Drivers' adjustment of overtaking characteristics for different objects

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ABSTRACT

Understanding of what will make people feel safer and more comfortable in autonomous vehicles is needed. Traditional driver behaviour models identified valence of road objects as relevant to trajectory planning. However, the notion that different objects differ in valence has to be empirically supported. Such data, can be used to modulate the dynamics of autonomous vehicles to align with human expectations. We examined whether drivers' overtaking behaviour changes with respect to the type of object ahead. Using a driving simulator, 28 participants drove scenarios of rural or urban roads at 50 or 100 km/h, while overtaking private cars, single motorcycles, groups of motorcycles, and trucks, that were either stationary or moving. Distance to the object and Time To Collision were obtained along with driving-style questionnaire and perceived risk. Results show that when overtaking, drivers adjusted the safety distances between them and the objects differently. Overtaking the truck and the group of motorcycles were perceived as riskier than single motorcycles and private cars. Also, for three out of the four road objects, drivers' subjective ranking of the object's riskiness fitted their objective driving measures. Results support the idea that valence reflects people's sense of riskiness, and that it is demonstrated in drivers' objective and subjective behaviour. The findings of this study provide empirical support for the role of valence in drivers' overtaking behaviour. These findings can now be used to design the behaviour of autonomous vehicles so that they appear more human-sensitive and are therefore less discomforting for passengers.

Keywords: Object avoidance, Overtaking, Valence, Perceived safety, Comfort in driving.