

Developing More Comfortable, Transparent And Acceptable AV-kinematic Cues For Drivers



Chen Peng

Institute for Transport Studies, University of Leeds, UK
SHAPE-IT ESR 5



UNIVERSITY OF LEEDS



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This project is about comfort for the on-board user of highly automated vehicles, specifically, understanding and improving subjective comfort from the vehicle kinematics perspective.

This poster is based on a paper (Peng et al., submitted) currently under review at Human Factors.

A driving simulator study, simulating roads with different road geometries and speed limits, was conducted. Twenty-four participants experienced three highly automated driving styles, two of which were recordings from human drivers, and the other was based on a machine learning (ML) algorithm, termed Defensive, Aggressive, and Turner respectively. Participants evaluated comfort or naturalness of each driving style, for each road segment, and completed a Sensation Seeking (SS) questionnaire, which assessed their risk-taking propensity.



Fig 2. The simulated environment (left) and the real road (right)

Results showed that:

- **Human-like** driving features were rated as more comfortable and natural than the ML-based, less-human-like, driving style, under most road contexts for users with different sensation seeking traits.
- Between the two human-like driving controllers, the **slower, milder and more conservative** controller (Defensive) was preferred, in terms of comfort and naturalness.
- When exposed to more complicated **road environments** (e.g., sharper curves, higher speed limits, potentially hazardous roadside objects), the Defensive driving controller was preferred.
- A **natural** driving style was not necessarily perceived as **comfortable**, especially by high sensation seekers.

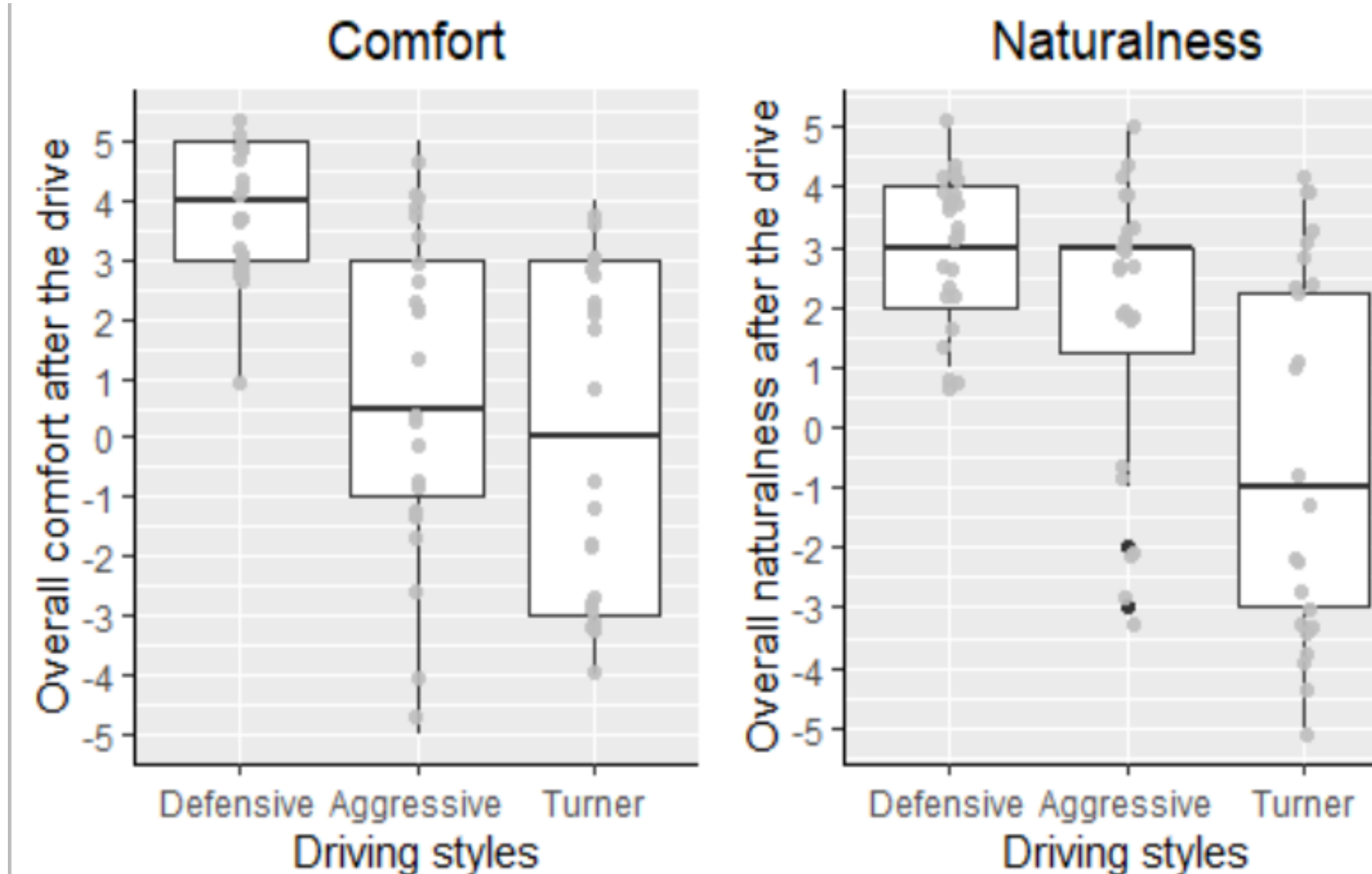


Fig 3. Overall comfort (left) and naturalness (right) evaluation of the driving styles.

Comfortable and Natural AV Driving Styles

Comfort and naturalness are thought to play an important role in contributing to users' acceptance and trust of automated vehicles (AVs), although not much is understood about the types of driving style which are considered comfortable or natural.

This study investigated users' subjective evaluation of three highly automated driving styles, in terms of comfort and naturalness, when negotiating a UK road in a high-fidelity, motion-based, driving simulator.

Fig 1. The University of Leeds Driving Simulator

Future Outlook

The next step of my research will include a focus group study aiming to understand descriptions and contributors of comfort (data collected, to be analysed), and an investigation on the influences of important vehicle kinematics on comfort via existing data and possibly a new simulator experiment.

Reference

Peng, C., Merat, N., Romano, R., Hajiseyedjavadi, F., Paschalidis, E., Wei, C., Radhakrishnan, V., Solernou, A., Forster, D., Boer, E. (2021). *Drivers' Evaluation of Different Automated Driving Styles: Is It both Comfortable and Natural?* [Manuscript submitted for publication].
[Preprint is available on ResearchGate](#)

Supervision and Contact Details

Supervisors:

Prof. Natasha Merat (University of Leeds)

Prof. Marjan Hagenzieker (TU Delft)

Dr Chongfeng Wei (Queen's University Belfast)

Contact details:

tscp@leeds.ac.uk

