Comparison of eye movement behaviour during negotiation of curves on a test-site and in a driving simulator

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Abstract

In this paper results are presented from a pilot study that explores validity of looking behaviour in a driving simulation. Four subjects completed test rides in a simulator and on-the-road, in both conditions on a similar two-lane test route that included curves. Each trial (real vs. simulator) was performed three times in daylight conditions. During the sessions eye movement behaviour was recorded via the Dornier Eye-Tracking-System (ETS). Results show that subjects use the same cues (lane markers) and very similar systematic viewing strategies during curve negotiation in reality and in simulation. However, the difference in ranges of measured viewing angles in the driving simulator compared with reality cannot yet be fully explained. The cause for greater angles as found in the simulator requires further data collection and calibration. Nevertheless, the results indicate that the driving simulator is a useful tool for further studies concerning the investigation of drivers' visual behaviour.

Introduction

In order to keep the vehicle within the lane boundaries, the driver has to fulfil different tasks that mainly rely on visual information. In this context the ability of well-timed acquisition and processing of information plays an eminent role. In case of curve negotiation the availability of visual information about further road geometry is very important for the quality of the driver's steering behaviour. As many studies have shown (Cohen, 1985; Shinar, et al., 1977; Land & Lee, 1994), drivers use the tangent point on the inside of the curve as informational unit to follow road curvature. The viewing distance relative to their own position is dependent on driving experience; experienced drivers look ahead about one second into the 'future' (Land & Horwood, 1995).

During night-time or fog this visual cue can be more difficult to observe (Zwahlen, 1987). The contrast between road surface and road border is reduced, while only a small portion of lane markers and curvature is illuminated by conventional headlights. In these situations suitable assistance systems, which help the driver to compensate the informational deficit, could be very useful. For this purpose more knowledge is needed about the driver's viewing strategies in normal

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