AV OCCUPANTS' PERCEPTION OF SAFETY IN RELATION TO AV BEHAVIOUR

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Will passengers feel safe in automated vehicles? Will they trust the driving automation? This study will give you the answer aiming to enhance perceived safety and trust in driving automation.

SIMULATOR STUDY I

Objectives

- Develop perceived risk and trust models
- Unravel the dynamics of perceived risk and trust in highway scenarios (Merging and hard brake).

Methodology and Equipment

Experiment devices

Results and conclusions

- **Regression models** of perceived risk and trust are built.
- Neighboring road users' **relative motion** (gap & braking) significantly influence perceived risk and trust.
- **Experienced drivers** and **male drivers** are less sensitive to risk.
- **Pupil dilation** can indicate perceived risk if the event is sufficiently risky.
- The merging and braking events increased **heart rate**.

SIMULATOR STUDY II

This study aims to investigate how UI with different information types and information modalities affect perceived safety and trust. Scenarios and measures are the same as in simulator study I.

UI design. Upper: The UI in the cabin and the surrounding information and pop-up message. Lower: Pop-up messages with surrounding and maneuver information

Results and conclusions

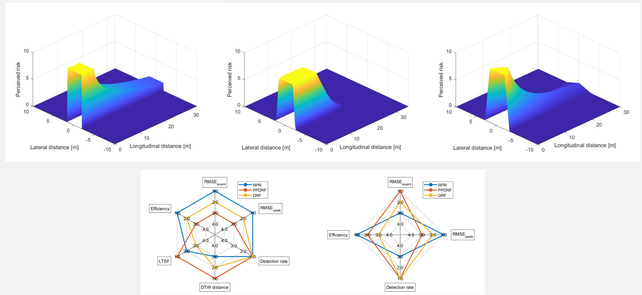
- All UI enhance perceived safety and trust.
- The UI with **acoustic maneuver** information enhances trust most.
- With UI drivers **intervene (brake) less**.
- Drivers **gaze** at the road **less** with internal visual UI.
- UI affect **acceptance** more than trust and perceived risk.

PERCEIVED RISK MODELLING

Objectives

This study aims to formulate perceived risk models for real-time computation and have a comprehensive comparison between the models.

Model visualization and performance



Upper: Model visualization of RPR, PPDRF and ADS.
Lower: Performance radar chart in two datasets

Conclusions

- Perceived risk is **2-D** and **changes non-linearly** with distance
- **Gaussian risk field** is suitable to describe lateral perceived risk
- It is supported that human drivers perceive risk by estimating collision **probability** and collision **severity.**

PERCEIVED RISK SURVEY

This is an ongoing study to **collect large-scale perceived risk data** and find the difference in various scenarios. We ask participants to give their perceived risk level to a series of video clips in different scenarios (shown as video streams below) that continuous in time domain.

Subject vehicle reacting to merging vehicles

Subject vehicle reacting to lane change abortion

Subject vehicle reacting to hard brake

Subject vehicle merging onto main road

Perceived risk slider after each video clip

LATEST PUBLICATION

He, X., Stapel, J., Wang, M., & Happee, R. (2022). Modelling perceived risk and trust in driving automation reacting to merging and braking vehicles. Transportation Research Part F: Psychology and Behaviour, 86, 178–195.

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