

Analysis of the influence of non-driving related activities on seat parameters and sitting postures

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Keywords: Non-Driving Related Tasks and Activities, Autonomous Vehicles, Seat Parameter, Digital Human Modeling

Abstract

Changing mobility scenarios are leading to innovative vehicle concepts. The absence of the driver has opened up a wide range of modified interiors and seating configurations for highly automated vehicles, which are the focus of research.

With the ongoing automatization in the car industry, new questions arise about human factors. From SAE level 3, conditional driving automation allows the driver to disengage from the driving task without the need for supervision. With an increasing degree of automation, the active vehicle driver is transformed into a passive vehicle passenger. This gives the driver the possibility to deal with non-driving related activities and tasks (NDRA, NDRT) whenever the automation is active. The question of what people are likely to do during an automated ride has mostly been addressed via online surveys or by analyzing other means of transportation like train and bus. Various studies examining train or bus journeys using different methods such as (online) surveys or observation of passengers in different means of transport show a wide variety of activities such as listening to music, looking at the surroundings, relaxing, talking on the phone, reading or working, and the use of electronic devices such as laptops, tablets and smartphones [1-2]. Other studies additionally examined seating parameters such as seat and recline angle [3-8].

However, knowing about desired activities allows researchers and developers to design future car interior including seat and seating position, internal HMI, air-conditioning and the automated driving functions according to user needs. Highly automated and autonomous vehicles enable different seating postures. Space in front of the seat allows the passenger more range for movement and postures [4]. Moreover, several studies contribute to the space managements of interior design in the future and show significant effects of NDRTs on driving postures concerning the seat positions and backrest angles [3,8].

The vehicle interiors are always designed to suffice the ergonomic requirements and enhance passenger comfort. The shift of focus from the primary task of driving to using the travel time for various NDRTs was the basis for this research. This research considers the transitional change in automotive development in transfer of vehicle control completely to the car and it evaluates its impact on the seat parameter regarding NDRTs. Change in occupant orientation and activities undertaken during the travel in a fully autonomous vehicle will affect the conventional movement space considerations in the vehicles. The occupant orientation, positions and tasks performed while travelling have an influence on the interior volume and layout. Thus, the possibility of new seat constellations will influence the spatial considerations.

The following research analyses the influences of NDRTs on seat parameters, which seat and backrest settings need to be adjusted for each activity. Furthermore, it is discussed, what main groups of NDRT for each seat setting can be classified. With the help of RAMSIS™ different seating postures for each activity are simulated.

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