

Abstract

Advanced Driver Assistant System (ADAS) was developed to reduce hazard on road, as driver were tended to get distracted from non-driving tasks. Researchers widely acknowledges that machine learning should be applied in ADAS, so that system can recognize driver's state and adapt accordingly. Applying machine learning on physiological signal to learn psychological model is a common research topic. Yet, little work have considered of challenges in implementation, which is different from other machine learning domains. Usual approach is to collect many signals and go through tedious signal processing to output feature vectors. Machine learning plays its part only after feature is available. Which is costly and also unlikely to be feasible in real world situation. We propose new machine learning based methodology that only requires simple single signal combined with manifold learning algorithm. Our methodology is robust in that it requires only one signal but doesn't compromise the performance. The first contribution of the work is that we collected data from partly automated vehicle's simulation, which little work was done to apply machine learning. The second contribution is we proposed new feature extraction methods which only exploits ECG signal. Our methods do not require domain specific knowledge or tedious signal processing procedure. As long as interval between R peaks are available (which can be measured easily with cheap commercial equipment) our manifold learning based features extractor will provide reliable features. As this implies no preprocessing it is more beneficial for implementation.

Keywords: *ECG, Machine Learning, Driver, Workload, ADAS. Manifold learning*