

Abstract EU Safety Conference 2022 - Bike2CAV

Title: Novel warning signals and solutions for cyclists' safety in automated, connected mobility

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Introduction

Rapid developments in the field of autonomous driving and its implications for society, traffic and safety management are shaping the everyday life of us all. Stakeholders along the intelligent road traffic system and bicycle industry aim to actively contribute to this challenge and are collaboratively working on new solutions. The safety of cyclists in the automated traffic of the future is the core focus of a current Austrian applied research project, which investigates novel data-based warning alerts exchanged between cyclists, a new generation of automated driving cars and road side infrastructure (www.bike2cav.at).

Objective and Methods

The aim of this contribution is to present and discuss the challenges and limitations of data-driven warnings and related new safety signal applications from a user perspective. These were identified in "Bike2CAV" during 2021 using an empirical mixed-methods approach: First, a user survey among active cyclists (n=892) in the DACH region investigated and prioritized the most risky situations for a cyclist collision with cars (e.g. intersections, overtaking, near miss situations). Second, the survey investigated needs and expectations for data-based digital warning applications and safety-enhancing devices (e.g., smart textiles, helmets, lights) to mitigate such situations in automated traffic. The survey results were explored in greater depth in two open innovation workshops with selected cyclists, and three automated warning concepts (auditory, visual, or haptic) were designed based on the user preferences (n=17; 5/2021). These solutions were evaluated in an interdisciplinary workshop with invited bicycle users, bicycle initiatives, the bicycle industry, road safety experts and researchers from the field of automated driving. The design prototypes will be re-evaluated by the BikeCitizens community and field tested during May 2022.

Results

The user needs analysis show that cyclists prefer not to be overloaded with information and to be warned only when the automated vehicle has not detected the cyclist motion or the cyclist's intention (e.g. to turn). The survey did not clearly ascertain a preference for either modalities of processing warning signals (visual, haptic and/or acoustic). There the envisaged solution is based on a smartphone, which alerts cyclists by a warning sound transmitted through either a Bluetooth-enabled bicycle helmet, and/or a red flashing screen in a bicycle navigation app and/or by vibrating handlebars.

Conclusion

Open issues: How do the preferred designs and modes of warning signal effect road safety of users? Do smartphones or smart textiles offer the possibility of giving cyclists an advantage as a vulnerable group in the automated traffic of the future?