Securaction

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Abstract: - The main reason for motor vehicular accidents is the driver drowsiness. This work shows a surveillance system developed to detect and alert the vehicle driver about the presence of drowsiness. It is used like small computer with machine learning to implement the Human Computer Interaction System. For the detection of drowsiness, the most relevant visual indicators that reflect the driver's condition are the behavior of the eyes, the lateral and frontal assent of the head and the yawn. The system works adequately under natural lighting conditions and no matter the use of driver accessories like glasses, hearing aids or a cap. Due to a large number of traffic accidents when driver has fallen asleep this proposal was developed in order to prevent them by providing a non-invasive system, easy to use and without the necessity of purchasing specialized devices. The method gets 93.37% of drowsiness detections.

Key-Words: - Drowsiness Detection, Face Detection, Eye Detection

I. Introduction

Driver fatigue causes the maximum accidents by cars, and lesser are by two wheelers. Four wheeler drivers easily go to resting mode and sometimes he/she enters to the drowsy state. Gaining information about behavior patterns generally inaccessible to unconscious introspection .The term drowsiness can be considered as the state of reduced alertness usually accompanied by performance and physiological changes that result in loss of alertness. A system has been designed with computer vision research which is dedicated precisely for detecting human blink. It is of utmost importance to measure eye movement during psychophysical tasks and experiments to study; Eye movement control; Gaining information about behavior patterns generally in accessible to conscious introspection .By monitoring the eyes, it is believed that the symptoms of driver fatigue can be detected early enough to avoid a car accident. Detection of fatigue involves a sequence of images of a face, and the observation of eye movements and blink patterns. The analysis of face images is a popular research area with applications such as face recognition, virtual tools, and human identification security systems. This project is focused on the localization of the eyes, which involves looking at the entire image of the face, and determining the position of the eyes by a self developed image-processing algorithm. Once the position of the eyes is located, the system is designed to determine whether the eyes are opened or closed, and detect fatigue.

II. Working Principle

A Drowsy Driver Detection System has been developed, using a non-intrusive machine vision based concepts. The system uses a web camera that points directly towards the driver’s face and monitors the driver’s head movements in order to detect fatigue. In such a case when fatigue is detected, a warning signal is issued to alert the driver. The algorithm developed is unique to any currently published papers, which was a primary objective of the project. The system deals with detecting eyes, nose and mouth within the specific segment of the image. If these are not found for 5 consecutive frames, the system draws the conclusion that the driver is falling asleep.

Drowsiness detection methods Detection methods are divided into two main groups: methods based on driver performance and methods based on driver status. The methods centered on driver status are divided into two subgroups: methods that use physiological signals and methods that use artificial vision techniques. The drowsiness detection using patterns analysis are generated based on measurable variables that are obtained experimentally. These variables can be speed, acceleration, braking, gear shifting, hand pressure on the steering wheel and the car's path in the road lane. This method has the disadvantage that its modeling depends on the characteristics of each car and the way of driving that is specific to each driver. By the use of the image processing, driver states can be determined. From the image of the face it can be detected if the driver is awake or asleep. The drowsiness of the driver can be determined because the driver is trying to close his eyes. This method

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has the advantage of not being intrusive and can be used techniques like the template pairing technique where a driver templates is defined. The technique of the behavior of the eyes, calculates the blinking frequency and the time interval of eyes closing in order to determine the rate of drowsiness. One of the most used indexes to calculate the level of sleepiness is PERCLOS (Percent of the time Eyelids are closed), which measures the percentage of time a person's eyes are closed at 80% to 100% in a period. According to a study by Walter Wierwille and colleagues, PERCLOS is among the most important real-time alert measures for vehicle drowsiness detection systems. Perclose = (Closed eyes time /(closed eyes time + open eyes time))*100 (1) The Yawning technique is based on the driver's yawn frequency. The opening of the driver mouth is greater when yawning than when speaking normally. The mouth is compared with a reference point experimentally obtained by the programmer and the number of times the driver has yawned is calculated to generate a drowsiness index. The analysis based on changing physiological measures use sensors that measure physiological variables of the human body to analyze states of drowsiness. These variables are the heart rate, brain activity, heart rate variability, respiration, peripheral skin temperature.

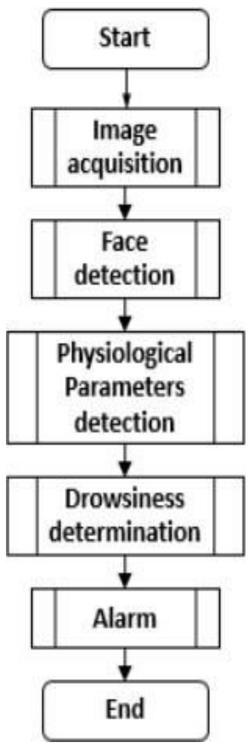

Fig Drowsiness Detection Methods

Feature types and evaluation The characteristics of a good detection algorithm are: Robust – very high detection rate (true-positive rate) & very low false-positive rate always. Real time – For practical applications at least 2 frames per second must be processed. Face detection only (not recognition) - The goal is to distinguish faces from non-faces (detection is the first step in the recognition process). The algorithm has four stages: Haar Feature Selection Creating an Integral Image Adaboost Training Cascading Classifiers The features sought by the detection framework universally involve the sums of image pixels within rectangular areas. As such, they bear some resemblance to Haar basis functions, which have been used previously in the realm of image-based object detection. However, since the features used by Viola and Jones all rely on more than one rectangular area, they are generally more complex. The figure on the right illustrates the four different types of features used in the framework. The value of any given feature is the sum of the pixels within clear rectangles subtracted from the sum of the pixels within shaded rectangles. Rectangular features of this sort are primitive when compared to alternatives such as steerable filters. Although they are sensitive to vertical and horizontal features, their feedback is considerably coarser.

Learning algorithm The speed with which features may be evaluated does not adequately compensate for their number, however. For example, in a standard 24x24 pixel sub-window, there are a total of M = 162 , 336 {\displaystyle M=162,336} possible features, and it would be prohibitively expensive to evaluate them all when testing an image. Thus, the object detection framework employs a variant of the learning algorithm AdaBoost to both select the best features and to train classifiers that use them. This algorithm constructs a "strong" classifier as a linear combination of weighted simple "weak" classifiers.

h (x) = sign (∑ j = 1 M α j h j (x))
{\displaystyle h(\mathbf {x})={\text{sign}}
\left(\sum _{j=1}^{M}\alpha _{j}h_{j}
(\mathbf {x})\riEach weak classifier is a threshold function based on the feature fi f j
{\displaystyle The threshold valueϴi {\displaystyle \theta _{j}}
and the polaritySj
{\displaystyle s_{j}\in \pm 1}
are determined in the training, as well as the coefficients
{\displaystyle \alpha _{j}}aj

III. Result

To obtain the result a large number of videos were taken and their accuracy in determining eye blinks and drowsiness was tested. For this project we used a 1.3 megapixel webcam connected to the computer. The webcam had inbuilt white LEDs attached to it for providing better illumination. In real time scenario, infrared LEDs should be used instead of white LEDs so that the system is non-intrusive. An external speaker is used to produce alert sound output in order to wake up the driver when drowsiness exceeds a certain threshold. The system was tested for different people in different ambient lighting conditions(daytime and nighttime). When the webcam backlight was turned ON and the face is kept at an optimum distance, then the system is able to detect blinks as well as drowsiness with more than 95%accuracy. This is a good result and can be implemented in real-time systems as well. Sample outputs for various conditions in various images is given below. Two videos were taken; one in which only the eyes were detected and the other in which both face and eyes were detected. Though the two processes have relatively equal accuracy, the computational requirements of the former and lesser than that of the latter.

IV. Conclusion

(i) The findings carried out by us suggest that is very much possible to detect drowsiness in drivers by analyzing their blink pattern but works on an assumption that all individual develop drowsiness in the same way.

(ii) It was proved that while the system was found in effective in darkness or lack of lighting causing errors due to non detection of eyes it performed impeccably in normal light giving up to 94% accuracy.

(iii) In the real time drowsy driver identification using eye blink detection if the parameters exceed a certain limit warning signals can be mounted on the vehicle to warn the driver of drowsiness.

(iv) Further it is a viable option to design a continuous scale of drowsiness and on crossings a certain threshold value level the systems could generate a signal which would automatically slow down or switch off the motor.This idea presents a system for drowsiness detection in automotive drivers based on image and voice cues. Onboard monitoring of the alertness level of an automotive driver has been a challenging research in transportation safety and management.

(v) In this paper, we have developed a robust real-time embedded platform to monitor the loss of attention of the driver based on image processing..

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