Retraction

Retraction: Multiview 3D detection system for automotive driving (J. Phys.: Conf. Ser. 1916 012046)

Published 23 February 2022

This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

Retraction published: 23 February 2022
Multiview 3D detection system for automotive driving

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Abstract. For the past few years, there has been an increase in road accidents all over the world. The most common crucial reason is drowsiness. The presented work deals with this problem to reduce the number of accidents while keeping the methodologies simple and intact with the usage of computer vision applications like blink rate, eye closure, yawning. Detection of the driver's drowsiness is done by a single-camera attached behind the steering wheel and to identify yawning and for alerting the driver, a buzzer is triggered when the eyes are closed and also when the count of yawning is greater than the specific rate. The system will also work even the driver is wearing glasses and it can be implemented with the comfort of a pocket phone.

Keywords: Real-Time Detection, Image Segmentation, Face Detection, Drowsiness Detection, Python

1. Introduction

During the 2019-2020 fiscal year, nearly 3,97,356 road accidents were recorded in India. The breach of traffic laws is the leading cause of this crash, accompanied by drowsiness. There are currently no technologies available to diagnose drowsiness. We developed an automatic alarming device to detect driver drowsiness based on a single capture and processed image with EAR(Eye Aspect Ratio) and MAR(Mouth Aspect Ratio) using a single camera, based on the proverb "Prevention is better than cure". In our project, we use the viola jones algorithm to detect drowsiness by recognizing and analyzing facial movements like detection of eye closure movements and yawning. It is cost-efficient and we use a single camera to detecting drowsiness. Hence there is no purpose of using sensors. If we use sensors, it causes a major problem in maintaining the sensors. We can operate this camera by using a car battery. The need for drowsiness detection systems, methods, and algorithms used for our project are explained in detail in the proposed system Each module and working details are explained and project screenshots are included in preprocessing module.

2. Related work

Drowsiness impairs a driver's response times, knowledge of risks, and ability to maintain focus. For decreasing the rate of road accidents we use real-time drowsiness monitoring systems. To identify the facial figures B Bhownick utilizes a method called thresholding Otsu [1]. It mainly focuses on the hair points and necessary face centers. Driver's doziness is caught by Vitale's [2] bright detection method, it uses an infrared camera for detecting alteration in the eyes. For detecting the face and eyes of a driver using spectacles an algorithmic solution is developed for eye detection by the greyscale intensity [3] so that even if the driver wears glasses or travel in the night time sleepiness will be detected.
Many sensors and respiratory gadgets are used for this system so that the aging of sensors and devices occurs, even the driver feels uncomfortable because of these pieces of equipment attached to the driver's body [4]. For this method, there will be drawbacks like poor decision making support, lacking of categorization and it will lead to the wrong classification when there is high computational complexity. A system that uses Haar-like algorithmic methods is used to detect 3D objects and facial landmarks by making use of OpenCV libraries. By using the eye factors the eye region is cropped for eyelids calculation. Haar cascade classifier will use the technique called Haar wavelet [5], this will calculate and classify the pixels in the image to squares, the learning algorithm used here is Ada boost Classifiers it utilizes cascading techniques to detect the face in an image by extracting a small number of important features from a large collection to achieve an effective result. Tanmay Rajpathaka used Morphological and Color Image Processing [6] for the detection of eyes which neglects the work of finding hair points and Kmeans is for detecting eyes as accurately as possible.

Landmark points are recorded for each picture and used to measure the eye aspect ratio [7], which is the ratio of the eye's height to width. Using these aspect ratios eye closure is determined. Zhao searched for exhaustion in a number of ways, including the nose, mouth, eyes, and every other part of the face. Textures and landmark points [8] were used to construct face condition classifiers. Because of factors such as illumination, image pixel quality, the driver's angle to the camera, the orientation of the face, and different eyelid closure thresholds, detecting eye closeness is difficult. Kim suggested a fuzzy-based [9] technique for eyelid openness and closure classification. The knowledge of I and K colors is extracted from the HSI and CMYK spaces, and the eye area is binarized using a fuzzy logic scheme. Galib proposed a massive real-life dataset consisting of hours of video with content ranging from the lowest level of drowsiness to the highest level of drowsiness. The method is based on a Hierarchical Multi-scale Long Short-Term Memory network that is fed in sequence by detected blink features. There are many reasons which result in road accidents some of them are weather conditions like too hot, long winds, heavy rain, snowfall these are the environmental factors, block in oil pipe, leakage of fuel, carbon deposits in the fuel tank, damage of gearbox, brakes, air level in tires and tire condition these are mechanical factors, alcohol consumption and intake of drugs are the social and economic factors, depression, tiredness, a disorder in eyes, tiredness were the physiological factors. Many researchers and developer involved in designing the drowsiness alarming system to alert the driver to prevent road accidents, Some scientist suggest the idea based on respiratory and behavioral analysis and some suggest idea based on the movement of the eye aspect ratio through continuous analysis of drivers by special sensors, the previous methodology of using Electroencephalogram, Electrocardiogram(ECG), EEG, Histogram, detection of movements of eyelids by EOG signals [10] Some suggest open and closing of the mouth during yawning by analyzing and calculation of mouth aspect ratio by use of specialized sensors, some other suggest analyzing the speed of driver by observing [11].

3. Proposed work
To detect driver drowsiness, a range of sensors and cameras are employed to analyze and monitor the drowsiness. It can block the entire front windshield, making the driver uncomfortable when driving for a long distance. When angle sensors are permanently mounted in the steering, it becomes difficult to turn in short bends [12]. Fixing these sensors and cameras with these methods is expensive and time-consuming. Sensors and cameras need way too much maintenance. If a single sensor or camera fails, the whole setup may be destroyed. When a driver wears spectacles while driving, certain algorithms are unable to predict eye movements. Some algorithms are extremely slow, and accuracy cannot be guaranteed when drowsy. We use the dlib library in our project to detect and visualize human faces Figure 1.
3.1. Preprocessing

Using a single camera to capture the image of the driver while driving, it identifies facial landmark by using the Viola-Jones face detection algorithm, from the facial landmark identify eyes, eyebrows, nose, mouth, jaws, ears. Use dlib library to done skin segmentation and also detect whether driver wears seat belt or not while driving, Viola-Jones algorithm was first proposed by Paul Viola and Michael Jones in the year 2001. It needs a full-frontal image and 2 FPR (frames per second) to perform face detection, It is one of the most recent algorithms used in the field of image processing and face detection because it has the following characteristics they are robust-very low false-positive rate, Real-Time, and Face detection by reducing the size of the image without loss of its features and remove all non-facial pictures and blur the background of the driver.

Four important steps involved in face detection are:

- Haar feature
- Creation of integral image
- AdaBoost training
- Cascading classifier

A library is a set of codes that have been put together. To perform the desired action, you must be in a particular position. These libraries are open source and managed by a group of volunteers. Mainly in this proposed work, we used dlib for facial landmarks identification, image processing, numerical, and data compression. Dlib python is very much the same as DMTL where it has the most generic approach to a high-performance machine learning toolkit in addition to various algorithms. There is a pre-trained detector of facial landmark also available in dlib which is used to estimate x and y axis points that will map to the facial structure. For resizing, rotating, and other basic image processing functions we used the Imutils package that contains a series of functions with OpenCV python for solving computer vision problems, and using it with NumPy gives the edge of highly optimized numerical operations. It can also be integrated with other libraries that use NumPy and it has other working functions like Fourier, linear algebra, and it provides an array object up to 50 times faster than traditional python lists. Creating sounds is the task for the playsound library which provides a pure cross-platform single function module with no dependencies for playing sounds. Using this we can attach sound at any corner with a single python code. Interfacing with mp3 data to a file we used gtts (Google Text-to-Speech) python library for audio manipulation and with customizable text pre-processor the resulted pronunciation will be exact and for spatial analysis process script spatial is used. Finally, with the argparse command-line parser module, we can get command-line arguments in the codebase.

3.2. Face detection
All the human face share some common features like the region around the eyes are little darker than the cheeks of the human face and region of the eyes are also a little darker than the nose. Viola-Jones algorithm uses less than three rectangular areas where these rectangular areas are calculated by Haar methodology using the formula values of the rectangular area is derived by subtracting the values of the sum of pixels in the white area from the sum of pixels in the black area. Its major role is to detect human faces and perform recognition based on our needs Figure 2.

![Facial detection steps](image)

**Figure 2.** Facial detection steps

The algorithm detects the face of the driver even if the driver wears spectacles except for black color and both eyes are visible to the camera. Suppose the driver face not visible or he/she looking at something else outside or turn backside while talking with his neighbor it cannot detect the driver’s face clearly Figure 3.

![Detection of eyes and mouth when a face is present in the frame](image)

**Figure 3.** Detection of eyes and mouth when a face is present in the frame

3.3. Eye detection

The main steps involved in the detection of the eye include detecting facial landmarks from the captured image, use haar methodology to detect the region of eyes, and detect pupils in the eyes. For the detection of blinking of eyes, Eyes Aspect Ratio (EAR) is the ratio of upper and lower eyelids. When eyes close the eyelids came to closure, so the Eyes Aspect Ratio decrease below 0.20, and if eyes open eyelids
move far hence Eyes aspect ratio increases if the ratio is below 0.20 for more than 2 seconds alarm start.

The closure and opening of the eyes are calculated using the given formula G1-Width of the eyes, whereas G2-Height of the eyes in figure 4.

\[
\text{EAR} = \frac{||p_2 - p_6|| + ||p_3 - p_5||}{2||p_1 - p_4||}
\]

**Figure 4.** Width and Height of eyes

The threshold values are calculated using the above formula if the threshold value crosses the value 2.0 it gives an alarm sound to give an alert or notification to the driver. Image processing takes only the very least size image as the input it gives quick and fast output. It performs encoding, restoration, geometrical correction, and noise removal Figure 5 and 6.

**Figure 5.** Eye Region after the calculations Cropped eye region

**Figure 6.** Image after converting to gray scale and converting to binary image.

3.4. Yawning detection

The drowsiness of the driver is analyzed every second using behavioral, physiological subjective. Yawning is mainly caused due to tiredness during yawning mouth open wider and large amount of carbon dioxide is exhaled out. It is an involuntary action. The adaptive threshold is applied in the sequence of captured and processed images. From the processed image, detect the darkest region between the upper and lower lips of the mouth. Movements of the mouth are represented by Eight coordinates, it start P1 from the left corner of the mouth and continuous to P8 in the clockwise direction, if the driver’s mouth open lips came closer so the mouth aspect ratio decrease, When the mouth open lips move far mouth aspect ratio increase, the mouth aspect ratio is calculated as the vertical difference
of mouth between upper lips and lower lips to the horizontal difference of mouth between left corner to right corner. Algorithm initially start with capturing of driver’s image and then detection of face using facial landmark and then detect mouth after the skin segmentation, yawning can be determined by the opening of mouth for more than a given period then the alarm is triggered Figure 7 and Figure 8.

![Figure 7. The region of mouth to be extracted.](image1)

![Figure 8. Image after converting to gray scale and converting to binary image.](image2)

### 3.5. Class diagram

![Class diagram for android platform](image3)

At last, the python script with inbuilt libraries will be integrated into java code for the creation of the android platform using Kivy, a cross-platform OpenGL-based user interface toolkit that has the requirement met by 99.9 percent of devices and also maintains normal java APIs, so it makes the platform less weight Figure 9.

### 4. Conclusion

Instead of using a high-end camera, sensors, or computationally complex methods, a real-time dozing detection system is proposed to detect the driver’s fatigue, even compatible with mobile devices based on image capture with increased accuracy. A real-time eye and yawn detection is the important parameter for this proposed work. In the future wearables like smartwatches can be used to detect blood pressure, pulse rate, and they can be used to further classify our proposed system more accurately and efficiently.

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