A Traffic-based Method for Safety Impact Assessment of Road Vehicle Automation

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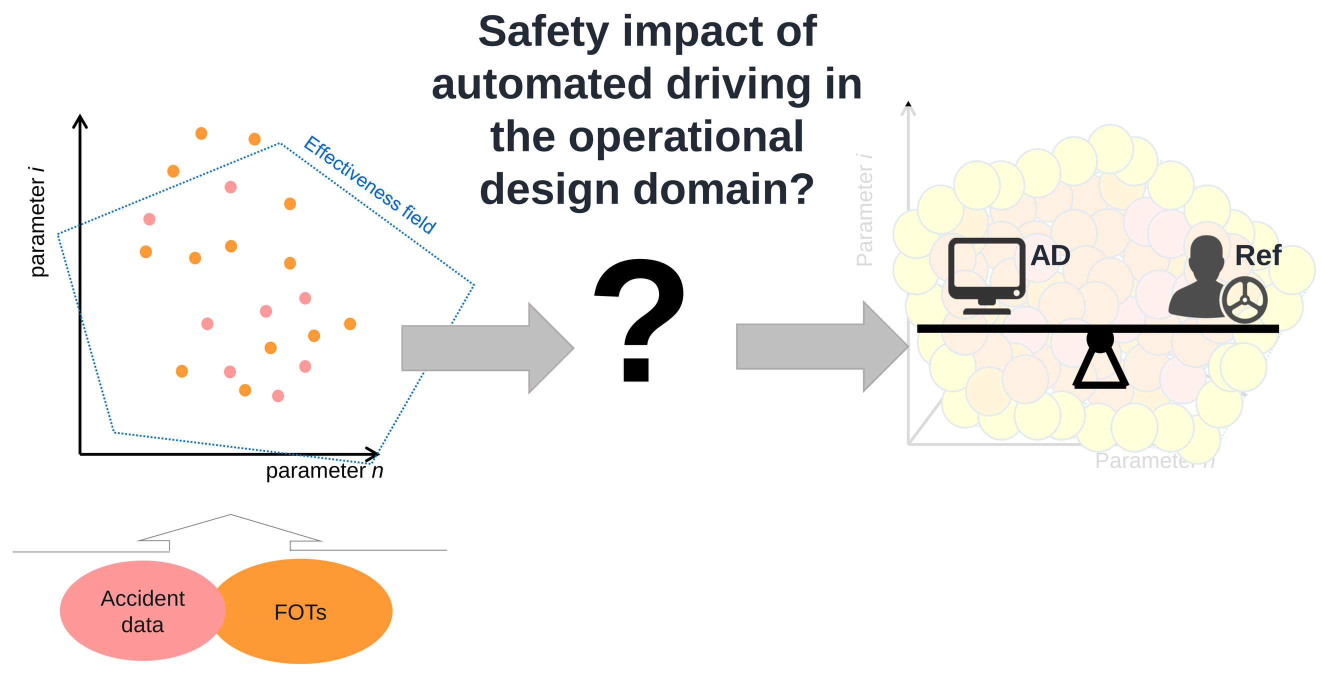
Challenges

- One of the major challenges for enabling market introduction of automated driving is to **identify risks** and **benefits** of these functions.
- According to the *German Ethics Commission on Connected and Automated Driving [1]*,

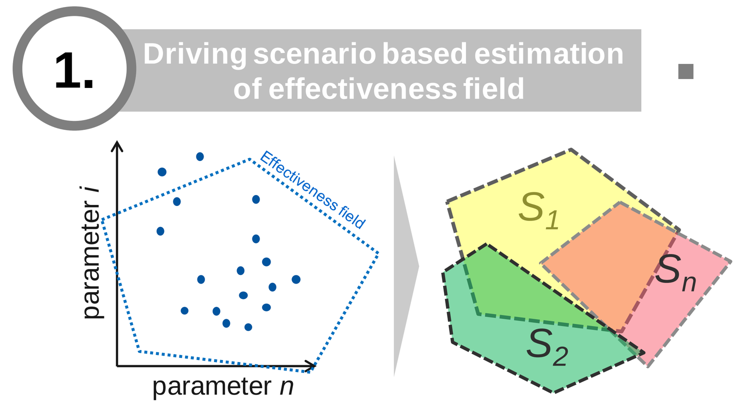
  "[..] the licensing of automated systems is not justifiable unless it promises to produce at least a diminution in harm compared with human driving, in other words a positive balance of risks [..]"

- In order to assess this balance of risks, a method for safety impact assessment of continuously operating [2] automated driving functions with respect to human driver performance is necessary.

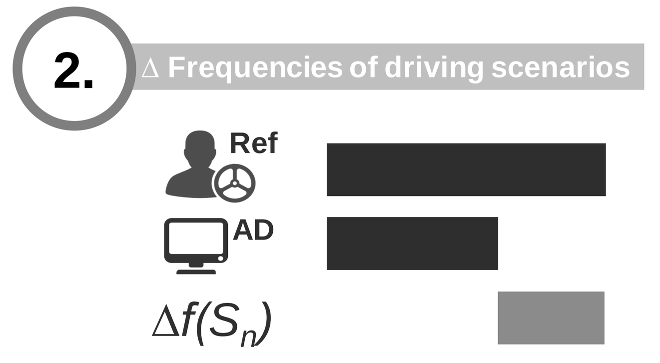


- Based on different data sources, such as national accident statistics [3], in-depth accident data [4] and FOT-data [5], a **simulation-based** approach for **prospective effectiveness assessment** has been realized.

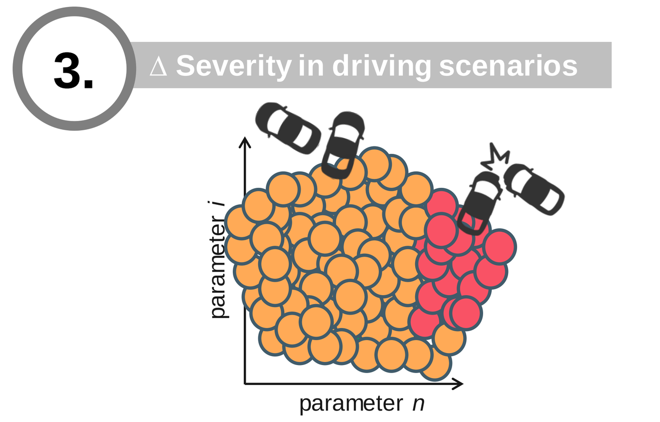
Method



- Accidents addressed by automated driving functions form the **effectiveness fields** gained from **national accident statistics** and **in-depth accident data.**

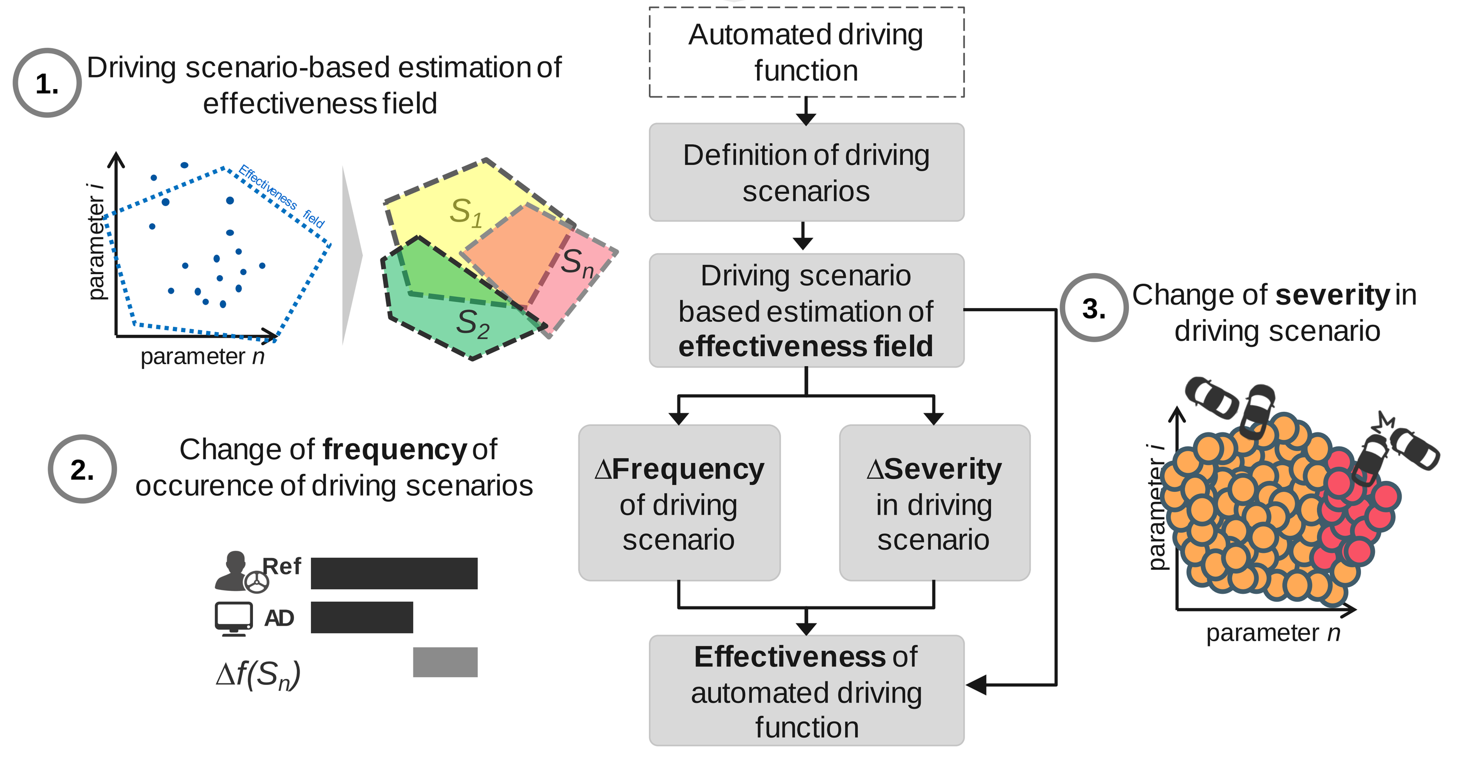


- Automated vehicles may not get involved in certain accident scenarios any longer while other, new accidents, will arise. **Changes in frequencies of driving scenarios** have to be assessed.



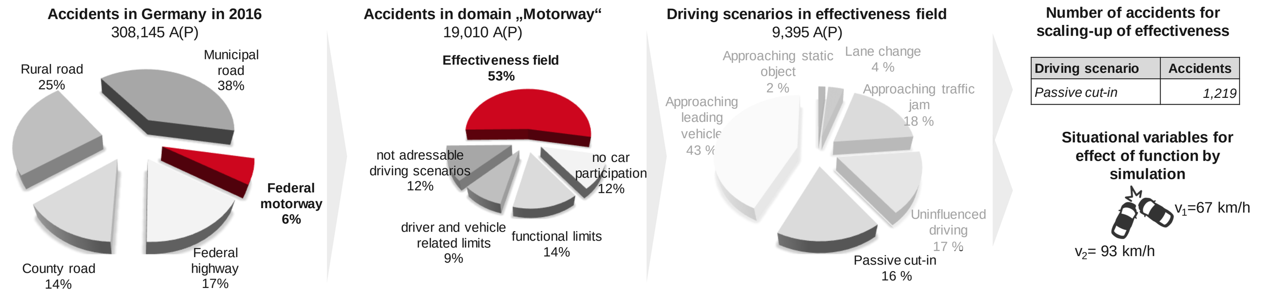
- In incident situations, the **performance** of automated vehicles **is compared** to human driver performance for obtaining Δ **severity**.

Methodical approach for safety impact assessment



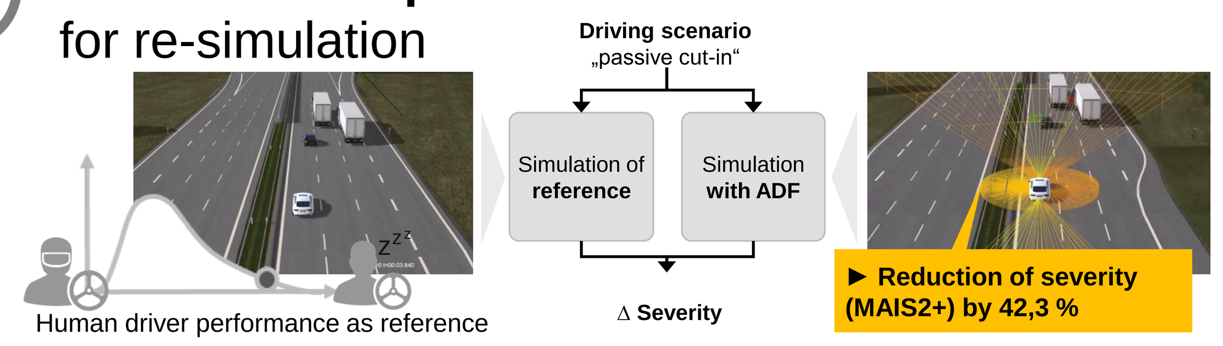
Results

1. Exemplary estimation of **effectiveness fields** of SAE level 3 "Motorway-Chauffeur"

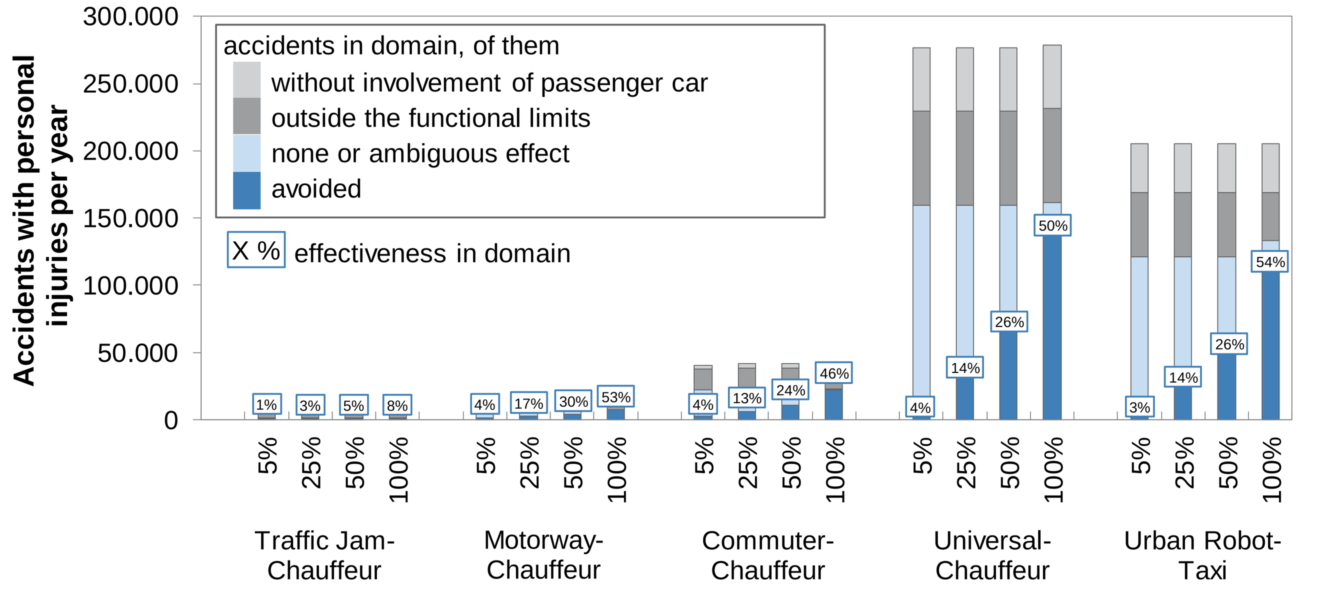


2. **Traffic simulations** for identification of relevant driving scenarios [6]

3. **Human driver performance models** as reference for re-simulation

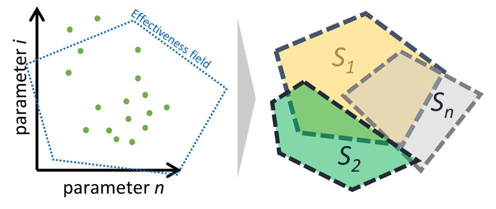


Results of effectiveness assessment



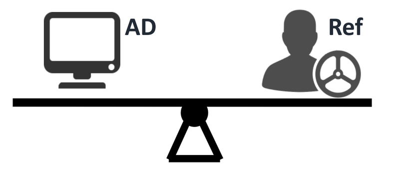
- Motorway-Chauffeur can **reduce 30 % of all accidents** on **German motorways** at a market **penetration of 50 %.**
- This equals 2 % of all accidents on German roads.

Conclusion



- The **operational design domain** (e.g. environmental conditions) highly affects the **effectiveness** of an automated driving function.

- **Changes in frequencies** (and thus relevance) of driving/accident scenarios have to be taken into account for safety assessment of AD.



- **Human driver performance** has to be modelled as a reference for assessment.

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