A Project Report on

Detection System for Driver's Safety

Submitted in partial fulfillment of the requirements

in

Computer department

by

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Academic Year 2020-2021

Approval Sheet

This Project Report entitled ***"Detection System for Driver's Safety"*** Submitted by ***"Nimali Keny"(17102062), "Pooja Maniyar"(18202012), "Purti Lalan"(1710246), "Purvi Lalan"(17102047)*** is approved for the partial fulfillment of the requirement in ***Computer Department*** from ***University of Mumbai*** .

Prof. Krupi Saraf

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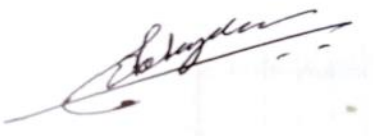
Place: A. P. Shah Institute of Technology, Thane
Date: 16th December, 2020

CERTIFICATE

This is to certify that the project entitled ***"Detection System for Driver's Safety"*** Submitted by ***"Nimali Keny"(17102062), "Pooja Maniyar"(18202012), "Purti Lalan"(1710246), "Purvi Lalan"(17102047)*** for the partial fulfillment of the requirement for award of a degree ***Bachelor of Engineering*** in ***Computer Department***, to the University of Mumbai, is a bonafide work carried out during the academic year 2020-2021.



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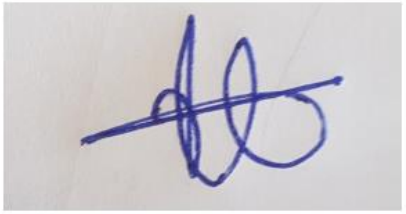

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Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that We have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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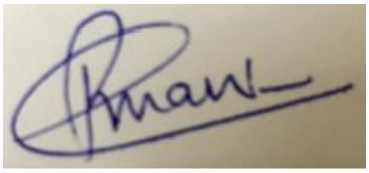
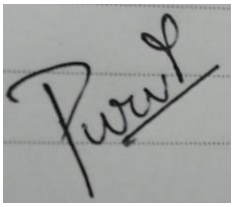


(Pooja Maniyar, 18202012)



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Date: 16th December, 2020

Contents

1. PROJECT CONCEPTION AND INITIATION

1.1 Abstract

The development of technology allows introducing more advanced solutions in everyday life. This makes work less exhausting for employees, and also increases the work safety. A new approach towards automobile safety and security with autonomous region primarily based automatic automotive systems is projected in this project idea. Nowadays, more and more professions require long-term concentration. In recent time's automobile fatigue connected crashes have greatly enlarged. Drivers must keep a close eye on the road, so they can react to sudden events immediately. Driver fatigue often becomes a direct cause of many traffic accidents. Therefore, there is a need to develop the systems that will detect and notify a driver of her/his bad psychophysical condition, which could significantly reduce the number of fatigue-related car accidents. However, the development of such systems encounters many difficulties related to fast and proper recognition of a driver's fatigue symptoms. Some of the technical possibilities are to implement driver drowsiness detection systems and lane curve detection system. The proposed system may be evaluated for the effect of drowsiness warning under various operation conditions and curves on the road while driving a car. We are trying to obtain the experimental results, which will propose the expert system, to work out effectively for increasing safety in driving. The detail of image processing technique and the characteristics also been studied.

1.2 Objectives

- One of the many objectives involved during the training of an autonomous driving car for driver's safety is lane curve detection.
- To alert the driver when he is drowsy to prevent accidents.
- The system accurately monitors the open or closed state of the eye.
- To minimize development and maintenance costs.
- To increase safety while driving.

1.3 Literature review

The lane detection, mentioned in the paper, is efficient and conveniently applicable for any car system. This paper proposes an idea of Hough lane detection technique which can detect discontinuous lanes as well. The lane boundaries near the camera always show themselves line-like in the image, while the parts far from the camera probably contain curve-like shapes. They thus divide the image in near field and far field region. the eye detection is used to check the driver fatigue, i.e. whether the driver is sleepy or not. The proposed system is supposed to have two webcams, one to detect the lane and the other to monitor the face of the driver. Now, whenever the car starts, the webcam will continuously shoot video, and the system will be sampling the videos into frames of pictures. Each picture will be fed to the processor, where using Hough transform, the lanes as well as the eyes will be detected. [1]

The aim of this paper is to develop an algorithm for drowsiness or alertness detection system. The focus will be placed on designing a system that will accurately monitor the open or closed state of the driver's eyes in real-time. By monitoring the eyes, it is believed that the symptoms of driver fatigue can be detected early enough to avoid a car accident. Detection of fatigue involves a sequence of images of a face, and the observation of eye movements and blink patterns.
This paper proposes a computer vision-based driver drowsiness system, use of OpenCV in image processing, interfacing of webcam to OpenCV, Haar classifiers like feature-based face detection methods, eyelid identification, and developing alertness system using eyelid status to warn the driver accordingly by providing an alarm. [2]

Fatigue is such a psychophysical condition of a man, which does not allow for a full concentration. It influences the human response time, because the tired person reacts much slower, compared to the rested one. Appearance of the first signs of fatigue can become very dangerous, especially for such professions like drivers. Therefore, there is a need to develop a system that will detect and notify a driver of her/his bad psychophysical condition, which could significantly reduce the number of fatigue-related car accidents. One of the technical possibilities to implement such a system is to use a vision-based approach. The basis of the fatigue detection system are the algorithms responsible for detecting facial features and their motion. This article presents the currently used driver drowsiness detection systems. The technical aspects of using the vision system to detect a driver drowsiness are also discussed. [3]

In this lane line detection project, they use OpenCV. Before detecting lane lines, they masked remaining objects and then identified the line with Hough transformation.
They have done this using the concepts of image processing using OpenCV library. To detect the lane they have to detect the white markings on both sides on the lane.
Using computer vision techniques in Python, they will identify road lane lines in which autonomous cars must run. This will be a critical part of autonomous cars, as self-driving cars should not cross it's lane and should not go in the opposite lane to avoid accidents. The canny function calculates derivatives in both x and y directions, and according to that, they can see the changes in intensity value. Larger derivatives equal to High intensity (sharp changes), Smaller derivatives equal to Low intensity (shallow changes) [4]

Canny operation provides the threshold automatically. However, it often produces far too much edge information including cars ahead and sceneries on the wayside, corresponding to the original image After observation and experiments, they summarize a scheme to decrease the redundant information. Firstly, delete the points that link with each other horizontally or vertically to reduce the horizontal and vertical line. These lines turn out to be cars ahead and other road signs. Secondly, wipe off the stray points that scatter in the edge image alone. To ascertain the initial points is the key to locate the lane markers precisely. they choose the search-area about a quarter of the image which belongs to the bottom of the scene, and these two points should be selected from the scan-line in the search-area. The lane can be recognized based on two points. In fact, they can obtain the lines after detecting the initial ones. They can get the terminal points in the area according to the triangle relationship of the disappearance point and the initial points and then construct models of left and right lanes separately. Finally, match the models of the segment with the edge image. The line model will be obtained from the initial-point and the terminal point. The mid-value of the range should be the endpoint from the last one, and the span from the minimum to the maximum is about 10 pixels. In most instances, the endpoints in successive images change little, so the optical searching choice is to start from the middle of the confines. If the model doesn't fit with the image, choose the one next to the mid-value on the left (or right) to see if this one fits or not, and next time is the one on the right (or left). And the rest can be done in the same manner

until the right one is found. If there isn't one to match with the lane, do the searching phase in the next scene. [5]

1.4 Problem Definition

- Our project is divided into 3 sub-parts on which we would be working in concern of driver's safety. 3 parts are as follows:
  - Face Recognition
  - Drowsiness Detection
  - Lane Curve Detection
- In India, on average about 1214 crashes happen on a daily basis. There are various reasons that can cause road accidents such as reckless driving, speeding, drunk driving, etc.
- Due to continuous journey, tiredness and fatigue can easily arise in drivers which may result in critical road accidents. From the survey, it is seen that almost 20% of accidents are caused by fatigue and 50% of accidents happen on the road.
- A solution to this problem is to identify when the driver is falling asleep and alarming the passengers of the situation so that appropriate measures can be taken.
- In any driving scenario, lane lines are also an essential component for indicating traffic flow and where a vehicle should drive.

1.5 Scope

- The main idea behind this project is to develop a system which can detect fatigue of any human and can issue a timely warning.
- This project will be helpful in detecting driver fatigue in advance and will give warning output in the form of alarm and pop-ups.
- Moreover, the warning will be deactivated manually rather than automatically. This will directly give an indication of drowsiness/fatigue which can be further used as record of driver performance.
- The system can be implemented in the Automobile Industry focusing mainly on Cars and Trucks.
- The Lane Curve Detection System can be implemented in self driving cars.

1.6 Technology stack

- Integrated Camera or Webcam
- Processor: - Core i3
- RAM: - 4GB

- Coding Language
  - Python-3.7
- Libraries Used
  - OpenCV
  - DLIB
  - Subprocess
  - Scipy
  - Numpy
  - Queue
  - Tkinter

1.7 Benefits for environment and society

- System is Fully Automated as it does not require any manual input from the driver.
- Decreasing road accidents.
- It can be implemented in heavy vehicles like trucks to avoid crashes.
- Detects if a driver is conscious or not. If not conscious will give appropriate warning.
- Alert drivers result in safe driving which in turn results in less road accidents.
- System does not distract the driver as the driver is only notified if the system detects the driver's drowsiness, else the system runs silently in the background without distracting the driver.
- Due to the non-obstructive nature of these methods they are more practically applicable.
- Lane curve detection can be further used in self driving cars.
- Car drivers, truck drivers, taxi drivers, etc. should be allowed to use this solution to increase the safety of the passengers, other road users and the goods they carry.

2. PROJECT DESIGN

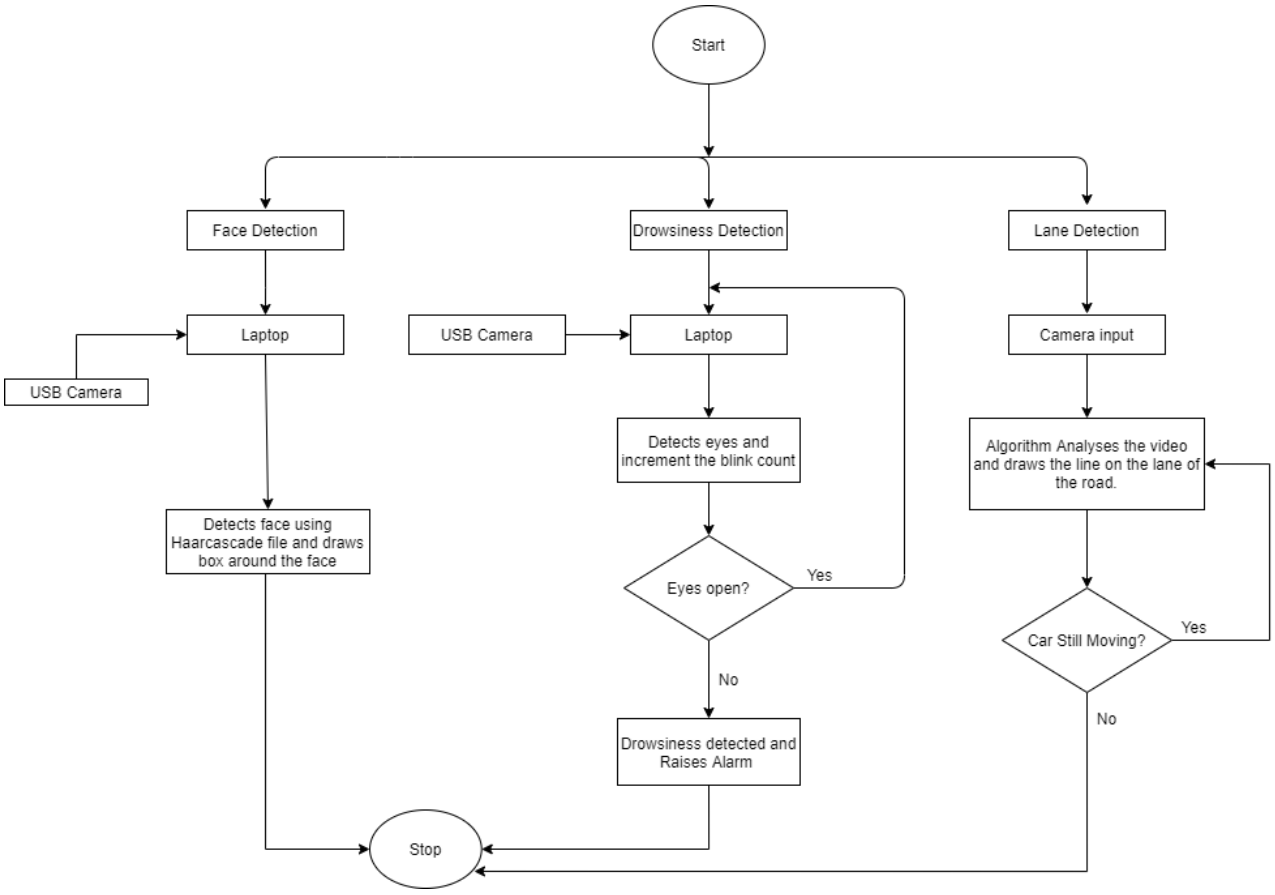
2.1 Proposed System

Basically, the whole project is divided into 3 parts which are:

1. Face detection
2. Drowsiness detection
3. Lane curve detection

- Face Detection: Face Detection initially detects your face using an integrated camera or wired camera. It detects your face using a Haar Cascade file and draws a box around the face.
- Drowsiness Detection: Once your face is detected using an integrated camera, it detects your eyes and starts counting your eye blinks by incrementing the blink count. It continuously keeps on detecting your blink and as soon as it detects that the eyes are closed for more than the expected number of seconds it raises an alarm.
- Lane curve Detection: One integrated camera would be mounted in front of the car which would detect the lane markings. Virtual lines would be drawn on both sides of the road which is seen on the car's dashboard to detect the road and its curves.

2.2 Design (flow of modules)



2.3 Module Explanation

Module 1 - Face Detection

- The System takes input from the integrated camera or the wired camera.
- The haar cascade algorithm will convert the image to grayscale to analyze the white area which will be obtained once the image is converted to grayscale.
- The algorithm then, will match that grayscale image with the pretrained face images xml file.
- If the grayscale and co-ordinates in the xml file matches, then the algorithm draws a box around the face.

Module 2 - Driver's drowsiness detection.

- When we will select the drowsiness module through the UI of the system which will be provided at the start, the system will take some seconds to recalibrate the users face.
- Once the recalibration process is done using the trained dataset i.e. DLIB library, the module will create virtual points around your eyes which will help the system to understand that it has to increment the blink counts.
- If the user's eyes are closed for more than some number of seconds, then the system will raise an alert by playing an alarm sound which will be integrated with the system.
- The user then, will have to deactivate the alarm manually instead of automatically.
- If the system is unable to find the face of the user, the system will raise a pop up message that the user needs to sit properly for calibrating his/her face.

Module 3 - Lane Curve detection.

- An Integrated camera would be mounted on the front of the car.
- When the Lane curve detection module would be selected through the UI of the system which will be provided at the start, the system will take some seconds to recalibrate the road marking.
- The lane which will be detected would be seen on the car's dashboard.
- Virtual lines would be drawn on both sides of the road which is seen on the car's dashboard to detect the road and its curves.

3. PLANNING FOR NEXT SEMESTER

Planning:

Working of Present System would be implemented in next Semester.
Two of us would be starting with face detection followed by driver's drowsiness detection. And remaining two of us would work on lane curve detection. We have collection some reference material referring the papers and coursera.
Face and drowsiness detection module are expected to end till February whereas lane curve detection module is expected to end till March.

4. REFERENCE

[1] Yashika Katyal ,Suhas Alur,Shipra Dwivedi, "Safe Driving By Detecting Lane Discipline and Driver Drowsiness", in 2014 IEEE International Conference on Advanced Communication Control and Computing Technologies (ICACCCT)

[2] V.V. Dixit, A.V. Deshpande, and D. Ganage, "Face Detection for Drivers' Drowsiness Using Computer Vision" N.A. Abu Osman et al. (Eds.): BIOMED 2011, IFMBE Proceedings 35, pp. 308–311, 2011. www.springerlink.com

[3] Damian Sałapatek, Jacek Dybała, Paweł Czapski, Paweł Skalski, "Driver Drowsiness Detection Systems", publication at: https://www.researchgate.net/publication/319464008

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