

TOUR DE INTERACTION



How Autonomous Vehicles (AVs) and cyclists will interact in shared traffic is largely unexplored but is key to ensuring safety when these new vehicles join our roads. We report the findings of an online survey (n=383) that investigates cyclist-driver interaction behaviour from cyclists' perspectives. We identified the scenarios that prompt interactions and the social cues cyclists use in these scenarios. Cyclists also reported their most carried wearable devices and their perception of AVs.

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Introduction

Cyclists are vulnerable road users (VRUs) who frequently share the road with motorised traffic. They rely on social interactions with drivers to safely navigate the road. A typical example is a driver using hand gestures to signal a cyclist to proceed at an intersection.

Autonomous vehicles (AVs) are close to joining our roads; social cues such as hand gestures and facial expressions will be lost, and interactions will shift from interpersonal to human-machine. Unlike with pedestrians, little work has explored how AVs will interact with cyclists.

We report the findings of an online survey (n=383) that investigates cyclist-driver interaction behaviour from cyclists' perspectives. Our results offer a starting point to inform how AVs should behave around cyclists.

Analysis

We used thematic analysis to analyse responses to our open questions. We report the five most prominent themes supported by findings from our Likert scale questions.

Results

Theme 1: Cyclist Device Use on the Road

Respondents identified smartphones as the most carried devices on cycling trips. However, qualitative data suggest that these devices are rarely in the cyclist's line of site.

Theme 2: Cyclists' Views on Using Wearable/On-Bicycle Devices to Interact with AVs

Respondents reported that the responsibility for carrying these devices should not be on cyclists.

Theme 3: Social Cues in Cyclist-Driver Interactions

Our findings show that cyclists commonly establish eye contact and use hand gestures to interact with drivers.

Theme 4: The Impact of Unexpected and Uncontrolled Scenarios on Cyclists' Perceived Risk

Cyclists perceive unexpected and uncontrolled scenarios to be dangerous in the presence of motorised vehicles. For example, intersections without traffic lights were more hazardous. Cyclists also reported a high perceived risk of scenarios that require them to transition from segregated to mixed traffic, such as cycle lanes that merge into traffic.

Theme 5: AV impact on Cyclist Behaviour

We found that cyclists do not know enough about self-driving vehicles to understand their impact on cycling behaviour.

RQs

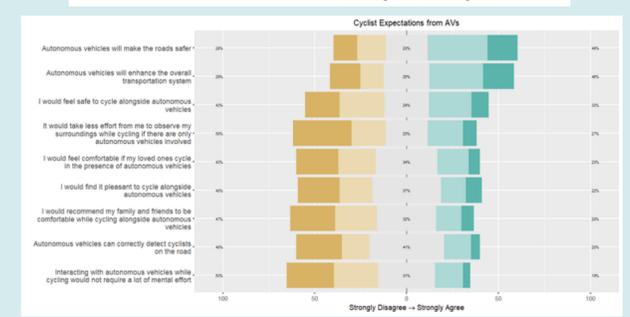
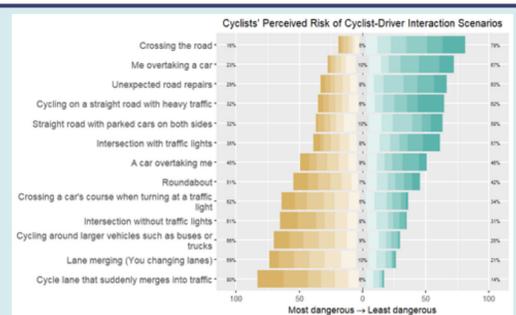
1. What available wearable or on-bicycle platforms can be used to host AV-cyclist interfaces?
2. How do cyclists use social cues to interact with drivers?
3. What traffic scenarios do cyclists perceive as the most dangerous?
4. How will the arrival of AVs impact cyclist behaviour on the road?

Methodology

We administered an online survey (n=383) designed to understand current cyclist-driver interactions as a starting point to inform how AVs should behave around riders.

In a mixture of open and five-point Likert scale questions, we asked cyclists to identify their most carried smart devices, cyclist-driver interaction techniques and scenarios and self-report their understanding of AVs.

Visualisations



Conclusions

- We identified the social cues and messages exchanged between cyclists and drivers to help designers address cyclists' unique needs.
- We uncovered cyclist-specific scenarios to help designers evaluate their novel interfaces.
- Cyclists currently use hand gestures and eye contact to interact with drivers. If future AVs cannot recognise these, and respond appropriately, then dangerous situations will likely occur due to miscommunication.
- We recommended further investigation as cyclists were currently unsure how they would be affected by AVs on the road. This suggests that care should be taken over their introduction to avoid unsafe situations.
- Our findings offer a basis for exploring AV-cyclist interactions by showing current cyclist-driver interaction behaviours, which should form a starting point for future research.

