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Occupant safety use cases in highly automated vehicles

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Self-driving technology is expected to completely change the current mobility model and could even spark a new industrial revolution once it is deployed within the automotive market. For that reason, lots of efforts are nowadays being devoted to optimizing the systems that enable driving cars without the need for a human driver. In this new scope of the industry – full of uncertainties – research initiatives play a crucial role in defining the challenges of the future. One of those cutting-edge initiatives is the OSCCAR (future Occupant Safety for Crashes in CARs) project, which will provide new approaches to improve the level of personal safety for the occupants of Highly Automated Vehicles (HAV). OSCCAR project represents key research – and a big challenge – to determine possible solutions that may guarantee the safety of autonomous vehicle occupants due to the fact that these people can be performing many different tasks, in different seating configurations and different seat positions when an accident occurs, making the vehicle passive safety approach extremely complex. Therefore, an extensive literature review has been performed.

The activities that passengers currently carry out in cars and public transport were compared with the expected activities they would carry out during a highly automated car ride in a study by Pleging et al. (2016). The survey had 300 participants and was a combination of a web, in situ survey in suburban trains and in situ observations in subway. The top three current activities reported were: looking out the window, texting and listening to music or radio, which 50% of the population defined as very frequent. In the survey about the expected activities, an increase can be observed (more than 15%) of the interviewed people that consider as very frequent in an automated vehicle the following activities: talking to the other passengers, listening to music and calling. They also consider that they would frequently surf internet, sleep and eat when travelling in autonomous vehicles. Different results have been observed between the likely activities performed currently in a journey and the ones expected in the future autonomous vehicle. In fact, is should be taken into account that many of the current activities listed have been observed in public transport – which have different transport characteristics than cars – and also, expected activities are based on the wishes and hopes of the autonomous vehicle's characteristics – which may not be the real ones. In order to see these facts, we have compared the expected activities with the ones currently performed in Fig.1. In conclusion, we see that people in an automated vehicle would tend to be more engaged in entertainment, eat and drink or working activities.

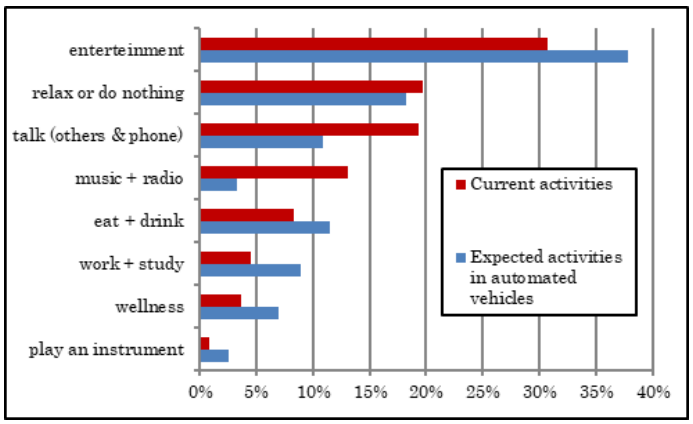

Fig.1 Comparison between the user activities in current journeys and the expected to be performed in autonomous vehicles

Furthermore, the literature review carried out showed that the Highway Pilot and the Parking Pilot are the most well-valued cases by real transport users among the different use cases. On the other hand, 'Vehicle on Demand' use case has proven to be the case with less reliability within the population. This can be explained by both the fact that no-one is going to drive the vehicle and that the technology is still far away from becoming real on the streets. When looking at the activities performed in the case of using current public transportation modes, a major difference between what people say and what they really do has been seen. In general, it has been observed that people like to do nothing when commuting with public transportation, while they say they read. The characteristics of the journey also play a relevant role in this case, depending on the length of the journey, the shared space, the seating position, the noise, etc. As it has been seen that, long journeys, calm and motivate people to focus on longer and more complex activities.

Finally, when comparing the current activities in passenger vehicles to the expected ones in Highly Automated Vehicles, the specific surveys have shown that people tend to be more engaged in entertainment, eating, drinking or working activities inside an automated vehicle. Overall, this work has set the basis to define future use cases related to Highly Automated Vehicles in order to better understand the complex scenarios that will have to be faced due to the introduction of this technology in the automotive market. Further steps will have to be made in order to link those use cases to specific developments in terms of passive safety occupant protection.

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