Driver Drowsiness Detection System

Nikunj Mistry
UG Student, Department of Information Technology, Universal College of Engineering,
Kaman, Maharashtra, India

Abstract:- A Driver Pattern Recognition System was developed, using concepts based on the concept of a non-disruptive machine. The machine uses a small monochrome safety camera that points directly to the driver's face and monitors the driver's eyes to detect fatigue. In such a case when fatigue is detected, the driver is alerted with a warning signal and if the driver is distracted he will also warn the driver to be careful. This report explains how the eyes can be found, and how to determine if the eyes are open or closed. The advanced algorithm differs from any currently published documents which is the main objective of the project. The device deals with finding facial edges using information obtained from the binary version of the image, which reduces the area where the eyes will be. When the surface area is defined, the eyes are obtained by measuring the horizontal area. Recalling the knowledge that the circuits of the eyes on the face bring about a great change in strength, The eyes are obtained by experiencing major changes in facial pressure. When the eyes are in a good position, measuring the distances between the size changes in the eye area determines whether the eyes are open or closed. The long distance is associated with blindfolds. If the eyes are found closed with five consecutive frames, the machine assumes the driver is asleep and sends an alarm. Also, the system can detect when the eyes are not available and operate under appropriate lighting conditions.

Keywords:- *Binarisation, OpenCV, Detection Algorithm, Noise Removal.*

I. INTRODUCTION

In a large number of car accidents, driver fatigue and frustration are a major factor. The latest figures estimate that 1,200 deaths and 76,000 injuries are caused by fatigue-related injuries each year [3]. In most car accidents, driver fatigue is a major factor. The latest figures estimate that 1,200 deaths and 76,000 injuries are caused by fatigue-related injuries each year [3]. Improving the technology to detect or prevent drowsiness in a wheelchair is a major challenge to the safety plan. Because of the danger posed by drowsiness on the line, Strategies to combat their effects need to be developed. This project aims to develop a sleep recognition tool. Emphasis will be on building a device that can follow the driver's eyes open or closed in real time with accuracy [1]. By tracking students, signs of driver fatigue are thought to appear early enough to prevent a car accident Detection of fatigue requires assessing eye movements and blinking patterns in the sequence of facial images [2]. Initially, we agreed to use Matlab to find blinking patterns. The process used to control geometric power levels [4], [5], and [6]. The algorithm used was as follows. First we use a webcam to capture a face photo. Pre-preparation is done initially with a binarizing file [7]. The upper and lower extremities are felt to reduce the area where the eyes live. In facial cases, the center of the face was found and would be used as a reference when measuring left and right heads [9]. The exact measurements of the facial area were determined 1 from the bottom from the top of the nose. Significant variations have been used in the measurements to describe the location of the eye. The horizontal scale did not shift while the eyes were closed and used to detect blinking [7], [8], and [12]. Matlab however had some problems. Matlab's processing power was extremely powerful. There were also some speed issues in real-time performance. Matlab could only process 4-5 frames per second. There was also a low 9 on the machine with low RAM. Because we all know that the blink of an eye is a matter of milliseconds. The movement of the driver's head can also be very fast. Although the discovery was made possible by the Matlab software developed by us, the result was very interesting. OpenCV came in this way. OpenCVV is an open source computer library. This is optimized for computer performance, with a strong emphasis on real-time applications. It helps to develop vision applications quickly and efficiently. OpenCV meets our low processing capabilities and high-speed data. In OpenCV, we used Haartraining software to detect faces and eyes [5], [9], [11], and [14]. This produces a separation, given a set of straight and non-specific samples. The steps are as follows: Collect face and eye data collection. This should be stored in a text file identified in one or more folders. For segregation to work effectively it requires high-level data [10]. Sample production system) (used to create a vector output format. We can duplicate the training process using this text. It produces beautiful samples from images to a specified width and height before adjusting and enlarging the size. Image editing is done using magnification. group categories are a weak divider. Usually, these weak dividers. They contain one different determination drug, called stumps. At the training session, the decision-maker learns in its data about its classification decisions and learns its accuracy in the weight of the voting data. it is estimated that the data points in which errors are made are highly regarded [8] .The cycle continues until the data collection error occurs in the vote e the average of the decision trees falls under a certain threshold. This algorithm is effective when there is a large amount of training data. Face-to-face planning is required for our project. So we used a learning curve to create our haarclassifier.xml files. [5], [10], [11], and [13].

II. OBJECTIVE

Improving the technology of monitoring or avoiding drowsiness on the wheel is a major obstacle to accident prevention programs. Resistance mechanisms need to be developed because of the risk of drowsiness on the line. The aim of this project is to improve the perception of drowsiness. The focus will be on developing a device that can accurately track the driver's eyes open or closed in real time. Following the student's lead, signs of driver fatigue are thought to appear early enough to prevent a car accident. Identification of fatigue requires a sequence of facial images to monitor eye movements and blink patterns.

III. LITERATURE SURVEY

1. Techniques for Drowsy Driver Detection

Existing drowsiness techniques for drivers can be divided into the following categories: hearing the body character, hearing the driver's work, hearing the response of vehicles, monitoring the driver's response.

2. Monitoring Physiological Characteristics

Among these methods, the best techniques based on accuracy are those that focus on physical processes in humans. This method is used in two ways: tracking changes in body signals, such as brain waves, heartbeat, and blinking of the eyes; and tracking body adjustments, such as reduced posture, driver's head leaning, and open / closed eye conditions. The first method, although very effective, does not work, because hearing electrodes will need to be connected directly to the driver's body, therefore, it will have to be irritating and disturbing. In addition, prolonged driving will lead to changes in sensitivity, reducing their ability to monitor precision. The second method is best suited to real-world driving situations because it may not interfere with getting the correction using visual cues from video cameras.

3. Non-intrusive ways of detecting drowsiness

With the analysis of driving wheel movement, accelerator or brake movements, vehicle speed, lateral acceleration, and lateral movement, the driver's behavior and vehicle behavior can be enforced. There are also non-invasive procedures for acne but are limited to vehicle form and driving conditions. The final process of getting drowsiness is to follow the driver's reaction. This means that the driver is always asked to send feedback to the device to indicate alertness. The problem with this method is that it will gradually disrupt and care for the driver.

4. System Configuration of Background and Ambient Light

Since the eye tracking system focuses on the change in intensity on the face, it is important that the reference does not include an object with a sudden change in intensity. The camera can pick up a high reflective object on the back of the pilot, and may eventually be mistaken as an eye. Since this design is a prototype, a managed area of lighting has been developed for testing. It is also necessary to have less surrounding light (ambient light), as the only significant light that illuminates the face will come from the dubbing driver. If there is too much ambient light, the effect of the light source will decrease. A dark background and less ambient light were used in the test area (in this case, the ceiling light was physically higher and thus less light). This setup is very realistic because there is no direct light inside a car, and the background is relatively similar.

5. Using the absence of retinal reflexes as a way of detecting when the eyes are closed

There are many strategies and procedures for eye tracking and procedures, as well as monitoring. Most of them are somehow related to the eye features (eye drawings) within the driver's video image. The first objective of this project was to use (only) the manifestation of a bone as a means of obtaining eyes on the face, and then to use the absence of this expression as a means of detection when the eyes are closed. It was then realized that this approach may not be the best way to keep an eye out for two reasons. First, the amount of retina thinking is reduced in low light conditions; and second, the manifestation may not be visible if the person has small eyes.

IV. EXISTING SYSTEM

Various techniques are used to identify passenger drowsiness, which can be divided into three categories [4], [5], and [6]. The first group focused on vehicle details such as vehicle location in route monitoring and directional patterns [7], [8] and [12]; The advantage of this method is that when it is available in the Controller Area Network, data can be easily accessed without external hardware. The downside to this is that road conditions and driver behavior, depending on measurement parameters, can lead to false positives or may result in poor sleep. A little sleep is a small slur of sleep, which is often heard without anyone even knowing it is happening. Anyone who is tired will meet them, but the people most at risk are those who work night shifts, have sleep problems such as sleepiness or sleep apnea, or are deprived of sleep. The second group includes methods based on the physical dimensions of the driver [9]. To diagnose drowsiness, some researchers have found the following physical symptoms: electrocardiogram (ECG), electromyogram (EMG), electroencephalogram (EEG) and electrooculogram (EoG) [10], [13]. To force this process, the driver's body must have an electrode attached to it. But this may not be good for both drivers and car companies. To date this has not been considered successful. The third group has methods that focus on following the eye / face of drivers [5], [9], [11], and [14]. This paper is based on a third section that uses eye condition to identify disrespect. The state of the state is determined using the driver's opinion. The camera is used to record pictures of the driver. Matlab is used to get an image of the eye, as well as to analyze it to see if the shape of the eye is open or closed. This method is more effective than others as the driver's sleep can be caught with their eyes.

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V. PROBLEM STATEMENT

Nowadays, automobiles are getting smarter as new technology develops. Cars can understand the roads, environment and driver's behavior. Automobiles add new safety features. It has been found that vehicular activities that contribute to traffic accidents are primarily drowsiness, distracted driving, and diversion. According to the National Sleep Foundation's Sleep in America survey, 60 percent of adult drivers (168 million people) Has driven a vehicle when it was being realized. In fact, 37 percent (103 million) people slept at the wheel. Therefore, to avoid accidents and save the lives of people, the driver celebration warning function is very important.

VI. PROPOSED SYSTEM

The proposed approach is divided into two major parts. The first step is to collect the driver's images from the captured video, identify the area of the face in those images, and then assess the area of the eye. The second part is responsible for extracting relevant features that reflect the level of drowsiness of the eye. Binarization is the next step to detect the eyes. Binarization converts the image into a binary image. The binary image is an image in which only two different values are considered for each pixel. In this case, the values 0 and 1, 0 are black, and 1 are white. It is easy to separate objects from the background with a binary image. The grayscale image is converted to a binary image through a threshold. In all pixels of the original image, the resulting binary image has values of 0 (black), with zeros for all other pixels and luminosity less than 1 (white). The threshold is often determined based on the surrounding light conditions, and the color of the driver. A threshold value of 150 was found to be efficient after studying several photographs of different faces under different light conditions. The criterion used in setting the appropriate threshold was on the basis that the binary picture of the driver's face would be predominantly white, causing some dark swelling from the eyes, nose, and / or lips. An ideal for the algorithm is an example of a binary image in which the background for detecting the eye is predominantly black, while the mask is predominantly white. Which will identify the edges of the face.

In the method of eye detection, the next step is to find out the face top and width of the driver's face. This is important because the outline of the face points down the area where the eyes are, which makes it easier (computationally) to determine the position of the eyes. The first step is to find a face top. The first step is to find the point of departure on the face, then reduce the y-coordinates until the top of the face is identified. Assuming the person's face is at the center of the image, the starting point of departure used is (100,240). The initial x-coordinate of 100 has been chosen to ensure that the starting point is a black pixel (not a face). The following algorithm describes how to locate the actual starting point on the face, which is used to position the top of the face.

1. Increasing the x-coordinate starting at (100,240) before the white pixel is located. It is believed to be the left side of the face.
2. When 25 more white pixels accompany the initial white pixel then continue to increase x until a black pixel is identified.
3. Calculate the number of black pixels after the pixels found in step 2, if a sequence of 25 black pixels is identified it is on the right.
4. The new starting x-coordinated value (x1) is the middle point of the left and right sides.

The top of the head can be found through the new starting point (X1, 240). The algorithm for finding the top of the head is as follows:

1. Starting from the starting point, decrease the y-coordinate (i.e.; move aface-up).
2. Continue decreasing until you find a black pixel. If y becomes 0 (reaches the top of the image), set it at the top of the head.
3. To see if a white pixel follows, check the black pixel.

i. Continue decreasing y if a large number of white pixels areidentified.

ii. If no white pixels are seen, the top of the head is at the level of the original pixel in black.

When located above the driver's head, the sides of the face can also be located. Here are the steps used to find the left and right faces.

1. Boost the top Y-coordinate by 10 (found above). Etiquettethis

Y1 = Y + Tall.

2. Find the face center using the stepsbelow:

i. At point (x1, y1), switch left until you find 25 consecutive black pixels, thisis

To the left (lx).

ii. At point (x1, y1), move right until you find 25 consecutive white pixels, that is the right side(rx).

iii. Face center (in x-direction) is: (rx-lx)/2. Label anx2.

3. Starting from the point (x2, y1), retrieve the top of the face. This will activate a new y-coordinate,y2.
4. Finally, you can find the edges of the face using the dot (x2,y2).

i. Increasing the coordination ofy-.

ii. Move left by subtracting the x-coordinate, when there are 5 consecutive black pixels You will find the left-hand side, add the x-coordinate to the labeledarray

'The left x.'

iii. Move right by adding in the x-coordinate, when there are 5 consecutive black pixels; You will see, this is the right side, add x-coordinate to the labeled array

'right x'.

IV. Repeat the steps above 200 times (200 different co-ordinates ofy).

To detect the rectangular portion of the eye
Detector =VisionDetector. CascadeObject (1)

Using the Viola-Jones algorithm, it creates a System Object Detect for items such as the nose, mouth, or upper body. By default face set is set, then the next step command is executed

Rectangular binding numbers [x y lengths]. Rectangle = step (EyeDetect, I) (2)

The values were changed as follows in this Rectangle to prevent

Rectangular nose and eye glasses
x = x+ 10 (3)

That transfers 10 pixels from starting point to the right W= w-10 (4)

Trunk 10 pixels at the endpoint.

Thus 10 pixels at the left and 10 pixels at the left The right side has been removed.
Y = y + 4 (5)

The starting point is moved 4 pixels downwards.
L= L-20 (6)

The next step is Noise removal. Noise removal from a binary image is very easy. From the top, (x2, y2), turn left to pixel by subtracting x2, and set each y white (200 y). Repeat the same on the face on the right. The key to this is to pause on the edge of the right side face and left side face; otherwise, details of the facial contours will be lost.

After the black blobs on the face have been removed, fascial edges are found again. As shown below, secondly doing so helps you to see the edges of the face better..

Detection Algorithm

Once the image was processed the final step was to determine if the eyes were closed or not. Many images were tested to understand the difference between open and closed eyes. The system determines/needs the following requirements to determine:-

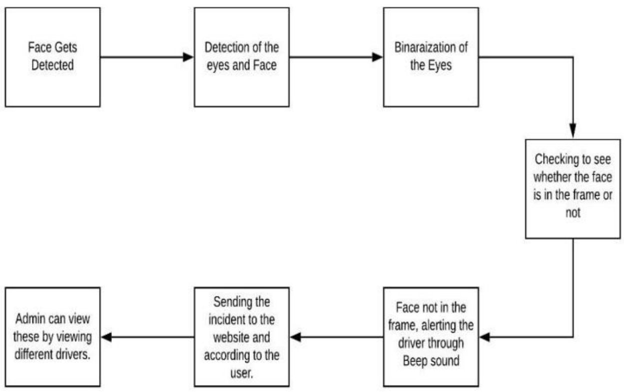
- Ratio of Black and White Pixels
- Column Count Greater than threshold
- The Rectangle Frame on the Face of the Driver

The first process calculates the black and white pixels in the image and then takes its measurement when the number of black pixels is 0 and White has the mean 1. When the eyes are open, the ratio between black and white pixels is higher than when the eyes are closed Instead, the scale is used to calculate black pixels, only. If the scale of the image decreases with white and black at the same rate that is it. Therefore the change in image size does not affect the effect. The Second Algorithm for Detection.

Is based on the column length of the image with the black pixels Matrix Indicator

- Summarize the number of black pixels (0) per column Ireland.
- Check if the threshold value is greater than the length.
- If the eyes are partly closed the length of the column would be Discounted.
- The eyelid covers the iris while the eyes are closed, and only the eyelashes turn to a dark pixel. The third method which is to obtain the Eye 's Shape (iris) Method has been added to remove false positives (i.e. Close or Open). The binary eye image is divided into two parts, and each of these eyes is obtained for testing. Its form uses the same method as described below.
- This method depends on the part of the eye. The eye has a large surface area and narrows as it moves to the left or right. This method detects eye formation by taking a column with a total number of black pixels. Then scroll left to see if there is a decrease in the number of black pixels in the next column and see the right side of the same. If at least the two methods mentioned above lead to eye opening, then the eyes are considered open.

VII. SYSTEMARCHITECTURE



VIII. CONCLUSION

Successfully implemented a drowsiness detection algorithm that captures live images from the camera to detect differences between the driver's open and closed eyes. Three or more consecutive cases of open or closed eyes are considered to experience drowsiness. If this happens it is an indication that the driver is sleepy and the system gives the driver a warning signal. The machine can detect the shape of the eyes with or without standard glasses. In some cases, the device may give incorrect results due to the effect of light, the location of the driver. Systems need to be made more reliable in future development so that these three variables do not become a hindrance to achieving a direct result. To set the limit values for continuous improvement, the system can be set to default reading at the beginning. In addition, data from one or more objects such as the steering wheel, lane time, and accelerator can be readable.

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