A Real-time Fatigue Driving Detection System Design and Implementation

Zhao-Bin Ma*, Yang Yang*, Fengyu Zhou**, Xu Jian-Hua***

*School of Information Science and Engineering, Shandong University, Jinan, China, 250100

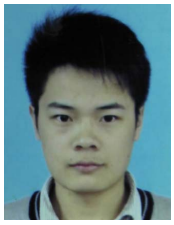
** School of Control Science and Engineering, Shandong University, Jinan, China, 250014

*** The 41st Research Institute of China Electronics Technology Group Corporation, Qingdao, 266555, China

yyang@sdu.edu.cn

***Abstract*—A reliable and real-time fatigue driving detection system is very important for traffic safety. Till now, various methods have been presented to improve the accuracy and robustness, however, few papers showed the efficiency of the system or the feasibility of real-time processing in embedded system. Considering the efficiency and reliability, a real-time fatigue driving detection system is presented in this paper. Firstly, Haar-like features and AdaBoosted classifiers are adopted for real-time face detection. The selection of the optimal sampling ratio and the minimum possible object size is discussed for high detection accuracy and computational efficiency. Secondly, eye location and iris positioning are applied to detected faces. We propose to use the area proportion that the iris takes in its minimum circumscribed circle as the indicator for judging the state of the eye, which is more convenient and has good robustness to distance. Finally, the percentage of eye closure (PERCLOS) is used as the criteria to determine whether the driver is tired. The embedded platform implementation of the proposed system turns out to be efficient.**

***Keyword*—AdaBoosted classifier, Face detection, Fatigue driving detection, Iris positioning, PERCLOS, Real-time**



Zhao-Bin Ma (M'15) received the Bachelor's degree in Integrated Circuit Design and Integrated Systems from Shandong University, Jinan, China, in 2013. Currently he is pursuing his Master degree in Integrated Circuit Engineering from Shandong University. His interests include IC design methodology, computer science, and pattern recognition.

Yang Yang received the BSc degrees of Electronic and Information Engineering and the PhD of Signal and Information, in School of Information Science and Engineering from Shandong University, China, in 2004 and 2009, respectively. He has been with School of Information Science and Engineering, Shandong University since 2009. He was a research assistant in Polytechnic University, Hong Kong from Aug.2006 to Jan.2007 and from Dec.2007 to Aug.2008, and a research associate in Polytechnic University, Hong Kong from July 2010 to Aug.2010，and a postdoc of Control Science and Engineering at Shandong University from Sept.2009 to Sept.2011, a postdoc of Biomedical Engineering at Imperial College London from Oct.2012 to Oct.2013.

Fengyu Zhou received the Bachelor's degrees and the Master's degree from Shandong University of Science and Technology, China, in 1992 and 1999, respectively. And he received the D.E degree from Tianjin University in 2008. He is now a professor at Control Science and Engineering in Shandong University. His interests cover intelligent robot, service robot based on cloud, fault diagnosis and prediction, and theory of intelligent control.

Xu Jian-Hua was a researcher in in 41st Institute of China Electronics Technology Group Corporation engaging in electronic measurement technology and development of measurement instrument. His present research interests include signal reception and signal analysis techniques.