Changing lanes with active lanekeeping assistance: a simulator study

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Abstract

Active lanekeeping assistance systems are designed to help the driver avoid unintended lane departures. Such a system may also have the additional goal of supporting the driver in changing lanes comfortably and without an unnecessarily large amount of driver effort. Thus, the interaction between the driver and vehicle is important when designing such a system.

This paper presents results from a user study that focused on the driver's ability to change lanes with an active lanekeeping assistance system. Three different systems were tested by each of 20 participants in a fixed-base driving simulator. The assistance from each system was based on the vehicle's position and orientation on the road, and differed only in the way that attempted lane changes were handled. During lane changes one system had an added dependence on time, and the other had an added dependence on the driver's steering rate.

The participants were instructed to make both slow and fast lane changes. Data analysis includes objective parameters such as the steering wheel angle and yaw angle, as well as subjective parameters such as the driver's performance evaluation. The results suggest that an assistance system based on the driver's steering rate is advantageous.

Introduction

Each year, a large number of vehicle fatalities are caused by the vehicle leaving the lane and colliding with a fixed object in the environment. In the United States, this type of accident accounts for approximately one third of vehicle fatalities (NHTSA, 2005). Similar statistics exist worldwide, such as in Germany (Statistisches Bundesamt, 2004). An active lanekeeping system, designed to help the driver avoid unintended lane departures, therefore has the potential to help avoid these accidents.

In D. de Waard, F.O. Flemisch, B. Lorenz, H. Oberheid, and K.A. Brookhuis (Eds.) (2008), *Human Factors for assistance and automation* (pp. 49 - 61). Maastricht, the Netherlands: Shaker Publishing.