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An Ideal Mechanism For Sensing State And Alarm Of A Driver Drowsiness Detection System In Automobiles

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ABSTRACT

Driver exhaustion is a significant factor in many collisions involving automobiles. A significant problem in accident prevention is the identification or avoidance of drowsiness at the wheel. The paper aims to gather the drowsiness signs from the driver's face by examining the condition on driver eyes. It is done by the processing of video images collected using a sensing tools. The results of the video are used for determining levels of somnolence and give the driver, message whether teamster is drowsy.

1. Introduction

In many car incidents driver fatigue is a major factor. Latest figures suggest that 1,300 fatalities and 85,000 injuries are due to fatigue-related accidents annually. Developing technology to detect or prevent drowsiness on the wheel is a major challenge for accident prevention systems. Because of the danger that drowsy poses on the roads, method to counteract its effects need to be created. The main idea behind this project is to develop a method to detect drowsiness. The important significance in this developing gadget is to track the movement of eye whether it is open or closed in real-time with precision.

By tracking the pupils, the signs of driver exhaustion are known to be evident initialample to prevent a car accident. Fatigue finding requires a series of facial expressions, and the identification of eye actions and flash patterns. The typical examination field for analyzing the face with applications, for example face recognition technique virtual apparatuses and security frameworks of human recognizable proof [1]. This implemented technique mainly focuses on pointing out the eye point, this is projected by capturing the whole face image and by using image- processing algorithm the exact portion of the eye is identified. Finally, after finding the position of the eye the device is programmed to detect the eye open and closure and it identifies the fatigue.

2. Methodology

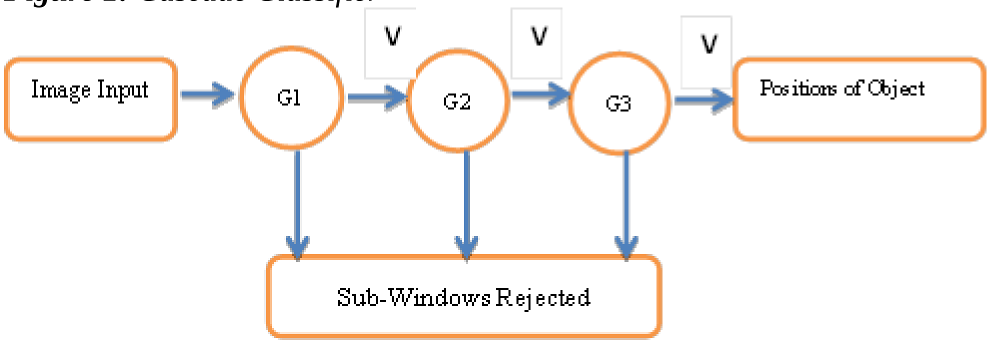
The new device is Automotive Drowsiness Monitoring System. Driver somnolence is determined from many symptoms that appear in the face of a drowsy driver. The machine would be capable to communicate a sleepy driver from a regular driver by examining the eye statuses [2]. An endless stream of video is gathered from faces of the teamster and fed in embedded controller for processing. At that time, eye condition of teamster is classified; classifiers are used.

First it captures the image of a person and identifies the face from the captured video. Later, it detects eyes and ears. If it is successful then it checks whether eyes are closed for a specific period of time or not. If it is closed more than a specific time (6sec), it identifies that the person is drowsy and it plays an alarm.

2.1 detection of face

With eyes located in the face region it is important to locate the eyes to detect the face. In this system is adopted for achieving this viola and Jones object detection algorithm. Algorithm use haar structures that are mined from the acquired images, and then use an ada-boosting cascade classifier to distinguish facial features from background types. Algorithm was applied by basic images; a principle decreases anamount of computations the detector wants to make [3]. Further ada boosting principle is used to increase algorithm efficiency. This definition combines numerous weak classifiers to create a powerful cascade classifier that is used in this framework.

Figure 1: *Cascade Classifier*



The framework adopted Implementation of the algorithm the opencv kit provides.We detect various parts of the face such as nose, mouth, ears along with eyes so that it would be easy for future enhancements if we want to extend using mouth movements to include in detecting drowsiness. The code snippet for this is as below.

```
shapef = facew_utils.shapef_to_np(shapef)
nosew = shapef[aStart:bEnd]
jawf = shapef[bStart:aEnd]
mouthw = shapef[xStart:yEnd]
```

2.2 eyedetection

In eye detection a related method is adopted, the hair features are collected from the face region and cascade classifier is used to identify as either eye or non-eye types[4]. Framework uses eye classifier "haarcascade eye.xml" that is too adapted from opencvsuite.It helps to minimise overall training period and reduces stringent practices involved in evaluating results.

```
locater = dlib.get_frontal_face_locater()
reader = dlib.shape_reader(args["shape_reader"])
(lStart, lEnd) = face_utils.FACIAL_LANDMARKS_IDXS["left_eye"]
(rStart, rEnd) = face_utils.FACIAL_LANDMARKS_IDXS["right_eye"]
```

2.3 state of eye detection

An eye is open when you can see from the real world, but from the machine viewpoint, eye wasmeasured open once the gap between eye top and bottom part is less than the defined threshold value [5].To be able to detect these states we have used a function which calculates the Eye Aspect Ratio using eucledian distance formula. We have used the following algorithm to find EyeAspectRatio.

```
leftEAR=functions.eye_aspect_ratio(leftEye)                    rightEAR=
functions.eye_aspect_ratio(rightEye)
```

Here the function that we have use this “eye_aspect_ratio”, which returns the EAR value based on the coordinates of the eye that have been passed.

```
def eyew_aspect_ratio1(eyew):
A = dist.euclidean(eyew[1], eyew[5])
B = dist.euclidean(eyew[2], eyew[4])
C = dist.euclidean(eyew[0], eyew[3])
```

earw = (A + B) / (2.0 * C)
return earw
Once we get the Eye Aspect Ratio (EAR) of each eye, we find the average aspect ratio and that would be our deciding factor for drowsiness.
EAR = (leftEAR + rightEAR) / 2.0

2.4 drowsiness detection

In assessing sleepiness level in teamster, theproportionattained in loop of 200 frame, representing block of 20 sec.To calculate the over-all number of frames obtained, a total frame counter is used [6].

The amount of period your eye was close= (drowsy/totalframe) x 100.

Calculations are prepared in 200 frame block;eachdenotes 20 seconds, since device wasfixed to run 10 frames / s. The values how the device uses processor clock time to measure the time taken by consecutive drowsy frame to measure the intervalvariance wheninitialnodding frame and last one isnoticed.

cpu_time_taken = ((double)(stop - start))/CLOCKS_PER_SEC;

Variance among two subsequent cpu time taken is derived from the time received by the CPU to providecomplete time occupied by smallsleep.

System will monitor the thresholds on an ongoing basis once driver drowsiness thresholds have been established and if they exceed assured level fixed at 50% and softwaredisplay alert [7].

cv2.putText(frame, "WAKE UP!", (10, 30), cv2.FONT_HERSHEY_SIMPLEX, 0.7, (0, 0, 255), 2)

When drowsiness is detected we will show a message on the screen using the putText method as shown above. An alarm is also triggered once the drowsiness is detected.

defsound_alarm(path): playsound.playsound(path)

Figure 2: *Driver Drowsiness Chart*

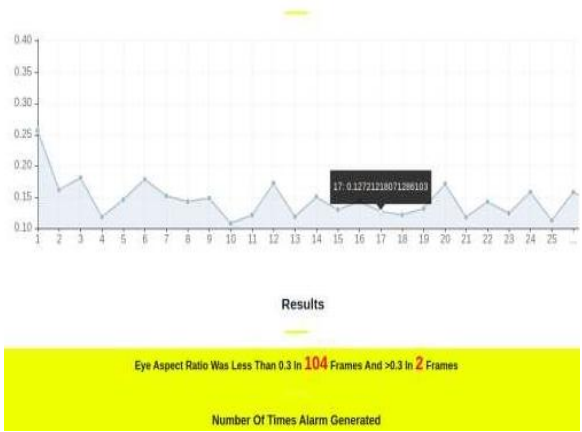


Figure 3*: Driver Drowsiness Chart*

The graph is plotted between the no of frames and eye aspect ratio in each frame. Here we have generated results for algorithm one where we have used Euclidean distance to calculate aspect ratio.

3. Result

The performance of the system when tests are carried out indissimilar conditions has been reached with interesting findings with various factors found to influence the system performance. Lighting is a parameter that significantly affects device efficiency when the device is evaluated under various illuminationsituations; the results differ constantly dependent on the external level.Inregular lighting situation, the output is high as shown by the test, in this situation the device reported up to 91% drowsiness detection when lighting is regulated but the average drowsiness recognition is down to 65.1%. But these figures differ dependent on the illumination situation prevailing.

Table.1: High illumination (strong lighting in the direction of the camera)

High illumination (strong lighting in the direction of the camera)				
Drowsy / alert found in 1000 captured frames	Drowsy frames identified	Projected No of unobserved drowsy frames	Alert frames detected	Projected No of unobserved Alert frame
Alert driver	10	990	23	977
Drowsy driver	34	976	43	956

Table.2: Normal Illumination (Normal Lighting With Good Visibility)

Normal Illumination (Normal Lighting With Good Visibility)				
Frames detected in 1000 frame Captured	Drowsy frame	Estimated No of un detected drowsy frames	Alert frames detected	Estimated NO of undetected Alert frame
Alert driver	112	888	840	160
Drowsy driver	651	549	346	654

Table.3: Low Illumination (Poor Lighting Condition)

Low Illumination(Poor Lighting Condition)				
Frames detected in 1000 frames captured	**Drowsy frames**	**Estimated No of un detected drowsy frames**	**Alert frames detected**	**Estimated NO of undetected Alert frame**
Alert driver	3	997	10	990
Drowsy driver	6	994	4	996

4. Conclusion

A transmission module can be integrated to improve control and more driver situation to transmit the driver state data to the relevant authorities in real-time. To improve system efficiency onnight-time, areas with stubbornlighting conditions, alivelyvideo capture routine can be accepted over visible light- dependent cameras, for example infrared camera.The research should be expanded in the future to cover extra complex user behaviours in visible of the camera which direct driver sleepiness.

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