THE USE OF PHYSIOLOGICAL MEASURES IN TRAFFIC RESEARCH

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Abstract

Traffic safety studies have demonstrated that human error is the major contributing factor in the majority of traffic accidents. Preventing or reducing traffic accidents might be obtained by supporting the driver to improve performance with respect to specific behaviours related to driving performance deterioration. Driver support systems, in particular road transport informatics technology based intelligent driver monitoring systems, hold promise to improve road safety, transport efficiency and environmental quality.
Driving performance is causatively related to driver state in the sense that changes in driver state will inevitably lead to changes in driving performance. In the development phase of driver monitoring systems ongoing physiology is measured continuously to study this relationship. The feasibility of monitoring driver state by monitoring driver behaviour through vehicle parameters is demonstrated by showing co-occurrence of changes in physiology and changes in behaviour.

Introduction

It has been argued that prevention or reduction of traffic accidents requires understanding the mechanisms of accident causation (Brown, 1991). The identification of specific behaviours contributing to accidents is vital for this understanding. Specific driving behaviours, as a part of driving performance in general, are subject to the same factors that affect human performance in general. Therefore, in order to identify in particular the insidious behaviours that lead to increasing accident risk, continuous monitoring of driving behaviour, and not to forget the driver, seems mandatory.
It has also been argued that driving performance easily deteriorates, for instance as a consequence of use of alcohol or medicinal drugs, illness, sleep deprivation, temperature, driver underload or overload (Brookhuis et al., 1991, for an overview see Thomas et al., 1989). These factors all affect driver state, which in fact is causatively related to the performance decrement, in the sense that changes in driver state will inevitably lead to changes in driving performance. Changes in driver state are reflected in changes in relevant physiological parameters such as electroencephalogram (EEG), electrocardiogram (ECG), galvanic skin response (GSR), electromyogram (EMG), etc. (see Brookhuis & De Waard, 1991). Ideally, to monitor the changes in driver state all the time, one would want to be able to continuously measure these physiological signals, in order to be sure that driver state is sufficient for safe driving. However, a device intended to monitor driver state must be able to detect detrimental influences from non-obtrusive in-vehicle parameters