Traffic simulation modelling of driver assistance systems

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Abstract

New in-vehicle driver assistance systems are currently introduced at a rapid pace. To exploit the full potential of these systems, it is necessary to estimate the systems future impact already at early stages of the system development process. This paper gives an introduction to the use of microscopic traffic simulation for analysis and evaluation of the impacts of driver assistance systems. Application of traffic simulation for analysis of driver assistance systems is exemplified by studies of an overtaking assistant and of adaptive cruise control.

Keywords – ADAS, traffic simulation, impact analysis

1. Introduction

Driver assistance systems are in-vehicle technologies that give support to various aspects of the driving task. The systems considered in this paper are commonly described as Advanced Driver Assistance Systems (ADAS). ADAS is one category of ITS that is expected to have substantial impact on future road traffic [1]. Examples of ADAS include systems from adaptive cruise control, intelligent speed adaptation and lane departure warning to driver vigilance monitoring, pre-crash vehicle preparation and parking aid. Currently available ADAS are autonomous systems. Co-operative systems based on vehicle-to-vehicle communication are expected to be introduced in the future. Thorough listings of available ADAS and systems under research and development are given in [2 – 4].

From society’s perspective, to increase traffic safety and to remedy congestion and pollution problems, it is important that ADAS lead to real benefits. Scarce resources require prioritisation and as a consequence ADAS need to be evaluated already at early stages of the development process. To assess impacts of already well-tried measures to improve the traffic system, one can conduct before and after studies or cross-sectional studies based on field data. Road safety analysis of traditional safety measures can for example be conducted based on the actual accident turn out. New technologies such as ADAS can however not be reliably evaluated based only on field data. Even though some ADAS already have been introduced in the traffic system, the proportion of equipped to unequipped vehicles is still too small for conclusions to be drawn. Instead, evaluations of ADAS have to be based on laboratory studies and modelling.