Toward a High-Level Integrative
COMFORT MODEL
in Autonomous Driving

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VERONIKA DOMOVA, REBECCA CURRANO, DAVID SIRKIN
Center for Design Research, Stanford University, USA

INTRODUCTION

In the context of autonomous driving, comfort is understood to be a subjective, pleasant state of relaxation lacking uneasiness and distress and resulting from apparently safe vehicle operation.

The extant literature on autonomous driving comfort, although extensive, is incomplete: no integrative model exists incorporating major automation-related, comfort-influencing factors and their interrelations.

LITERATURE REVIEW

We identified about 40 works that (a) report users' positive and negative experiences using automation, and (b) investigate comfort-related reasons motivating users to engage automated driving or to resume manual control

From the identified works, we distilled 20 automation-related, comfort-influencing factors, which inform the proposed model.
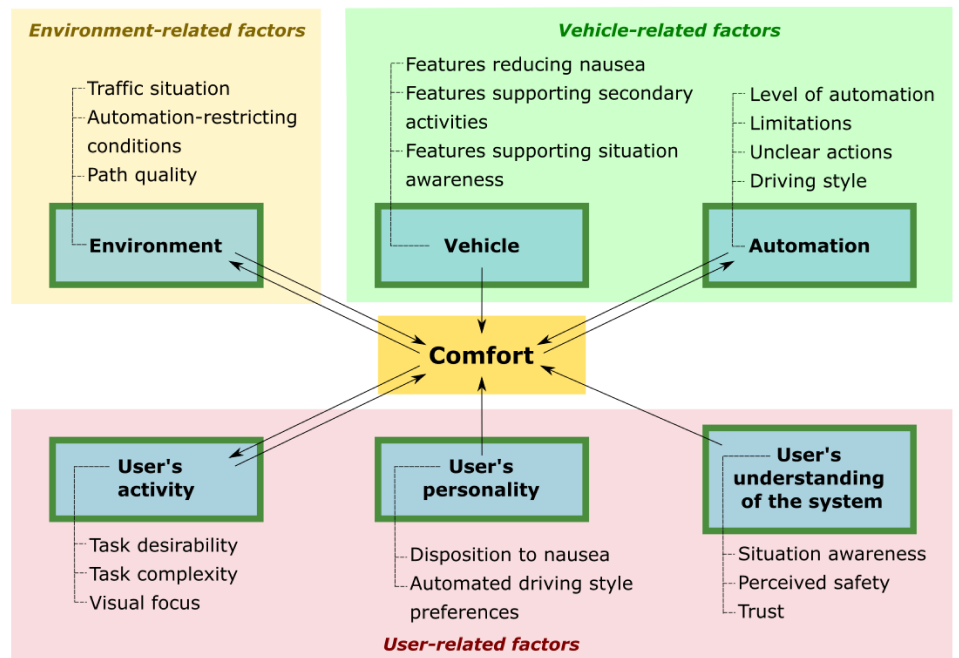
MODEL

The comfort model comprises 6 groups of comfort-influencing factors clustered into 3 larger categories: environment-, vehicle-, and user-related factors. The factors are solely related to autonomous driving.

The model contributes an updated account of user comfort and its influencing (and influenced) factors, inclusive of the features and characteristics of automation.

Some of the model's groups, or their constituent factors, are relatively fixed, such as the vehicle's features or the user's background, while others change over time, such as the environment or the level of automation.

Furthermore, some of these changes can be foreseen or predicted, such as weather conditions, while others cannot, such as automation failures.

Environment-related factors
- Traffic situation
- Automation-restricting conditions
- Path quality

Environment

Vehicle-related factors
- Features reducing nausea
- Features supporting secondary activities
- Features supporting situation awareness

Vehicle

- Level of automation
- Limitations
- Unclear actions
- Driving style

Automation

Comfort

User's activity
- Task desirability
- Task complexity
- Visual focus

User's personality
- Disposition to nausea
- Automated driving style preferences

User's understanding of the system
- Situation awareness
- Perceived safety
- Trust

User-related factors

Arrows represent the directionality of comfort influences: all identified factors may influence user comfort, and some in turn may be modified by users, due to their confort/discomfort.

FUTURE WORK

- By further analyzing the predictability of the comfort-influencing factors, we can identify a baseline level of comfort for a given trip, as well as uncertainty introduced by externally changing factors.

- Further research is needed to estimate the possibility to implicitly encourage users to engage or disengage automation by adjusting theirlevel of comfort.