Adaptive driving support -information about the vehicle's lateral position

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Abstract

In the car-driver system several task components carried out by the driver can potentially be taken over by the car. However, when designing such a support system, automation problems are lurking. In the adaptive automation literature a proposed solution to traditional automation disadvantages is to apply assistance only when necessary to sustain goal states. We have conducted a driving simulator experiment in which effects of providing driving support on lateral control in two modes, permanent and adaptive, have been evaluated. Indicators of driver's performance status and subjective ratings of both mental workload and user acceptance were assessed. Driving support was implemented as an icon reflecting the lateral position projected on the windscreen as a head-up display. When adaptive, driving support was switched on and off based on average lateral positioning behaviour to indicate increasing safety risks rather than an emergency signal. Not all drivers made use of the feedback information, but the results showed positive effects, particularly for the adaptive feedback condition.

Introduction

Nowadays, a wide variety of in-vehicle information systems are available for the driver. Current examples range from traditional speedometers to highly advanced pedestrian detection systems. Moreover, modern information provision technology can be expected to further increase the number of sensors available and further change the way information is presented to the driver (e.g. by a head-up display). At present, there are no commercially available systems providing the driver with objective information of the vehicle's position on the road. However, the task of keeping the vehicle on the road or in the correct lane is one of the major control tasks while driving and therefore an important aspect of the primary task to maintain safe control over the vehicle (Parkes, 1991; De Waard, 1996).

The lane-tracking (steering) task is usually carried out in a highly automated fashion although a driver will direct attentional resources to the task whenever the situation demands it; and in doing so, switch from the control level of operation to the manoeuvring level (Michon, 1985). However, a driver may potentially encounter

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