

Title: High accuracy identification of driver's tiredness and bad driving behaviors

Industrial Applications □Intelligent Manufacturing ■Intelligent Driving □Intelligent Life □Smart Medicine □Smart City

[Overall background]

Fatigue driving is one of the most important hidden dangers in traffic safety. Statistics show that traffic accidents caused by fatigue driving account for 15% of personal injury accidents and more than 20% of death accidents. Taking the actual road traffic environment as the background, the research on the monitoring, analysis, decision and intervention of the degree of driver's weariness will help to reduce the occurrence of traffic accidents, especially the malignant traffic accidents. In particular, for the driver who is engaged in long distance passenger transport and cargo operation, it is difficult to maintain a high vigilance state for a long time because of the professional requirements. Therefore, it is more important to monitor and intervene in real time.

At present, Jiangsu, Henan, Hubei and other provinces have issued corresponding policies, such as Jiangsu Province, for example, before December 30, 2018, all the "two passenger and one danger" vehicles in the province all installed the active safety intelligent control system terminal (including fatigue driving alarm). The Ministry of communications is also discussing the formulation of relevant standards. The mandatory installation of fatigue driving recognition and early warning technology in operation vehicles has become the trend.

[Business background]

Deep learning is a great breakthrough in the field of artificial intelligence in the last ten years. Although its theoretical research is still in the initial stage, the deep learning model has shown great potential in engineering application. Now the big and home & abroad well-known high-tech companies are investing more in the field of deep learning to win the commanding heights of the technology field. From the development of driver fatigue state detection technology at home and abroad, the technology of on-line identification of driver fatigue state based on artificial intelligence, as a highly practical technology in the field of biometric identification and mental emotion calculation, can be explained with the high level semantics of its unique real time and fatigue characteristics. The characteristics of Interpretability, non-invasion and forensics have become the most promising technology for driver fatigue identification.

Project description

[problem description]

At present, the main driver fatigue state detection methods include the characteristics of the driving track, the vehicle operation characteristics, and the facial expression feature extraction based on the machine vision. Driver's fatigue detection algorithm has been applied in the market based on machine vision, but it is not ideal because of the comprehensive influence of the complexity of light conditions, the uncertainty of facial posture, the concealment of fatigue characterization, the individual difference of the driver and so on. The market penetration and innovation of the product still contain great potential for development and growth. If we can build discriminant degree of driver's fatigue by constructing multi-level deep neural network, we will greatly improve the detection accuracy and enhance user experience.

This competition, through the camera acquisition of the driver image information, based on artificial intelligence technology, will achieve the driver's weariness, bad driving behavior (smoking, playing / dialing mobile phone) with high precision identification, which makes it a practical prospect of the technical scheme.

[User expectations]

- (1) Using camera to detect drivers' fatigue, distraction, smoking, playing / dialing mobile phones.
- (2) Having all-weather working ability, especially in complex environment.

[Economic effect]

With the development from passive safety to active safety, the ADAS system will usher in rapid development. It is estimated that penetration ratio can reach 7% in 2019. Considering the new vehicle volume and ADAS price, the ADAS of the pre loading market can reach 80-90 billion Yuan, the composite growth rate can reach 40%. Moreover, the market size is expected to exceed 100 billionYuan in 2020. The application of this scheme will bring the team's economic benefits to one hundred million Yuan.

[Technical path]

PC end development

[Technical indicators]

- (1) The speed of the algorithm is $> 15\text{fps}$;
- (2) The detection rate of closing eyes, yawning, smoking and mobile phones is more than 95% (a single item was at least 90%).

[Standard Submission]

Participants are asked to design a set of solutions that meet the needs of the upper development from the perspective of the underlying developers.

- (1) Software outline design scheme and test scheme.

[Task list]

- (1) Driver's weariness application can be executed at PC end.
- (2) The flow chart of the algorithm.

[Reference tool]

Opencv, Dlib, MTCNN

[Reference data]

- (1) provide a training sample video set;
- (2) provide a test sample video set.

[Data interface]

None