

UNDERSTANDING CONTEXTUAL CUES IN ANTICIPATING LANE CHANGE BEHAVIOUR

Insights from a Naturalistic Driving Study

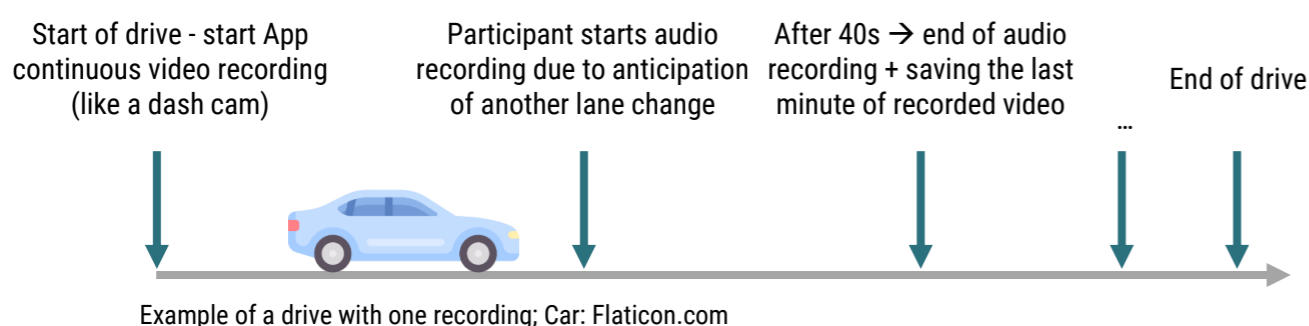
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Motivation

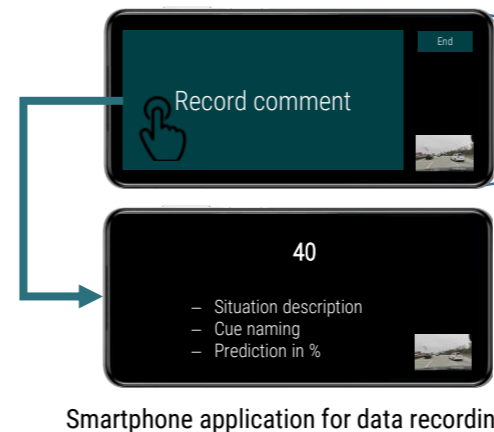
- Human drivers use implicit (e.g. vehicle dynamics) and explicit (e.g. turn signals) cues to anticipate lane changes^{1,2,3}
- It is unclear whether contextual cues are also used for anticipation⁴

Methode

- Naturalistic Driving Study (N = 30; 20 male & 10 female)



Example of a drive with one recording; Car: Flaticon.com



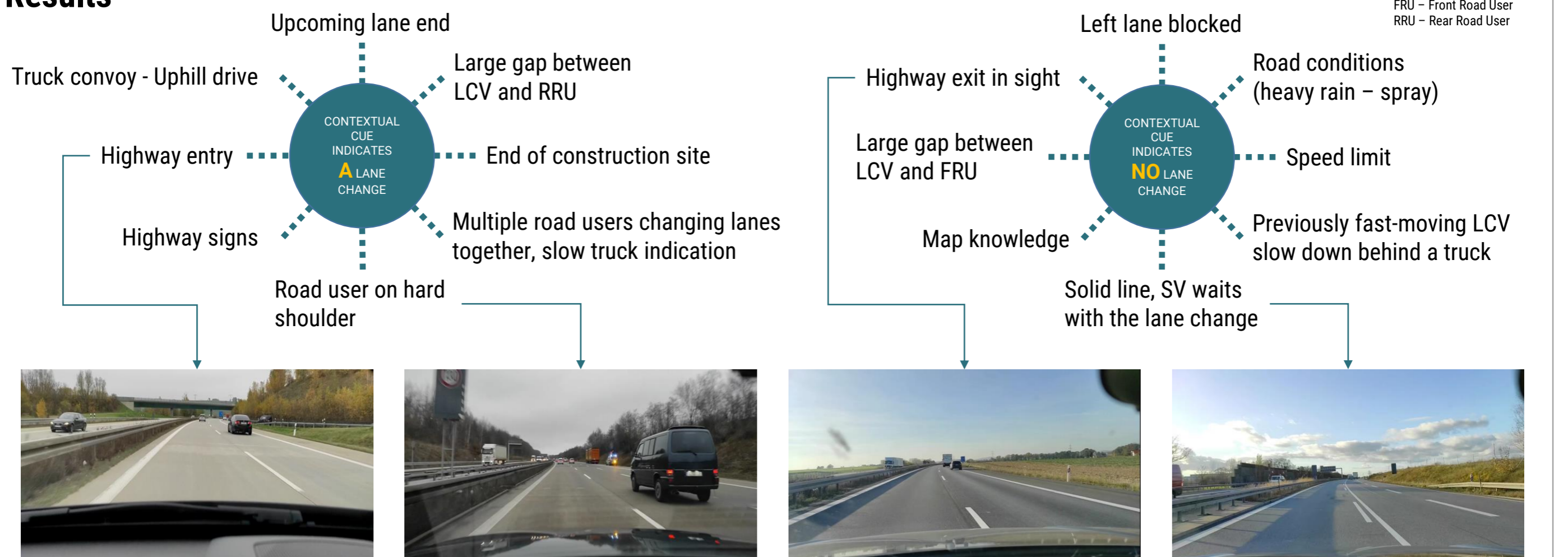
Participants

- Mean age: 46 years (23-66, SD = 12.3)
- Mean driven kilometers last year: 35.183 (8.500-65.000)
- Mean driven kilometers last five years: 220.500 (50.000-1.330.000)
- No problems were reported using the smartphone app

Data

- Video and voice recordings were transcribed and annotated using MAXQDA
- Over 28.000 kilometres were driven during the test period
- Over 1000 lane changes were recorded during the test period

Results



Conclusion

Drivers use implicit cues to anticipate the driving behaviour of other road users e.g. speed differences, distance to other road users, lateral positioning, ...

"The black Hyundai just changed lanes because it was going faster than the truck in front of it. That was predictable, because he also flashed his lights beforehand. Prediction, I say 100%. It was clear that he was going to do that."

Contextual cues also play an important role

e.g. highway entry / exit, construction site, uphill drive with slow vehicle, ...

"I assume that the car in front of me on the right side will immediately change to the left lane. This is because the speed limit is lifted after the tunnel and the car is naturally faster than the truck in front of it. That's exactly how it is. That was to be assumed with almost 90%."

Literature

- ¹Schieben, A., Wilbrink, M., Kettwich, C., Dodiya, J., Oehl, M., Weber, F., Kaup, M. (2019a). Testing external HMI designs for automated vehicles: An overview on user study results from the EU project interACT (19. Tagung Automatisiertes Fahren)
- ²Lee, Y.M., Madigan, R., Giles, O. (2021). Road users rarely use explicit communication when interacting in today's traffic: implications for automated vehicles. Cogn Tech Work 23, 367-380, doi: 10.1007/s10111-020-00635-y
- ³Moore, D., Currano, R., Ella Strack, G., Sirkin, D. (2019). The Case for Implicit External Human-Machine Interfaces for Autonomous Vehicles. In Proceedings of the 11th International Conference on Automotive User Interfaces and Interactive Vehicular Applications. Association for Computing Machinery, 295-307, doi: 10.1145/3342197.33453200
- ⁴Wirthmüller, F., Schleichtrien, J., Hipp, J., Reichert, M. (2020). Towards Incorporating Contextual Knowledge into the Prediction of Driving Behavior. IEEE 23rd International Conference on Intelligent Transportation Systems (ITSC), pp. 1-7, doi: 10.1109/ITSC45102.2020.9294665.

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