DROWSINESS DETECTION IN AUTONOMOUS CARS

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Overview

In recent years, driver drowsiness has been one of the major causes of road accidents and can lead to severe physical injuries, deaths and significant economic losses. Statistics indicate the need of a reliable driver drowsiness detection system which could alert the driver before a mishap happens. Researchers have attempted to determine driver drowsiness using the following measures:
(1) vehicle-based measures;
(2) behavioral measures and
(3) physiological measures.
A detailed review on these measures will provide insight on the present systems, issues associated with them and the enhancements that need to be done to make a robust system. In this paper, we review these three measures as to the sensors used and discuss the advantages and limitations of each. We are planning to implement that by designing a hybrid drowsiness detection system that combines non-intusive physiological measures with other measures one would accurately determine the drowsiness level of a driver. A number of road accidents might then be avoided if an alert is sent to a driver that is deemed drowsy.

Goals

A driver who falls asleep and when the wheel loses control of the vehicle, an action which often results in a crash with either another vehicle or stationary objects. In order to prevent these devastating accidents, the state of drowsiness of the driver should be monitored. The following measures have been used widely for monitoring drowsiness:

1. Vehicle-based measures—A number of metrics, including deviations from lane position, movement of the steering wheel, pressure on the acceleration pedal, *etc.*, are constantly monitored and any change in these that crosses a specified threshold indicates a significantly increased probability that the driver is drowsy.

2. Behavioral measures—The behavior of the driver, including yawning, eye closure, eye blinking, head pose, *etc.*, is monitored through a camera and the driver is alerted if any of these drowsiness symptoms are detected.

3. Physiological measures—The correlation between physiological signals (electrocardiogram (ECG), electromyogram (EMG), electrooculogram (EoG) and electroencephalogram (EEG)) and driver drowsiness has been studied by many researchers.

4. Using subjective measures where drivers are asked to rate their level of drowsiness either verbally or through a questionnaire. The intensity of drowsiness is determined based on the rating.

5. These methods have been studied in detail and the advantages and disadvantages of each have been discussed. However, in order to develop an efficient drowsiness detection system, the strengths of the various measures should be combined into a hybrid system.

6. Describing the simulated environment for drowsiness manipulation,analysing the various methods of drowsiness manipulation for study purposes. Along with that, to describe the different methods that have been studied for detecting driver drowsiness, driving conditions and hybrid measures and presenting the benefit of fusing various measures to develop an efficient system.

Use Cases

Drivers Drowsiness and rash driving

- Front line workers in factory
- Security officers
- Students monitoring in class

Reverse Used cases

- Monitor babies

Data

1. AT&T "The Database of Faces"
2. Using pre-trained Modern landmark Detector on “In-the wild” Dataset
3. Real time data based on facial expression

Process Outline

1. Using pretrained model to for edge detection
2. Capturing charastesticks point to classify blinks and detect emotions
3. Using EARSVM to classify blinks
4. Integrating alarm system and UI
5. Deploy using Opencv and hit the alarm system
6. Build Ui to show the working for the same

Milestones

Timeframe	Delivery
Day 1-2	Edge detection using characteristics point
Day 3-7	Feature extraction, mapping and decision
Day 8-10	Design UI and System Integration
Day 10-12	Testing and documentation

Deployment Details:

1. Language: Python
2. Webcam and Gym Environment

Libraries Used

1. Open CV
2. Scipy
3. Dlib
4. Imutils
5. Numpy

USER INTERFACE DESIGN PLAN

1. Get the facial data from the webcam
2. Use classification for blinks and facial expression
3. Make decisions based the calculated results
4. Perform actions in the gym environment based on above decisions

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