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A Project Report on

Detection System for Driver's Safety

Submitted in partial fulfillment of the degree of
Bachelor of Engineering(Sem-7)
in
Computer Engineering

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1.Project Conception and Initiation

1.1 Abstract

Nowadays, more and more professions require long-term concentration. 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

This paper proposes an idea of Hough lane detection technique which can detect discontinuous lanes as well. The proposed system, is supposed to have two webcams, one to detect the lane and the other to monitor the face of the driver. [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 [2]

Nowadays, more and more professions require long-term concentration. People, who work for transportation business (like car and truck drivers),must keep a close eye on the road, so they can react to sudden events (e.g. road accidents, animals on the road, etc.) immediately. Long hours of driving causes the driver fatigue and, consequently, reduces her/him response time. In order to reduce the number of road accidents resulting from a driver fatigue, it is of great importance to introduce to the automotive industry a system that would effectively detect the first signs of a fatigue and notify the driver. [3]

1.3 Literature Review

In this lane line detection project, we use OpenCV. Before detecting lane lines, we masked remaining objects and then identified the line with Hough transformation. We have done this using the concepts of computer vision using OpenCV library. To detect the lane we have to detect the white markings on both sides on the lane. Using computer vision techniques in Python, we will identify road lane lines in which autonomous cars must run. Canny edge is used to calculate the intensities [4]

This paper proposes a novel lane departure algorithm for detecting lane markers in images acquired from a forward-looking vehicle-mounted camera.It is a real-time algorithm for lane detection and tracking, which is also simple to implement.Visual field of a downward side camera is narrow, and only a few information of the lanes can be applied.It detects the left and right lane markings separately, whereas most of the previous work uses a fixed-width lane model. It combines lane detection and tracking into a single algorithm. Canny operation provides the threshold automatically. [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
  - Numpy
  - Queue
  - Tkinter

1.7 Benefits for environment & 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

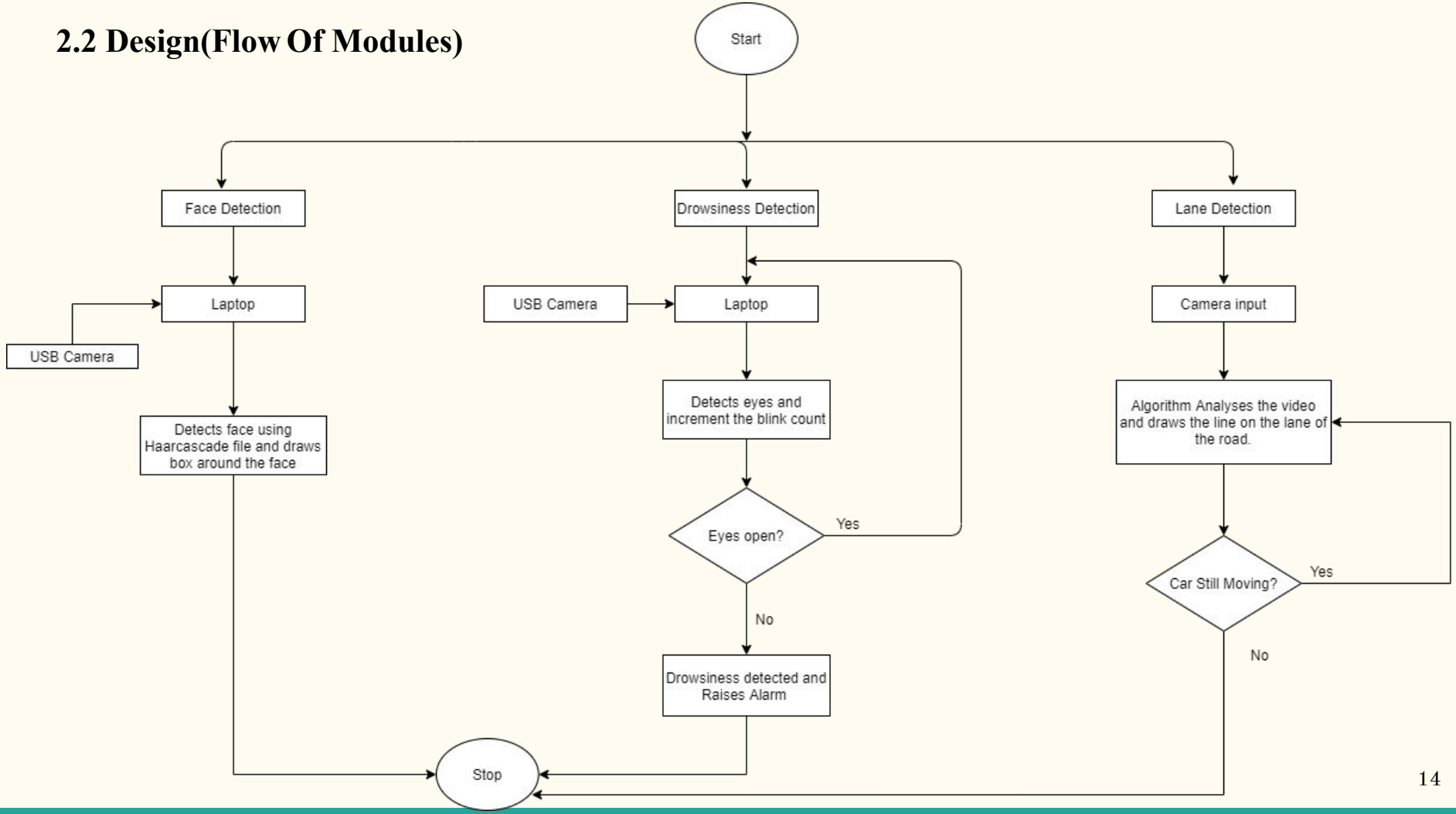
2.1 Proposed System

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 amount 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 it's curves.

2.2 Design(Flow Of Modules)



2.3 Module-1 – Face Detection System

- The System takes input from the integrated camera or the wired camera.
- The haar cascade algorithm will convert the image to grayscale to analyse 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 – Blink 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 amount 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

- 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 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 it’s curves.

2.4 References

[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

[4] Sunil Kumar Vishwakarma, Akash, Divakar Singh Yadav, “Analysis of Lane Detection Techniques using openCV”, IEEE INDICON 2015 1570168493

[5]Yue Dong, Jintao Xiong, Liangchao Li, Jianyu Yang, “Robust lane detection and tracking for lane departure warning”, Published in: 2012 International Conference on Computational Problem-Solving (ICCP)

3.Planning for next semester
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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.

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Thank You