APPLICATION OF IMAGE PROCESSING TECHNIQUES ON VEHICLES

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01 Motivation

Automotive has an important place in human life, and the usage of personal vehicles is increasing. Unfortunately, this is also followed by the increase of car thefts and car accidents. The primary focus of this project is preventing vehicle theft, by having a facial recognition system which is providing a high level of security and high usability. System checks driver's face against a facial profile that already exists in the database and when the system confirms the driver, it allows to access the vehicle. The system is also allowing to register of new drivers. As an exention, to remedy the traffic accidents due to drowsiness, we have implemented a real-time alert system. The detection of drowsiness is determined with eye status since as drowsiness increases, eye openness will be decrease. When the eyes are closed, system warns the driver. It is hoped that this project would keep the car safe, prevent them from stealing and enhance driver's safety, prevent deaths and injuries.

02 Background

01 Facial Recognition

Face or facial recognition is identifying or verifying one or more persons in the scene by comparing with faces stored in a database, given static or video images of a scene. Face recognition relies on complex and dynamic structure of human face. In our project, we have implemented face recognition for vehicle authentication.

02 Drowsiness Detection

The level of drowsiness can be obtained by many approaches, however, one of simplest approach is a classification of driver based on his/her eye states, either having open or closed. In drowsy state, the eyes will be more in closed state compared to non-drowsy state.

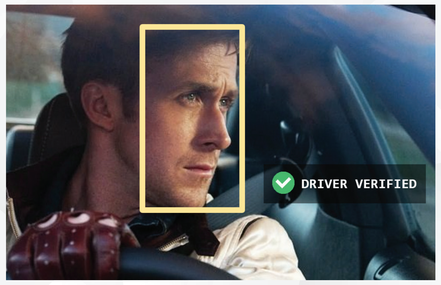


Figure 1: Identification of driver from his face

Figure 2: Drowsy driver with closed eyes

03 Dataset

In this project, we have used FEI Face Dataset, which is publicly available and contains 200 different young and middle-aged individuals and each image taken with 14 various perspective such as different orientation, brightness etc.

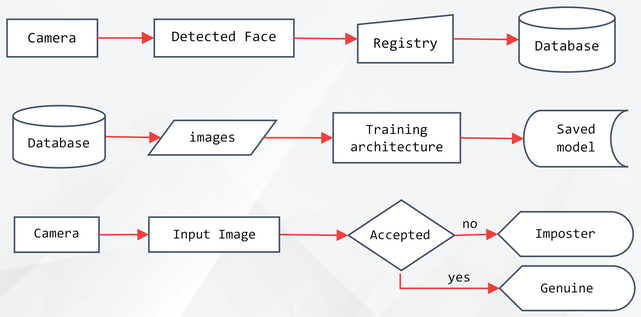
Figure 3: An individual from FEI Face Dataset

04 Implementation

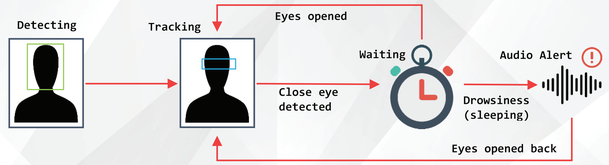
01 Methods

We have used Convolutional Neural Network (CNN) in recognition task. As a pre-trained network, inception-v3 CNN has been selected. The images are taken from webcam using Image Acquisition Toolbox in MATLAB.
The closed eye pairs are detected using Viola-Jones Algorithm. The program tracks the eye pairs using Kanade Lucas Tomasi Algorithm in real-time.

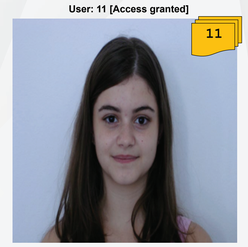
02 Face Recognition Framework



03 Drowsiness Detection Framework



05 Results



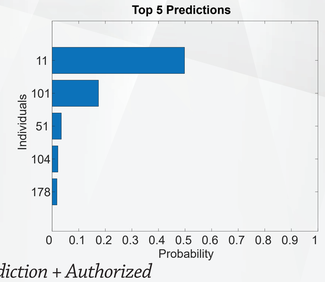
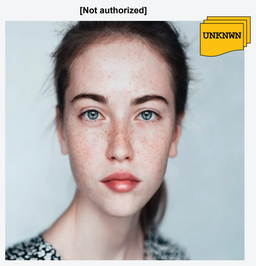


Figure 4: Correct prediction + Authorized



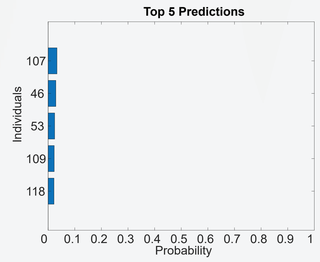


Figure 5: No prediction + Not Authorized

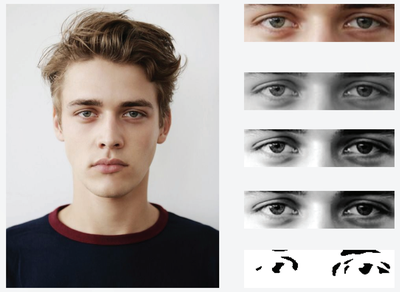


Figure 6: Eye detected and processed

Figure 7: Open and closed eye pairs are detected

06 Conclusion

The implemented facial recognition system is able to distinguish the presented driver and authorize him/her if he/she is registered to the system. The drowsiness of driver can be detected in real-time, and when the eyes are closed, the system is alerting the driver. With our efforts, it is hoped that image processing and machine learning techniques would improve the safety of both vehicles from stealing, and people from drowsiness related accidents involving injuries or deaths.

07 Acknowledgment

We would like to thank our advisors for their support.

MATLAB python NVIDIA