy, and to alert the driving force before the driving force falls asleep.

One proposed technique employs video cameras focused on the driving force's face for monitoring the attention of the driver.

Prior known driver drowsiness detection techniques have proposed processing the video images from the cameras to work out a particular measurement of the percent of closure of both eyes of the driving force.

The percent of eye closure is then wont to determine if the driving force has become drowsy.

it is therefore desirable to supply for an alternate low-cost driver drowsiness detection system for detecting a driver drowsy condition, particularly to be used during a vehicle. A low-cost system for detecting a drowsy condition of a driver of a vehicle includes a video imaging camera located in the vehicle and oriented to generate images of a driver of the vehicle. The system also includes a processor for processing the images acquired by the video imaging camera. The processor monitors an eye and determines whether the eye is in an open position or a closed state. The processor further determines a time proportion of eye closure as the proportion of a time interval that the eye is in the closed position and determines a driver drowsiness condition when the time proportion of eye closure exceeds a threshold value.

4. Methodology

Implementation is the stage of the project where the theoretical design is turned to a working system. At this stage the most work load, the best upheaval and therefore the major impact on the prevailing system shifts to the user department. If the implementation isn't carefully planned and controlled, it can cause chaos and confusions.

Implementation includes all those activities that happen to convert from the old system to new one. The new system could also be totally new, replacing an existing manual or automated system or it's going to be a serious modification to the prevailing system, Proper implementation is important to provide a reliable system to meet the user needs.

The process of putting the developed system in actual use is named system implementation. This includes all those activities that take place to convert from the old system to the re system, the system can be tested only after through testing is done and if it is found to be working according to the specifications and providing instructions provided to it.

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A. Implementation Procedures

The most important step in detecting the active state of driver depends on the position of the camera. The place where the camera is placed must satisfy few constraints that is face must be visible to the camera and a good light source is preferred for better results. The optimal location to place the camera is in the gap between the main glass and the steering which provides valuable light source and better view of drivers face to the camera. Next comes the GSM module connected the system. It can be placed anywhere is the car. And last one is the alert buzzer which is turned on when the driver is detected drowsy it must be placed a bit near to the driver to awake him in case he is drowsy. This is the implementation of all hardware's which are further connected to a computer which will processing all the inputs and provides the output.

B. User Manual

A neat system if not operated and used properly could fail. Training the user is important, as if not done well enough could prevent the successful implementation of a information system. After the development of the complete product the system is handed over to the user so in order for better results user needs to be trained. They must know their roles, how they can use the system and what the system will do and will not do. Both system operators and users need training.

C. Operational Documentation:

Once the documentation plan is needed, it is essential that the user of the system is made familiar and comfortable with the environment. Education involves right atmosphere and motivating the user. A documentation providing the entire operations of the system is being developed. The system is developed in such a way that the user can work with well consistent way. The system is developed user friendly so that the user can work the system from the tips given to them. Users must be made aware how system works and what are all the benefits of the system.

D. System Maintenance

A perfect system when not maintained well fails. So even this product that id drowsiness detection project needs some amount of maintenance. It doesn't cost too much; all you need is a camera lens cleaner to keep the camera lens clean. Software and hardware maintenance are key constraints to achieve a great success.

5. Results

The models were successful at discriminating lower levels of ORD (0–1) from moderate and severe levels (2–4); however, they were not effective at differentiating moderate drowsiness (ORD 2) from severe drowsiness (ORD 3–4). This is somewhat surprising because the expectation would be that more severe drowsiness would present more obvious symptoms that could be picked up by a DMS. The lower prevalence of severe drowsiness may have limited the ability of the model to accurately discern it. Several measures of model performance are derived from the confusion matrix that counts instances of correct and incorrect classifications. Accuracy is one such measure and is reported directly by the caret model. It is computed as:

$$\text{Accuracy} = TP + TN/ TP + TN + FP + FN$$

(2) where TP and TN denote true positives and true negatives (appearing on the diagonal of the confusion matrix), and FP and FN denote false positives and false negatives (in the offdiagonals of the confusion matrix). The no information rate (NIR) is simply the prevalence of the most common class. The accuracy must be significantly higher than the NIR to be a compelling indicator of good performance, and this significance is reported as a P value in the testing set results. Receiver operating characteristic (ROC) curves can be constructed for binary models, and the area under this curve (AUC) is another performance statistic. A multiclass ROC (MROC) measure is available for multiclass models and generalizes the AUC measure by averaging pairwise comparisons between classes (Hand and till 2001). An alternative measure that doesn't come from the confusion matrix is log loss. It is useful in that it takes into account how much model predictions vary from the truth. A perfect model has 0 log loss.

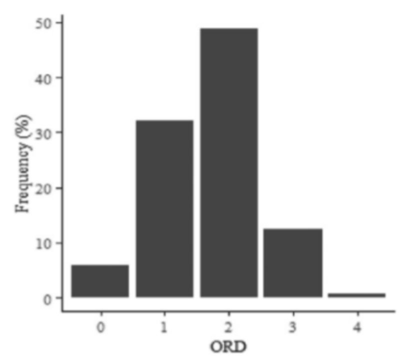

Fig. 1. Distribution of ORD ratings among possible values (0-4)

Table 1. Model performance statistics with test set.

Statistic	VEH	DMS	BOTH	BIN
Accuracy	0.63	0.78	0.82	0.83
NIR	0.58	0.58	0.58	0.60
P value	<.001	<.001	<.001	<.001
Log loss	0.77	0.64	0.59	0.46
MROC	0.73	0.79	0.79	0.90[a]

[a]Traditional AUC.

Table 2. Three-class model confusion matrix for prediction of ORDs.

Prediction	Reference		
ORD	0–1	2	3–4
0–1	394	133	0
2	62	527	13
3–4	0	0	0

6. Conclusion

In this way we built up an arrangement of against mischance in light of tired driving location and tried to take a gander at the developing advances and determine the best methodologies in attempting to keep the main source of lethal vehicle crashes. At present, the main selling product in the market is just a reed change to recognize head point tilt. Accessible item is amazingly restricted and not very powerful. In our future upgrade of our undertaking we intend to back off a vehicle naturally when weariness level crosses a certain confine. Rather than limit tiredness level it is proposed to outline a persistent scale driver weariness identification framework. It monitors the level of Drowsiness persistently and when this level surpasses a specific esteem a flag is produced which controls the hydraulic slowing mechanism of the vehicle.

Committed equipment for picture obtaining preparing and show Interface bolster with the hydraulic stopping mechanism which incorporates hand-off, clock, stepper engine and a direct actuator. When languor level surpasses a certain limit then a flag is created which is conveyed to the hand-off through the parallel port (parallel information exchange required for faster results).

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