

Is drivers' situation awareness influenced by a highly automated driving scenario?

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Abstract

This paper presents results from a study conducted for the European FP6 project *CityMobil*. The experiment described here is part of four cross-site experiments designed to study the human factors issues associated with various degrees of automated driving. Thirty-nine drivers were asked to drive a simulated route with two zones in a within-subjects design, with a main factor of automation. Driver behaviour in "manual" driving, where all driving manoeuvres and decisions were made by the drivers, was compared to "highly automated" driving, where lateral and longitudinal control of the driving task was dictated by the "automated system". In this condition, drivers were asked to take their foot off the pedals and their hands off the steering wheel and allow the vehicle to be driven for them. Situation awareness in both driving environments was measured by computing drivers' response time to a series of unexpected/critical traffic events. Results showed that drivers' response to these events was significantly later in the highly automated condition, implying both reduced situation awareness and perhaps an excessive trust in the automated system.

Introduction

The driving task is becoming more and more automated and it is now possible for various aspects of driving to be controlled by a range of automation and assistance systems. Examples of such systems include Adaptive Cruise Control (ACC), Intelligent Speed Adaptation/Assistance (ISA) and Lane Keeping Assistance System (LKAS), as well as various collision warning and avoidance systems, which use radar detection devices. The idea behind the implementation of most such systems is that they will provide assistance and comfort to the driver, reducing the number of road accidents by increasing safety. Indeed, in the case of a highly automated driving scenario, there is no longer a need for the driver to be involved in the driving task, and his/her role moves from one of an operator to a system supervisor, simply monitoring the functioning of the automated vehicle. However, as suitably highlighted by McKnight & McKnight (2003), the task of maintaining a vehicle in the centre of the road and ensuring a steady speed are perhaps not the most difficult aspects of the driving task, and would indeed be relatively easy to achieve on an empty road, even by novice drivers. However, problems arise when the automated vehicle is required to interact with more complex road environments, as well as

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