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Android application based vehicle driver drowsiness detection system through Image Processing

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ABSTRACT

Conduct the simulation experiment and analyze the data to search for an automatic detection system based on driver performance, human conduct and emotions. A design of drowsiness detection systsems is the goal of this venture. A driver with a Drowsy or sleepy mode cannot tell when an uncontrolled sleep will take place. Injury crushes in fall asleep are very grave. Accompanying fatigue or drowsiness-related crashes [1] can result in 1.200 deaths and 77.000 injuries per year in recent statistics. Driver fatigue is responsible for more than 25 percent of road accidents [2]. Through alert the driver about his / her drowsiness, we will can the risk of an accident. The main concept of this system is the simulation of somnolence detection with image processing and the detection of somnolence. Furthermore, the person authorized to locate the vehicle can be notified by GPS. This system helps avoid most injuries, thereby protecting human lives and increasing personal suffering. With this system the car driver eyes are monitored by camera, and we detect driver drowsiness symptoms early enough to avoid accidents by developing an algorithm. Within a specified time, interval, the car driver eyes are closed by more than80 percent. This project will help in advance in detecting driver fatigue and give alarming signals in the form of a sound and an LED blinking. The alarm is manually not immediately deactivated. A deactivation key is used to trigger the alert for this reason. The machine assumes that the operator sleeps and sends a warning message.

Keywords— *Drowsiness detection, Advances vehicle safety, Eye tracking system, Track the location (GPS), Warning output (alarm and LED blinking), Real time drowsiness detection*

1. INTRODUCTION

Dullness of the hand, motion of the head and brain activities are harmful, which are associated to sleepiness. In this Method there will primarily be three components (1) Eye recognition (2) Facial characteristic extra activeness including detecting the aspect of the face (3) Recognition of open or closed ears.

Facial characteristic is also observable in this Process. Face is detected with the face detection algorithm in real time in the MATLAB and facial features such as detecting the portion of the eye and then detecting an algorithm for opening and closing of the eye, reducing tiredness accidents as well as save money and reduced suffering for human beings. In the preceding example, which explains how drowsiness is sensed by the use of wearable sensors, this uses neurological stimuli such as a EEG pulse or brain wave [3], adjustments in the vehicle's performance of equipment such as turning, pace, braking etc. [4], and also uses visual patterns such as a Gaze Position It is very challenging and cost-effective to collect Drowsiness data using external interactions or portable devices or detectors. In order to detect exhaustion or drowsiness by using a self-developed image processing method, we must develop a system that points directly to your driver's face and monitors his ears. The machine will warn drivers on drowsiness.

2. DROWSINESS DETECTION

A driver who is Drowsy or Sleepy cannot tell when an uncontrolled sleep will occur. Injury crushes fall asleep are very serious. According to recent statistics 1200 fatalities and 76000 accidents can be reported annually due to fatigue and drowsiness. 1] Driver tiredness has triggered more than 25% of road traffic accidents. 2] The number of accidents every day is rapidly increasing. They must therefore develop a system that maintains drivers centered on the road and decreases the risk of an accident by alerting the driver to his / her somnolence. Our entire emphasis and focus will be on designing the system which accurately monitors the driver's eye's open and closed status. This system monitors the eyes of the driver with a camera and detects symptoms of driver somnolence by developing an algorithm. Something that senses our wishes is best done by the eyes and facial signs. Within a given time

period the car driver eyes were shut more than 80 percent. 3] Sonic and LED blinking alert output. The alarm is manually disabled instead of automatically. A locking mechanism is therefore used to trigger the warning signal.

3. ALGORITHM STUDY

Description of algorithms and their work: There are three main aspects of this system: (1) Face detection using algorithm viola- jones (2) Facial feature extraction such as detection of the eyes by using algorithm viola-jones (3) Detection of the open or closed eyes by the use of a new logic.

4. HAAR ALGORITHM

Digital picture features in object recognition are hair characteristics. The accessibility measurement is carried out by Haar with only the brightness of the picture (like RGB pixel values for each pixel of the image). The detection window or region at a certain location considered hair characteristics. In Figure (1) the detection window moves through the entire picture. The detection values are summed and pixel values are added up to the total pixels in each area and the discrepancy between quantities is determined.

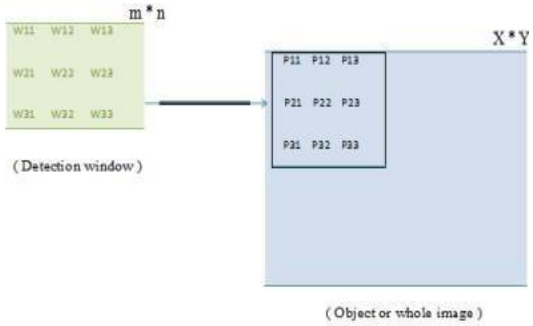


Fig. 1: HAAR Features

The goal size measurement window is relocated over the input picture and numerical measures are used in each subsection of the image. The measurement is then less than the threshold value, which indicates the entity is found.

$$\text{Calculation:} \quad (ii(x,y) = \sum_{x' \le x, y' \le y} \text{value}(x', y'))$$

Or

$$(ii(x',y') = \frac{1}{m \times n} \sum_{i=0}^{x} \sum_{j=0}^{y} wij.pij > t \quad res \quad old)$$

The color of the face, for instance, is lighter than that of the ear. The hair feature is a two- eye and cheek rectangular array. The detection window is the rectangle specified. Figure (2) indicates that in the pixel binary values for the image, the hair cascade is shown as a horizontal, vertical, middle, or angle view of the pixel values.

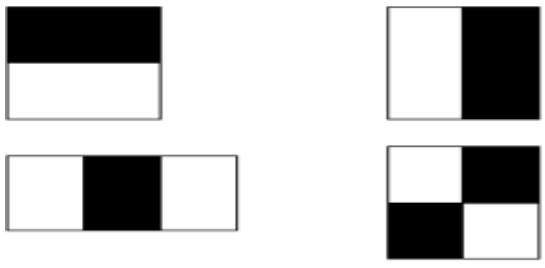


Fig. 2: For kinds of HAAR features in binary [7]

Advantages: Calculation Speed
Disadvantages: Detection time is high

4.1 HAAR Cascade

HAAR cascade is an algorithm for object detection, primarily used for facial sensing and for identifying people, artifacts or facial expressions in an image. The configuration of the cascade and the function in the loop are represented in Figure (3). The classification cascade consists of several phases, each of which is a weak classification. When the sub- windows on any level malfunction, they are evaluated not as facial. It is known only as a head that the sub-windows move through every point.

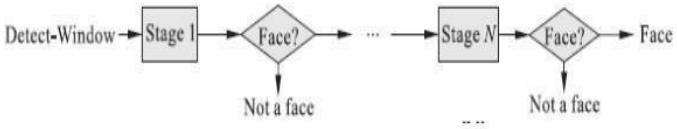


Fig. 3: Structure of cascade features

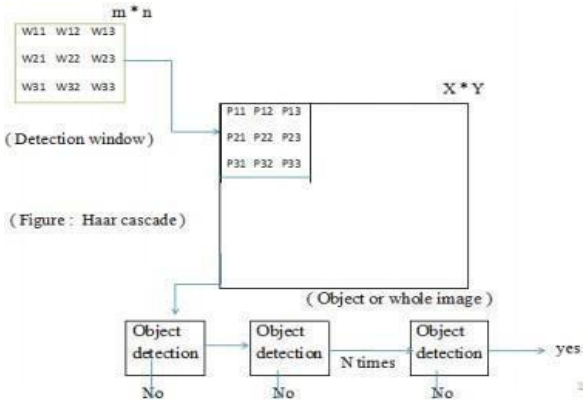


Fig. 4: HAAR cascade algorithm

Figure (4) shows the fact that a cascade classification works with the hair as if features are trained by the hundreds of samples of views of the particular object as a positive image, a car etc. A classifier is then trained; it can be implemented in an input object to the area of interest. The region does not display the object when the classifier is output' Yes' or' 1' and the classifier output is' No' or' 0.' The detector window travels through the photo and searches every position by the classifier, to look for the item in the entire picture. The Cascading Classifier or Detector Fenster was designed so that the target of concern is conveniently resized to the various sizes.

Advantages: Used for particular, detection time is less.
Disadvantages: Numerical value expect, Calculation complex.

Table 1: Comparative study of algorithm

No	Parameters	Haar features	Haar cascade	Viola-jones	Ada-boost
1.	Calculation	Easy	Complex	Easy compared to all	Complex rather than viola-jones
2.	Detection time	High	Less	Less	High
3.	Working area	Whole image	Particular image	Intregal image	Classifier
4.	Resized area	Cannot resized	Resized	Resized	Cannot resized
5.	Accuracy	Low	Better than Haar	High compared to Haar and cascade	High compared to all

Here, table 1 is described that the accuracy of the Ada-boost is very high but its detection time is high and the detection time of viola-jones algorithm is less. So, the viola-jones algorithm is preferable to the first step of this system.

5. METHODOLOGY

In order to detect exhaustion or somnolencia by the self-built photo processing algorithm which provides information about car user' somnolence, we must design a system using a camera that points directly to the driver's face, track the car driver eyes.

5.1 Proposed Work

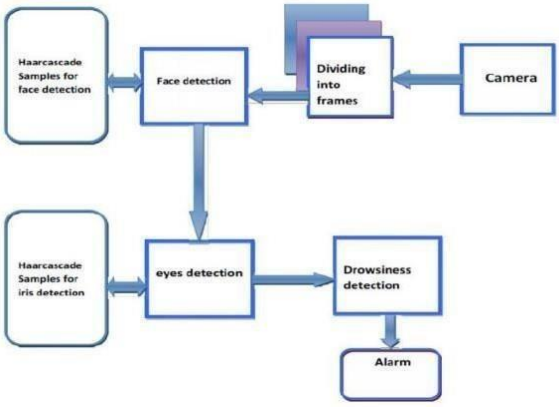


Fig. 5: Block diagram

Figure (6) explains the device to track the driver's eyes using camera and to diagnose signs of driver drowsiness by self-developing an algorithm and provide disturbing signals in the form of the LED blink. Figure (6) The alarm is manually not immediately deactivated. A toggle is therefore used to suppress alert for this reason. The machine assumes that the operator rests and sends a warning signal. Working diagram of the study:

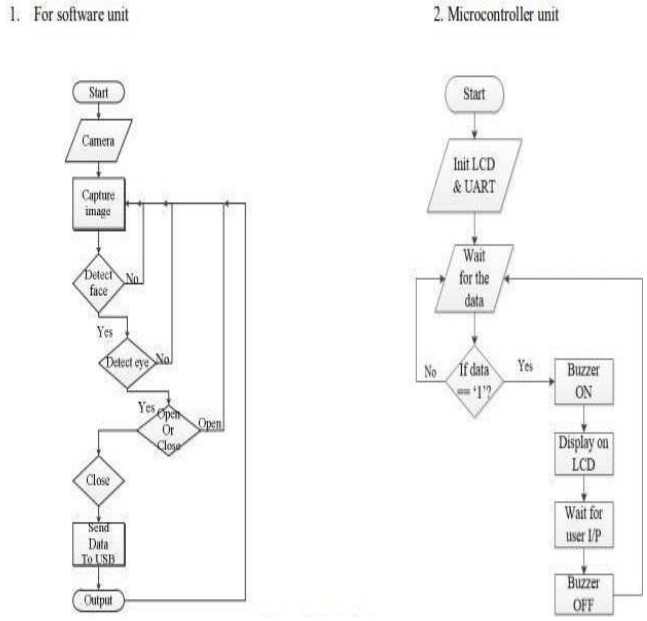
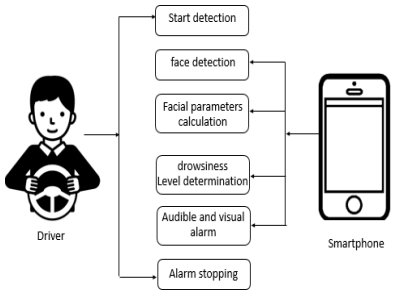


Fig. 6: Flow Chart

5.2 Description

5.2.1 Processing A Static Image: The procedure is based on the algorithm Viola-Jones. The project began with a computer-specified static object eye recognition. The first move was to save the picture in a parameter that shows the position and the object form. Only the eyes are removed from the given picture and analyzed for closure or exhaustion identification. The picture is only processed to identify the image's eye area by providing the region's location, width and distance as input to the feature of the rectangle). By using the vision class in MATLAB you obtain the position, width and height. The built-in Cascade Object Detector feature is used for eye detection. The Eye Detect element, together with the image, is inserted into the phase method and the returned values are XCoordinate, Y Coordinate, Breeding and Height of the eye area. The image is then truncated with a method of imcrop) (and the illustration itself is one source as the n*4 matrix. The RGB picture obtained is transformed first in the rgb2gray) (method to its corresponding grayscale form. This is accompanied by the transformation of the resultant gray picture with theim2bw) (feature in its black and white shape. The resultant BW picture is then extended to just the face. The goal is toimprove the front-end functionality of the dilation method. IM2=imdilate(IM, SE) dilates the grayscale, binary or mixed image IM loaded to represent dilated picture IM2, IM2. SE is the entity which forms the component, or set of items that the STREL function returns. The operator's fundamental influence on a binary object is that it slowly enlarges the boundaries of foreground pixel regions (white pixels). The use of the MATLAB image processing method therefore allows sleep detection systems large and small regions of the foreground object pixels.

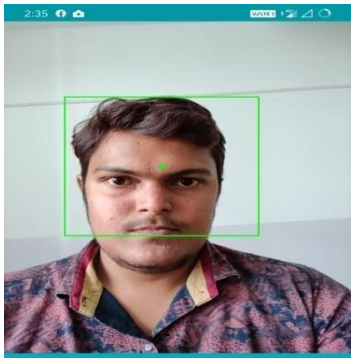


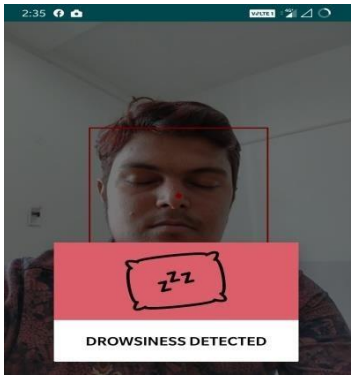
5.2.2 Processing A live feed: The next step was to perform the same thing on a live video feed, either with an external USB-operated camera or with an integrated webcam. The accuracy of this eye sensing approach is dependent on the camera's response. The relationship with accuracy is found to be direct. The higher the precision required, the better webcam performance. Next, the first move is to recognize the installed webcam drivers and then set up the webcam in order to get the video feed required. By using the imaqhwinfo) (feature, the related webcams are found. The following step was a webcam configuration and video assignment. The frames are matched to the image object's properties by the trigger and returned color space. The live feed was then achieved with the start function (video object). For the face detection, an entity FaceDetect was initialized with the sight declaration of Cascade Object Detector. The next phase was the picture so that only the mask for further eye recognition was kept fixed. The live video stream can be presented as independent structure and each frame interpreted separately. To trigger an item Eye Detect was using the sight Cascade Object Detector for the identification of the eye area. The recording of the clip for the first 50 frames was initially carried out. The video has been converted into a single frame with the function getsnapshot), (which returns an image matrix for RGB. The next move was to define a static image of the eye area, the distinction being that the image was preserved digitally in a MATLAB script instead of in the computer's memory. The loading time is improved since the getsnapshot) (functionality only operates when connecting to the webcam. The triggerconfig) (property of the video object was set to manual mode to reduce the amount of time it took to getsnapshot). The EyeDetect element, together with the image and the return values of the X coordinate, Y coordinate, Width and Height eye area, are given as input to the phase method. The image is returns. The picture is then trimmed with the imcrop) (function, one as the n- cross-4 matrix and the other as the object itself. The resulting RGB image is first converted by the rgb2gray) (function to the equivalent gray form.

5.2.3 Judging Drowsiness: A person's weight loss can be determined by the length of time when his / her eyes are shut. The quicker identification and retrieval of information is the goal of our program. Track the number of frames that cover the eyes. When the number of frames reaches a certain level, the screen produces a warning message that the driver is drowsy. The webcam acquires the image for storage in our algorithm first. So, we check and identify the faces in each image by using the Viola Jones Algorithm. The image is obtained if no eye is found. If a face is detected, the area of interest within the face is marked. The ears are in this area of interest. Defining an area of interest significantly decreases the system's computational needs. The eyes are then identified by Viola Jones Algorithm from the region of interest. If an eye is observed, the blink counter K is set to' 0' and there is no reaction. If the eyes in a particular picture are shut, the blinking monitor is enhanced and a blinking is remembered. It is deducible that the driver feels drowsy when the eyes are closed for more than 4 frames. Drows are therefore observed and there was a warning. The whole process is then repeated while the driver drives the car.

6. RESULT OF FACE DETECTION

The general definition of face detection is that human heads are separated from their surroundings and located precisely in the image. Face is our system's main focus on identification transmission. Computer system human face detection is now one of our system's main fields. Numerous algorithms are implemented in facial identification using this framework and/or methods such as our information, model game, neural networks, image decomposition, pattern recognition, etc. We use the algorithm for the face detection with viola jones in our process. The result is displayed in figure.





7. CONCLUSION

Through the application of MATLAB and Viola Jones algorithm, we have established the positive drowsiness detector model. The current study confirms that drivers do not have sufficient rest, leading to sleepiness. And the factors causing traffic accidents are drowsiness. A system that detects the driver's somnolence is therefore necessary. In many tests, the system detects the driver's drowsiness and somnolence symptoms are: blinking, disturbance rate and oscillations. These patterns determine a level of drowsiness, however in the case of this outside the range established to recognize the face, the distraction level presents difficulties. In this case only with blinking frequency and eye opening because they are the most prevalent.

8. FUTURE WORK

Once fatigue rates exceed a certain threshold, a vehicle must be immediately slowed down with the real-time fatigue detection system. It is advised that a continuous driver fatigue detection system be developed rather than a minimum drowsiness rate. This constantly measures the degree of drowsiness and produces a signal to activate the vehicle's hydraulic braking system if this amount reaches a certain value.

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