

Integrated Approach for Nonintrusive Detection of Driver Drowsiness

Principal Investigator

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Project Abstract:

This project is the extension of NATSRL FY 2008 and FY2009 projects, titled as “**Real-time Nonintrusive Detection of Driver Drowsiness**”, which aims to develop a real-time, nonintrusive driver drowsiness detection system to reduce drowsiness-caused accidents. In our previous research, nonintrusive sensors for driver’s heart beat measurement were developed and implemented on the vehicle steering wheel. Heart rate variability (HRV) was analyzed from the heart beat pulse signals for the detection of driver drowsiness. Promising results were obtained. However, one of the major issues with the previous system is using only one parameter (Low-Frequency(LF)/High-frequency(HF) ratio of HRV) to access the driver’s status, which has relative high variability and has different changing patterns for different drivers. In this project, we propose to use multiple parameters for the drowsiness detection, including the LF/HF ratio, VLF (very low frequency) of HRV signal, RRV (moving average of heart rate time-interval), driver gripping force changes, and the steering wheel motion variability. This integrated approach will be tested in a driving simulator in combination with Electroencephalography (EEG) measurement and analysis, as EEG is deemed as the most accurate indication of sleep stages and will be used to as a “gold” standard and to find the fall asleep events off-line (please note that EEG signal cannot be measured nonintrusively, so it is not appropriate for real applications).

Anticipated Duration of Project : 12 months