A Survey Paper on Drowsy Driver Detection System

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Abstract – This paper is a summary of the study and project undertaken in the field of computer engineering to build a framework for detecting driver drowsiness to avoid accidents caused by driver exhaustion and sleepiness. The study presented the findings and recommendations for the project's restricted implementation of the various techniques. The project's implementation, on the other hand, provides a practical understanding of how the system operates and what improvements can be made to increase the overall system's usefulness.

Keywords – Driver drowsiness; eye detection; blink pattern.

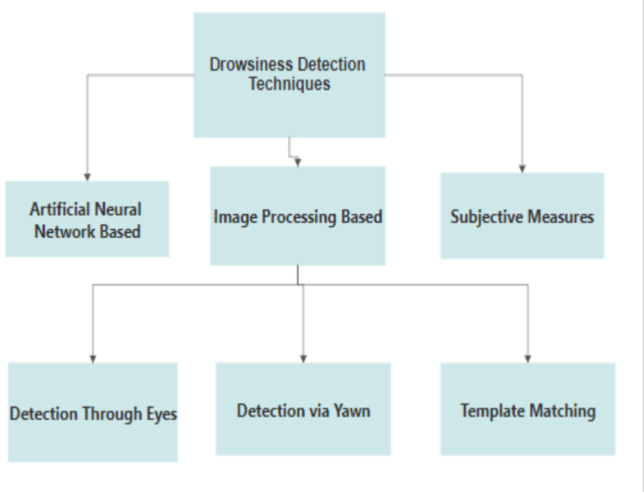
1. INTRODUCTION

In intelligent transportation systems, real-time monitoring of driving behavior is important. By reducing and minimizing the risk of possible traffic incidents, such monitoring enhances traffic safety. One of the most promising and widely used methods for detecting the driver environment is a vision-based technique that uses video cameras to identify hazardous situations. In this case, video cameras can capture pictures of a driver's facial features, such as head motions, eye state, and mouth state. In this paper, we use the smartphone's built-in front-facing camera to continuously monitor driving facial features and identify drowsiness and distraction dangerous states early. There are two forms of dangerous state recognition: online and offline. The driving dangerous states are calculated in real-time on mobile devices with the help of computer vision libraries OpenCV and Dlib while driving due to the efficiency and performance of smartphones in online mode.

1.1 SYSTEM REVIEW

This survey is being conducted to better understand the general public's needs and requirements and to do so, we combed through various websites and applications for the necessary information. We created an audit based on these results, which helped us generate new ideas and make different arrangements for our mission. We came to the conclusion that such an application is needed and that there is a reasonable amount of progress in this field as well.

2. DROWSINESS DETECTION TECHNIQUES



If a driver is sleepy or fatigued it is visible on the driver's face. Different signs indicate the drowsiness of the driver. The vital sign is given by the eyes. The eyes are either open, close, or halfway open. From the movements of the eyelids, we can take the signs. The algorithm processes the image captured through the webcam and converts them into a grey-scale image. The grey-scale image is easier to detect the eyes. This algorithm then uses the edge detection technique over the eyes. By using this technique, it calculates the area of both the eyes. This technique can give the value of the area of eyes but it won't work for every single driver. As every driver's eyes are of different shapes and sizes, the value can differ from person to person. Some drivers may have droopy eyes that can indicate that the driver is sleepy, which is not true. This can create an obstacle while detecting face and eyes

3. IMAGE PROCESSING TECHNIQUES

In image processing techniques, the driver's facial images are captured so that one can find all the details on the driver's face. Using the details of eyes and mouth, one can detect whether the driver is awake or drowsy. There are various other symptoms too through which we can conclude whether the driver is sleepy or not. Following are the explanations of some of the techniques.

3.1 DETECTION THROUGH EYES

In this technique, the eye blinking rate and duration for which the eyes are closed are taken into consideration. There is a certain difference between normal eye blinking and the blinking that occurs when the eyes are tired. Drowsy drivers sometimes close their eyes for a longer period and that's how we detect drowsiness. In this system, A camera continuously records the video of the driver, and then computer vision techniques are applied to the captured video for localization of eyes and measure its closure duration.

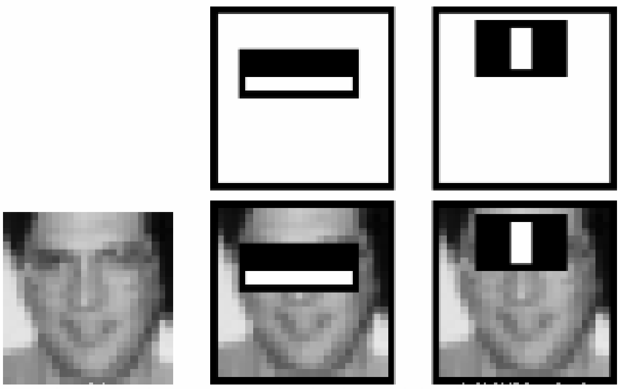
3.2 DETECTION VIA YAWN

One of the signs of exhaustion is yawning. It's believed that the yawn is modeled with a wide vertical mouth opening. When you yawn, your mouth is wider than when you talk. Yawns can be detected using face tracking and then mouth tracking. When the machine senses a yawn, it warns the driver.

Rather than relying on a single technique to detect driver drowsiness, some researchers have combined many vision-based image processing techniques to achieve better results.

3.3 TEMPLATE DETECTION

To detect the face within the image, the algorithm needs to be trained on positive and negative images. The features are required to be extracted from the image. The number of pixels under the white rectangle needs to be subtracted from the total number of pixels under the black rectangle to give each function a single value.

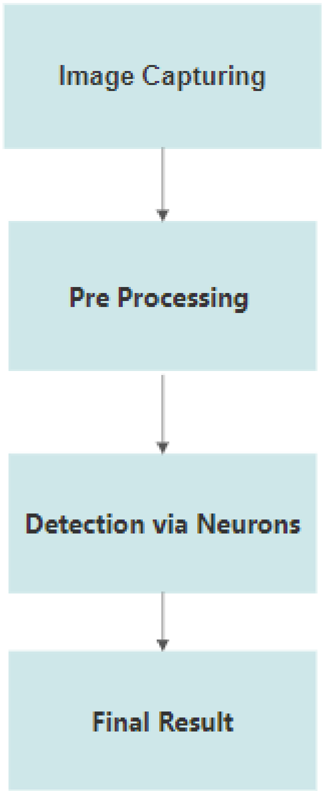


4. SUBJECTIVE MEASURES

Subjective lives that assess the amount of somnolence area unit supported the driver's estimation and lots of tools are accustomed to translating this rating to a measure of driver somnolence. The foremost usually used somnolence scale is the Karolinska temporary state Scale (KSS), a nine-point scale that has verbal anchors for every step. Some researchers compared the self-determined KSS, that was recorded each a pair of min throughout the driving task, with the variation of lane position (VLP), and found that these measures weren't in agreement. Ingre et al. determined a relationship between the attention blink length and also the KSS collected each five min throughout the driving task. Researchers have determined that major lane departures, high inborn reflex length, and drowsiness-related physiological signals area unit prevailing for KSS ratings between five and nine [10]. However, the subjective rating doesn't coincide with vehicle-based, physiological, and behavioral measures. As a result of the amount of somnolence is measured just about each five min, fast variations can not be detected by mistreatment subjective measures. Another limitation to the mistreatment of subjective ratings is that the self-introspection alerts the driving force, thereby reducing their somnolence level. Additionally, it's troublesome to get somnolence feedback from a driver in a very real driving state of affairs. Therefore, whereas the subjective rating area unit helpful in determinative somnolence in a very simulated setting, the remaining measures could also be higher fitted to the detection of somnolence in a very real setting.

5. ARTIFICIAL NEURAL BASED TECHNIQUES

In this approach, they use neurons to observe the driver's somnolence. just one somatic cell is often not a lot correct and therefore the results of that's not smart as compared to over one neuron. Some researchers square measure finishing up investigations within the field of optimization of driver drowsiness detection victimization. Artificial Neural Network folks in fatigue exhibit bound visual behaviors that square measure simply noticeable from changes in countenance like the eyes, head, and face. Visual behaviors that usually replicate a person's level of fatigue embody lid movement, gaze, head movement, and countenance to form use of those visual cues, they created artificial neural networks to observe somnolence. They tested samples and got ninety-six results. Figure five shows that flow however be a man-made neural network system that will observe somnolence.



LIMITATIONS

[1] This algorithm could only detect face and eyes in limited range from the webcam.

[2] The algorithm which uses Haar Cascade could not detect eyes in a low light setting.

DISADVANTAGES

[1] Edge detection technique used to detect drowsiness. But the set value can differ from person to person because of different eye shapes.

[2] The use of the Haar cascade feature to detect face is not compatible with large datasets.

ADVANTAGES

[1] Use of vision cascade to detect face even in low light setting.

[2] Use of MATLAB for detection of eyes which helps in eyes detection even if the face is tilted.

CONCLUSION

The face of the driver has been detected by capturing the facial landmark and after that localization of eyes is done to measure its closure duration and a warning is given to the driver in the form of an alarm to avoid real-time crashes.

As a result of our research, we have concluded that combining two or more methods will help us provide the best results by reducing the weakness of other approaches. This could contribute to the development of a non-intrusive and highly effective driver drowsiness detection system.

ACKNOWLEDGEMENT

Because of our professor HOD Dr. D.R. Ingle's guidance, we can complete this paper. We would like to express our deepest gratitude to our professor as well as those who assisted us in completing this paper. We'd also like to express our gratitude to our parents for their unwavering support.

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