

Methods for assessing cognitive workload of drivers

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Abstract

The major cause for road accidents in modern traffic is distracted driving, resulted primarily from extensive use of In-Vehicle Infotainment Systems (IVIS). Distraction is defined as diversion of attention from the primary task of driving and can be divided into three major groups: visual (eyes off the road events), manual (hands off the steering wheel) and cognitive distraction (lost in thought or solving problems non-related to the ongoing task of driving).

In this talk, we are going to focus on cognitive load which can be assessed with the use of self-evaluating questionnaires, direct monitoring of psychophysiological activities, and indirectly by measuring performance of various secondary tasks. Self-evaluation questionnaires and self-ratings may appear questionable, but various studies have demonstrated that people are capable of giving a numerical indication of their perceived load. Most subjective measures are multidimensional and assess groups of associated variables, such as mental effort, fatigue, and frustration, which are all highly correlated.

Psychophysiological measures of drivers include ocular activities, cardiac functions, electro-dermal activity and even electrical brain activity. The greatest advantage of these types of measurements is that they allow the continuous collection of data and do not require any kind of response from the driver (self-report or performing an additional task), leaving the driver's attentional and cognitive resources focused only on the observed tasks.

Indirect measurements on the other hand monitor the performance of various secondary tasks - performed in addition to driving. Response times and hit rates success are then considered as indicators of changes in cognitive load. We are going to present the Detection Response Task (DRT) – ISO standardized method which has gained in popularity in recent years. It is mainly due to its relatively simple implementation and free availability of source code for Arduino-based implementation.

Keywords: distracted driving; cognitive workload; DRT; open source implementation.