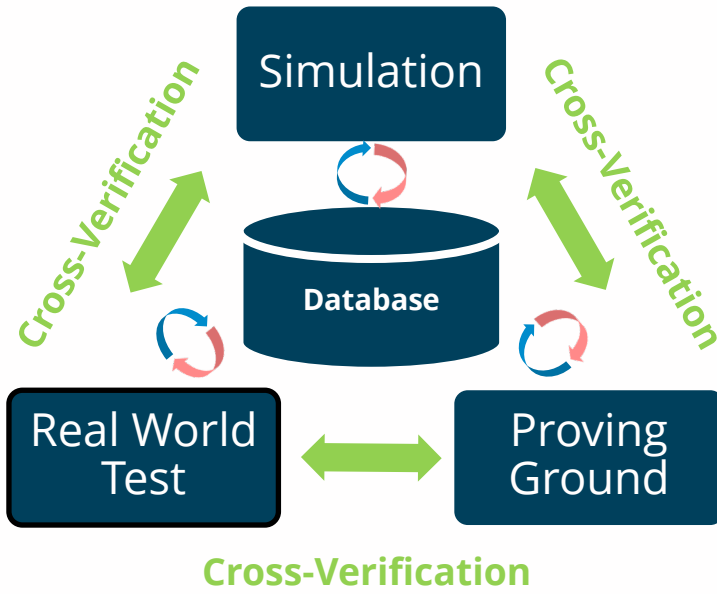


VERIFICATION

Korbinian Groh, Sebastian Wagner
Thomas Kühbeck, Alois Knoll



Problem

Infeasibility to conduct the whole **test volume** on **real roads**

Simulation can not be validated as a whole and therefore not be used for assessment

Solution

Cross-Verification
of scenarios on real roads and simulation

Result

In **cross-verified test cases**, simulation can **contribute to the test volume** through **variations**



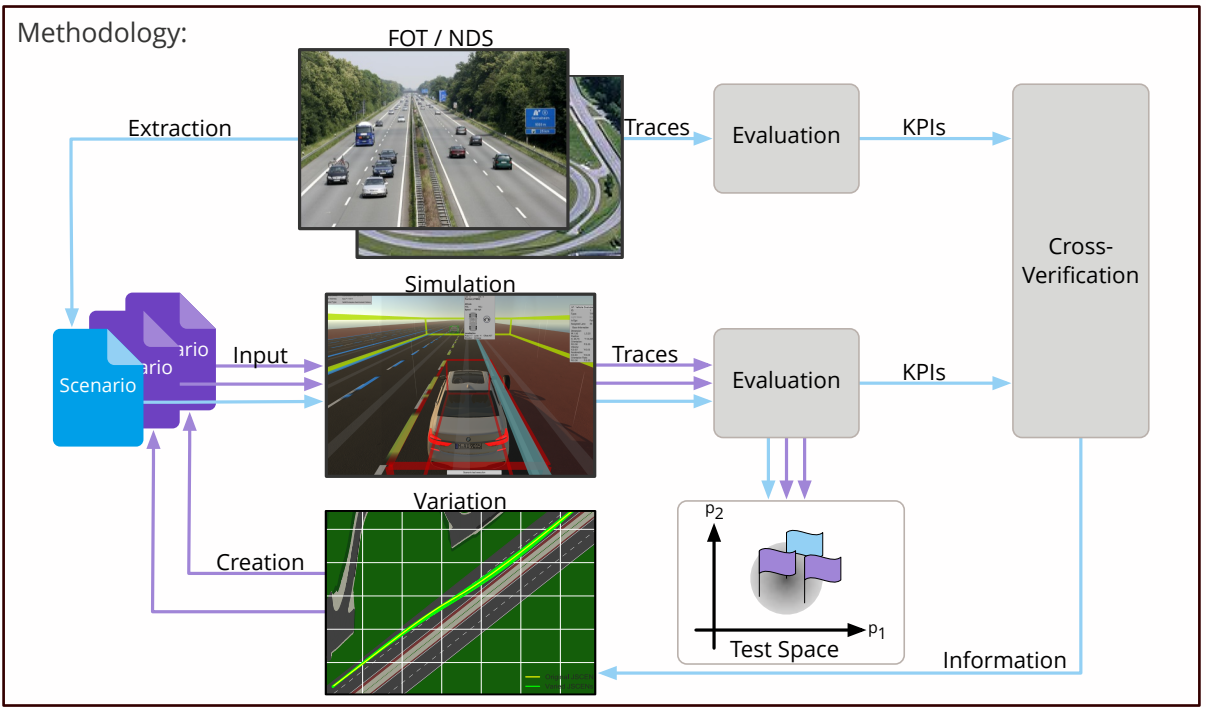
Testing and Safeguarding – Stand 22

VERIFICATION

Korbinian Groh, Sebastian Wagner
Thomas Kühbeck, Alois Knoll



Method for Assessment of Highly Automated Driving including Verification.



Measurements:

- **sensor data (SD)** for HAD function recorded (odometry and environment model)
- **ground truth (GT)** in form of dGPS available

Scenario Description:

- **deterministic** actions for all traffic objects (TOs) except the EGO
- HAD function is **free to perform** after the start
- start conditions related to OpenDrive map
- **unambiguous** trace representation for TOs

Simulation:

- **same HAD function** deployed as in real-world
- has to **fulfill** the **start conditions** set in the scenario description
- has to **match defined traces** of the TOs

Evaluation:

- **measures and metrics** reflect the behavior of the HAD function
- focus is mainly on **risk-related** measures



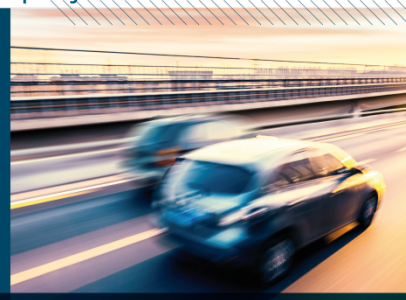
Supported by:



on the basis of a decision by the German Bundestag

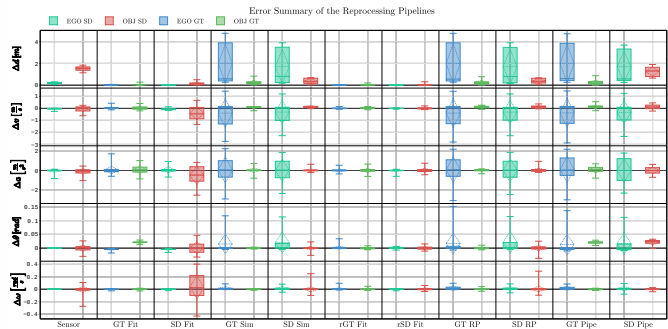
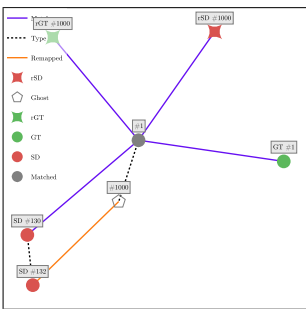
VERIFICATION

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VIDEO

Cross-Verification:



- **Object matching** between GT, SD and resimulation of both
- Reveals **ghost objects** and **missed detections**

- Detailed **error analysis** throughout the whole pipeline
- Major errors in simulation:
 - GT: AD function is presented with ideal information in simulation → improved behavior
 - SD: Some sensor errors are corrected by the consistent scenario description → likewise idealized information

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