

Real Time Drowsiness Detection

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ABSTRACT

A large number of traffic accidents occur worldwide every year that claim the lives of millions of people. A prodigious number of these accidents leave people with astringent injuries such as cut arms, lost legs, spine injuries, brain damage etc which are no less than a fatality. Not only does it claim lives but in many cases it leads to loss of property. Statistics claim that a vast amount of these accidents are caused on part of the drivers and one of the leading causes is the driver drowsiness. To tackle this problem virtuoso have proposed many techniques and methods that encapsulate a number of fields of studies of science among which one prominent and promising technique is that of computer vision in amalgamation with one of the assuring technique of artificial intelligence called machine learning.

Keywords: Driver fatigue, Drowsiness detection, Deep learning, Accident prevention Intelligent transport system.

I. INTRODUCTION

Consenting to open accurate data, over 1.3 million people spend on every year in the city and about half a million people suffer non-deadly injuries as a result of road accidents [1]. In view of police reports, OPEN ACCESS Sensors 2012, 12 16938 the US National Avenue Movement Security Association (NHTSA) moderately surveyed that an aggregate of 100,000 vehicle crashes annually are the arrange aftermath of driver sluggishness. These accidents came about in around 1,550 passing, seventy one thousand lesions and estimated twelve and a half a billion in cash related hardships [2]. In the year 2009, the US National Rest Foundation (NSF) nitty gritty that fifty four percent of adult automobilists have driven an automobile while feeling worn out and twenty eight percent of them truly fell dozing [3].

Studies have suggested that most of the vehicular accidents are caused because the drivers are over exhausted when driving the vehicle and getting very less sleep or no sleep at all still continue the driving task even been worn out mostly on highways. This is done at a huge risk to lives and property. Researchers have devised many methods to overcome this problem by devising many methods some of which may be even used in conjunction with each other.

Our study also provides a solution to this problem making use of the approach of deep learning. In which we will be using Haar Cascade algorithm which has been explained in the following section. This algorithm detects a persons face and uses the eye information state to determine whether the person is in a drowsy state or not and eventually alarming the concerned party to avoid any accidents from happening.

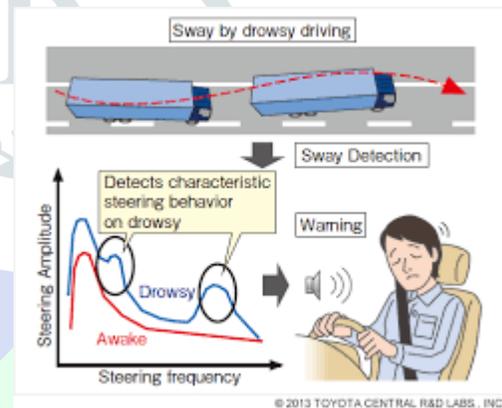


Figure 1: Depiction of drowsiness detection

Figure 1 given above shows in nutshell the detection of the fatigue of a driver using one of the many methods that involve the observation and analysis of the steering wheel that the driver has been holding and this factor used in determining whether the driver is depicting an abnormal behavior is called as the steering wheel movement.

II. METHODOLOGY AND IMPLEMENTATION

The proposed system comprises of two major steps each of which have its own underlying methodologies and algorithms applied. Figure 2 gives the block diagram of the proposed system model showing roughly how the system implements its different functions to achieve the desirable results and finally analyze if the proposed system is robust to face the challenges of an actual real world environment.

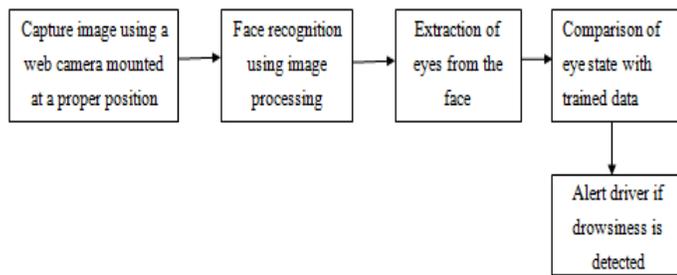


Figure 2: Proposed system for drowsiness detection

Step 1. Using image processing

Using image processing techniques we can capture the images of the driver using a web camera of a proper quality. This step is further divided into a number of steps which even use mathematical functions and calculation. The following sub steps are included in this major step:

1. Capturing images from a proper web camera:

This could be any camera like a laptop camera through which we capture the image. Since we will be using open cv it allows us using a function with which we will be have captured the image as frames which will be saved in our files for later access and observation.

2. The image may consist of the background of the driver which is not of interest to our analysis. But we only need the face of the driver so after capturing a whole image we need to extract our area of interest which the driver's face for which we use image processing.. Hence, object detection needs to be done. Here, we are using Haar algorithm using the open cv framework given by python. The appropriate mathematical functions process the image captured by the camera and extract the face from the image discarding the remaining background of the image which is of no use in our study. Thus, the resultant of this step would be the face area which we may call our region of interest. We are not interested in the color of the images as we are using open cv which processes image using grayscale .So, using appropriate functions we convert our image to grayscale for further processing. Here in our Haar cascade algorithm works which extracts from the whole image the face of the person forming rectangular portion across the face saving the appropriate x and y coordinated of the rectangle and the height as well.

3. The third sub step following the extraction and generation of our region of interest would be the detection of the eyes from the generated region of interest as the focal point of our study lies with the analysis of eyes.

Step 2: Using machine learning

Our approach uses the concept of machine learning hence we are making use of the neural network for our study purposes. Here in we will be using a specific type of neural network called the convolution neural network which is based on a study field

of artificial intelligence known as deep learning. The reason we are using the convolution neural network is that this technique is promising and very well suited for image classification purposes. This convolution neural network that we are using is basically a type of deep learning model which comprises of three main layers which are an input layer, a hidden layer and a final output layers. Here , what needs to be noted is that the middle layer may in turn consist of a large number of layers through which the data may be trained. Hence this model would provide results which are much efficient than many other models that could be considered for the same purpose.

The following sub steps follow the detection of eyes:

1. As eye detection is performed using image processing techniques , the resulting image is fed into a classifier which is an already created file or we can say an already created database where many different eye positions have already been stored in the form of training data sets and the various eye positions using functions are mapped into values which indicate whether the eyes of a person driving are open or closed.

Step3: Alerting the driver and the concerned authorities

1. Once we get the results from the comparison of the eye state using the trained classified, this result may then be passed in the form of an alert sound such as a beep to the driver if the result was that the eyes are closed .

III. CONCLUSIONS

In this paper, I have inspected one of the e techniques accessible to settle drowsiness condition of a person riding the automobile. I have mentioned a technique catching the drowsiness of a driver employing the methods of computer vision which include an image processing system employing image processing algorithms that make use of methods, techniques and mathematical formulas which provide the visual state of a driver by methods of image extraction that could further be used to extract the eye condition of the driver. This result is then given as input to yet another algorithm to which we have already set a number of training data set with which we compare the result given by image processing algorithm to indicate whether the driver is in the sleepy state or not and then using an alert function we manage to alert the driver of his improper driving state .It is also clear from the results that this implementation is efficient as well as robust.

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