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Safety Performance Assessment of Automated Driving

Virtual Experiments using stochastic (Monte-Carlo) Simulation

Problem Statement

- How can new technologies be objectively assessed with regard to their (side) effects prior to their introduction into traffic?
- Traffic sample size to achieve statistical power for performance assessment of Automated Driving (AD) is far too large for Naturalistic Driving Studies

Approach: Virtual Experiments

(1) Modelling of current (stochastic) traffic processes as reference / baseline.

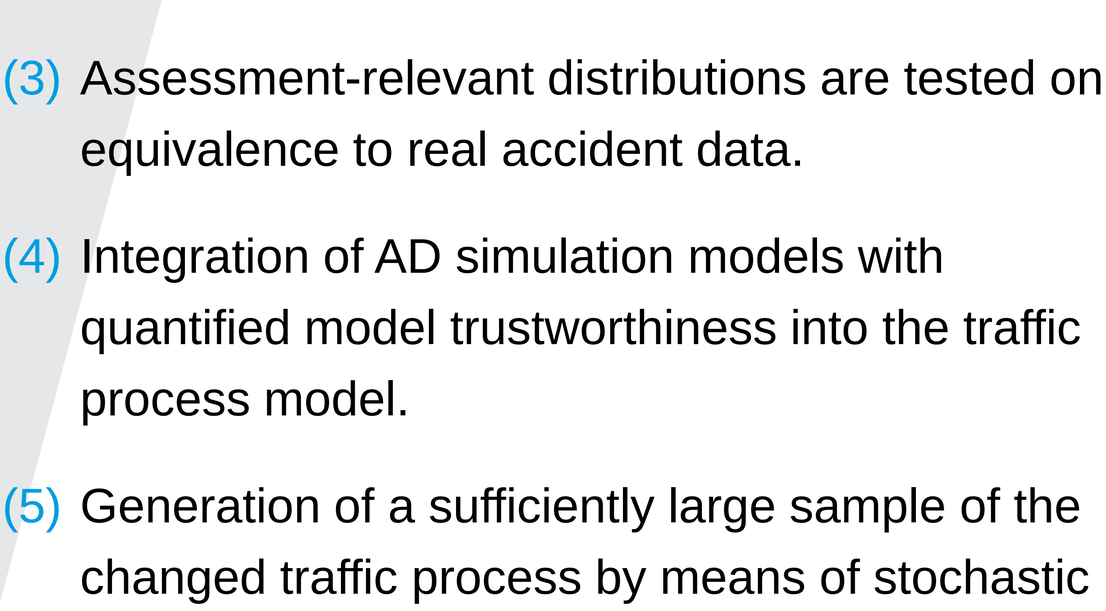
(2) Generation of synthetic traffic scenarios using stochastic simulation.

(3) Assessment-relevant distributions are tested on equivalence to real accident data.

(4) Integration of AD simulation models with quantified model trustworthiness into the traffic process model.

(5) Generation of a sufficiently large sample of the changed traffic process by means of stochastic simulation with integrated AD.

(6) Performance of the measure compared to the reference traffic process is evaluated.



Key Challenge: Cause-Effect Models of Manual Traffic Processes

- Traffic processes need to be modeled taking into account stochastic variations in the cognitive and dynamic behavior of all road users (including cyclists, e-scooters, etc.).
- Odd sample combinations of the underlying distributions can lead to accidents and therefore have to be modeled realistically to generate validated performance estimates
- Model of variations in dynamic performance of E-Scooter drivers
  - Including parameters such as skill level, pertinent cognitive and perceptual features, dynamics and physical limitations
- Models of Human Cognitive Performance
  - Major causal factor in traffic accidents
  - Reduce problem complexity by modelling time until traffic conflict perception

Benefits

- Development accompanying tool that can be used for early impact analysis of technologies on the overall traffic context.
- Reduction of misdevelopments due to misjudged (side) effects in the overall traffic context
- Continuous cost efficient feedback on technology performance enables iterative optimization

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