DROWSINESS DETECTION IN AUTONOMOUS CARS

04.12.2018

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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 into 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

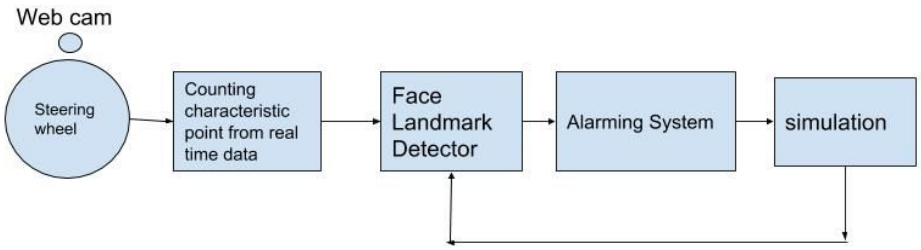
A driver who falls asleep and when the wheel loses control of the vehicle, an action which often results in a crash with either another vehicle or stationary objects. In order to prevent these devastating accidents, the state of drowsiness of the driver should be monitored. The following measures have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

1. Capture characteristic points and define the classification of blinking
2. Set threshold to decide drowsiness
3. Emotion detection to avoid rash driving
4. Integration of an alarm system to monitor the control

Future Milestones

1. Slowing down the vehicle and steering vehicle to the roadside to avoid any collision.
2. Adding more facial characteristic points to monitor facial expressions(eg. Yawn)

Block Diagram



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 a pre-trained model for edge detection
2. Capturing characteristics point to classify blinks and detect emotions
3. Using EARSVM to classify blinks
4. Integrating the 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 finding drowsiness threshold
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 on the calculated results
4. Perform actions in the gym environment based on the above decisions

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