

REAL WORLD ACCIDENT SCENARIO SIMULATION WITH IPG CARMAKER

October 2020

Angela Schubert, Marcus Petzold

Agenda

Introduction to traffic accident research at VUFO

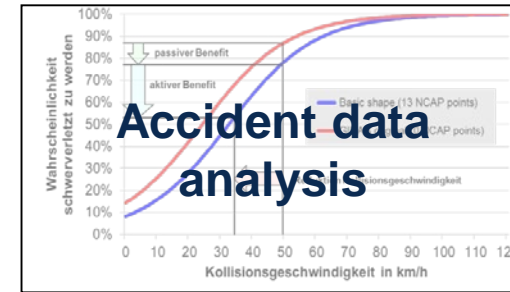
Motivation

Accident research and scenario generation

Applications

Perspectives

Introduction to traffic accident research at VUFO



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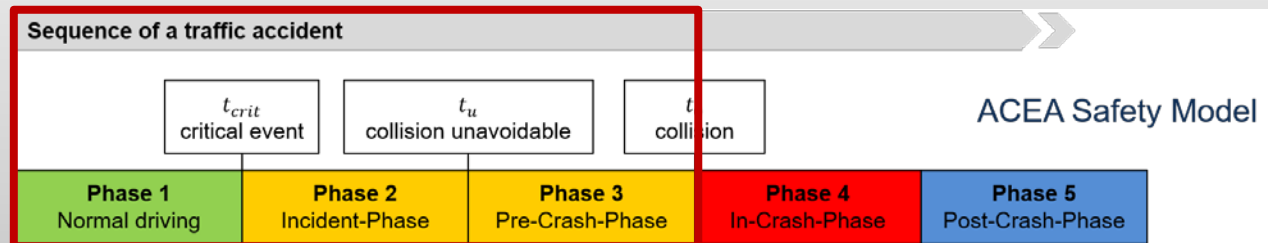
Perspectives

Motivation

Goal: Avoid or mitigate traffic accidents

Method: Simulation of the pre-collisional accident phase for as many GIDAS accidents as possible with IPG CarMaker 

Analysis of the time before the first collision to be able to avoid or mitigate accidents



Offer the possibility for analysis and simulation of many real accident scenarios for the evaluation of ADAS and highly automated driving functions

Starting point: Detailed accident database

GIDAS
GERMAN IN-DEPTH ACCIDENT STUDY

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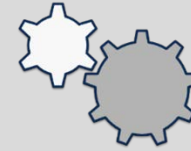
Perspectives

Accident research and scenario generation

Manual effort



Automated process



Accident data
collection



GIDAS
GERMAN IN-DEPTH ACCIDENT STUDY

Sketch creation &
reconstruction



GIDAS
GERMAN IN-DEPTH ACCIDENT STUDY

Generating
accident scenarios



GIDAS-PCM
GERMAN IN-DEPTH ACCIDENT STUDY PRE-CRASH-MATRIX

Accident scenarios
@ IPG CarMaker

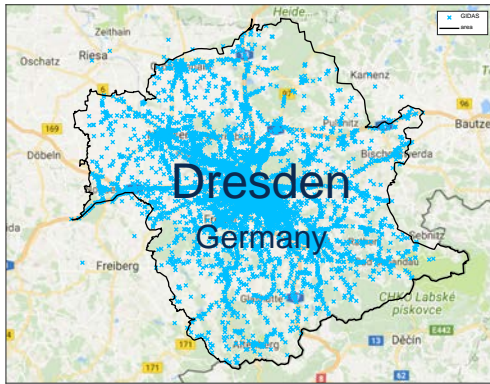


IPG
AUTOMOTIVE

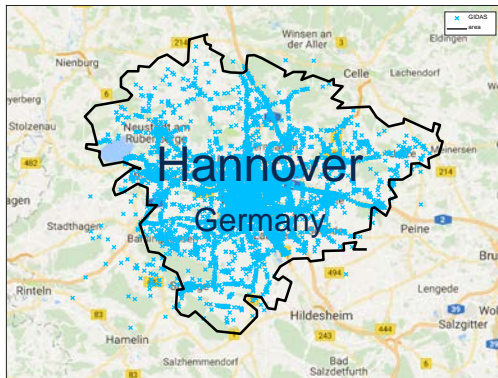


Accident investigation on the spot

Investigation area



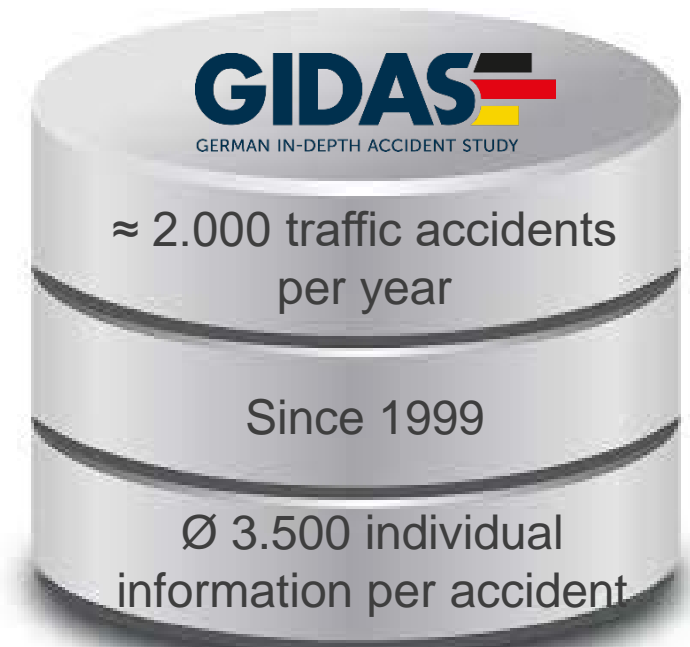
Source: Google Maps & GIDAS



Information



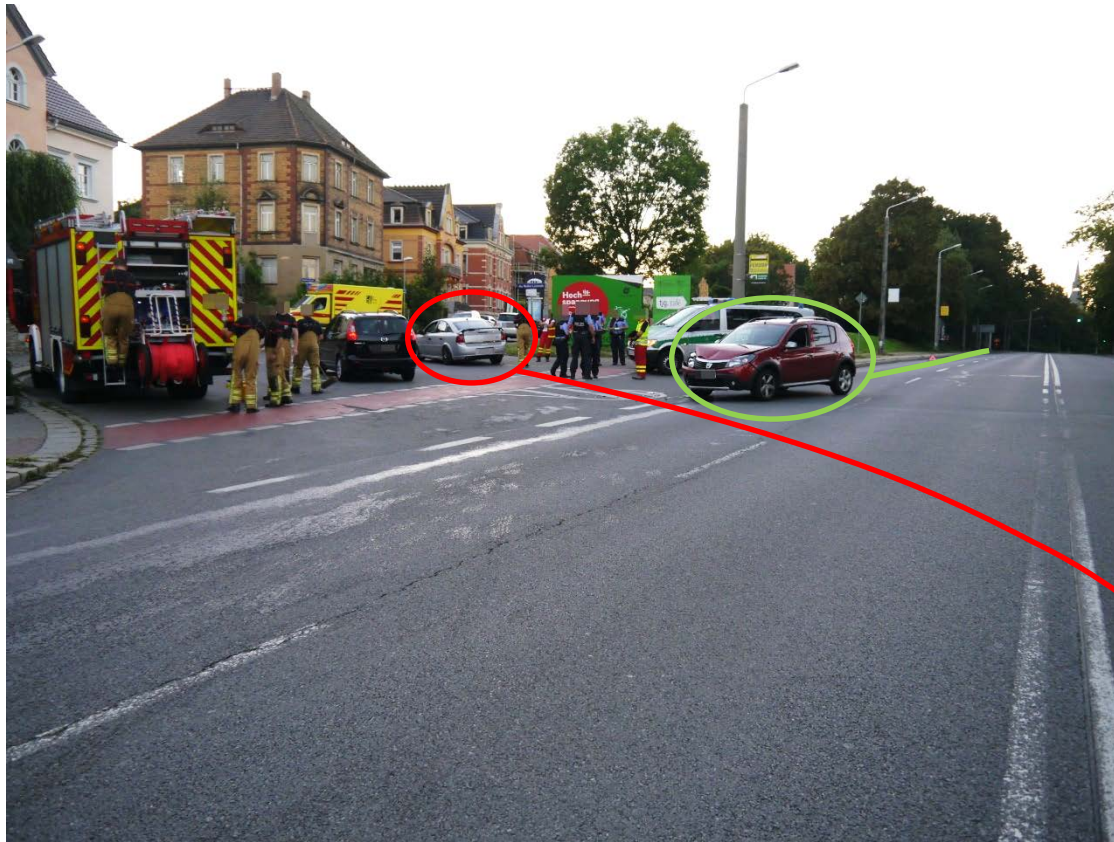
Database





Accident investigation on the spot

Example case for scenario Left-Turn-Across-Path / Oncoming-Traffic



Deformations



Documentation of the environment





Comprehensive accident analysis

Accident sketch

3D Laserscan

Manual measurement



Reconstruction of the accident with PC Crash®



Detailed mapping of the environment

- Road markings
- Objects, e.g. buildings, trees
- Temporary local changes to the road layout, e.g. construction site markings
- Driving trajectories of the participants

Reconstruction of the course of events and simulation of the collision based on:

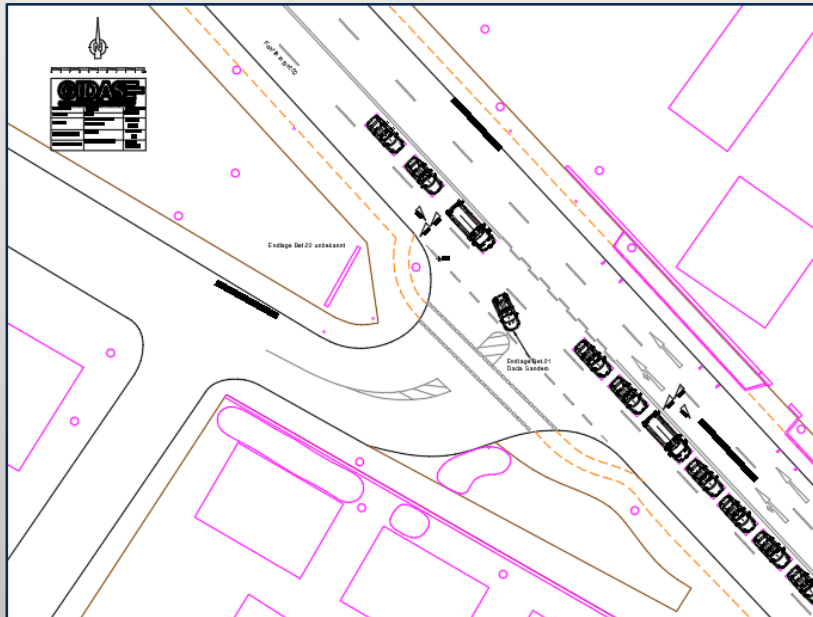
- Brake or skidding marks
- End position of the participants
- EDR recordings / electronic vehicle data
- Interviews
- Evidences of the accident, e.g. vehicle parts, blood marks



Comprehensive accident analysis

Example case for scenario Left-Turn-Across-Path / Oncoming-Traffic

Accident sketch

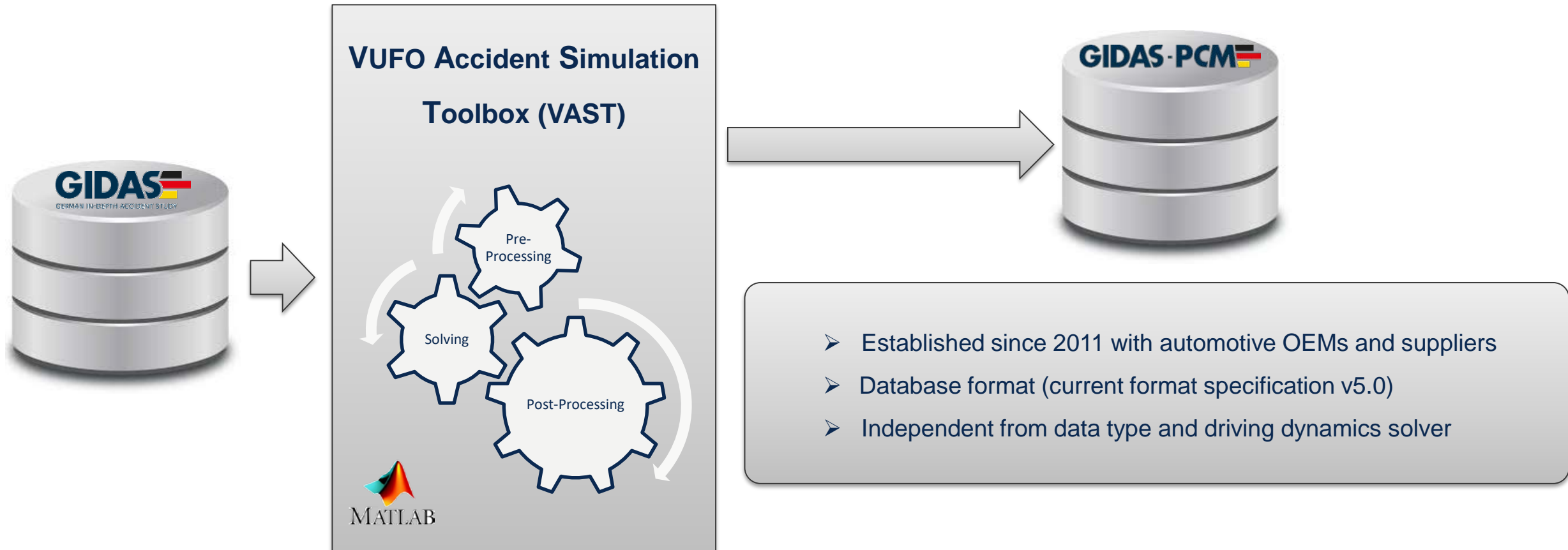


Reconstruction of the accident
with PC Crash®



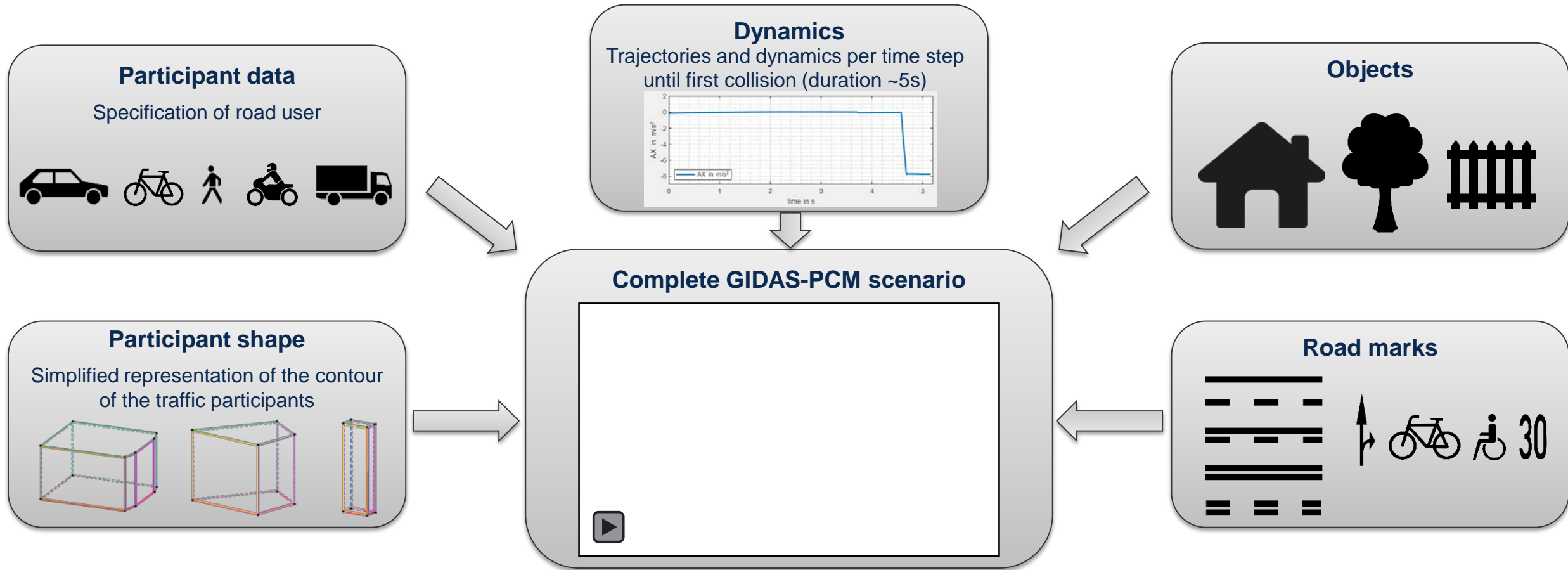


Method - from GIDAS to a database of accident scenarios





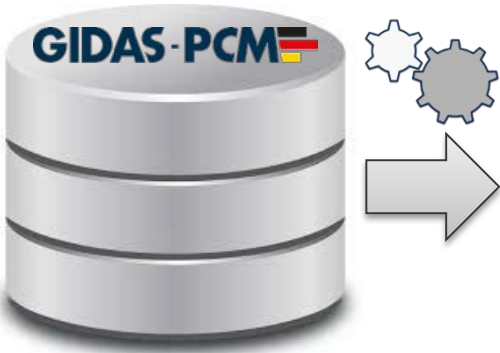
Accident scenarios in the GIDAS-PCM database





Automated Creation of IPG CarMaker Testruns

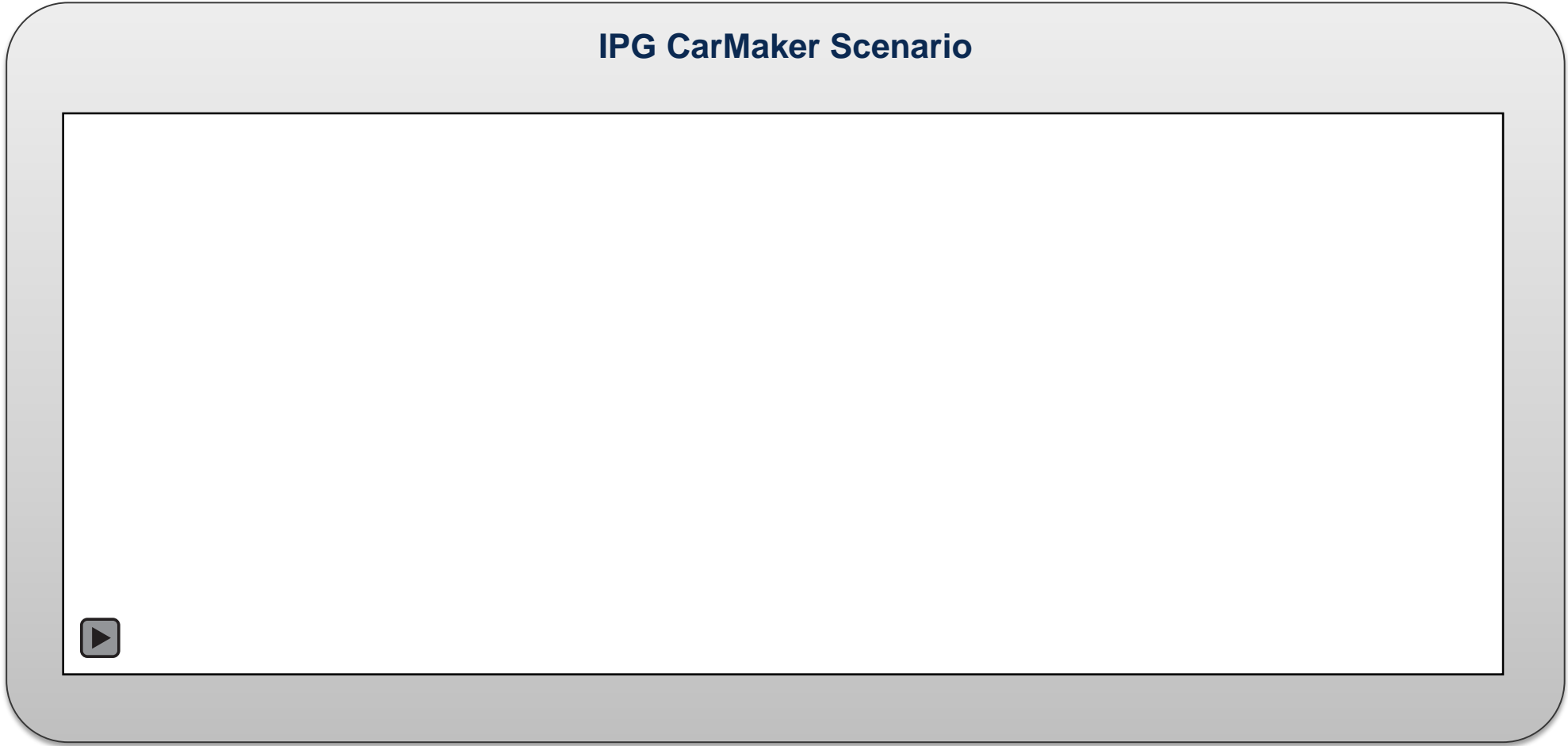
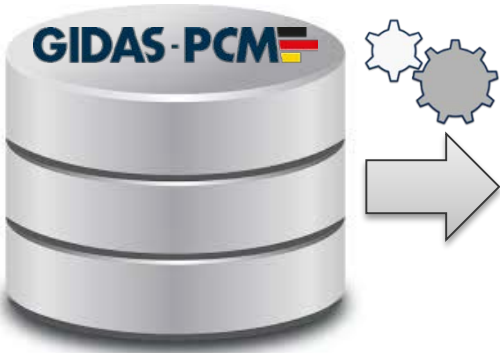
IPG CarMaker file creation and simulation





Automated Creation of IPG CarMaker Testruns

IPG CarMaker Scenario



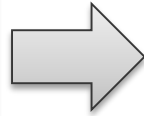
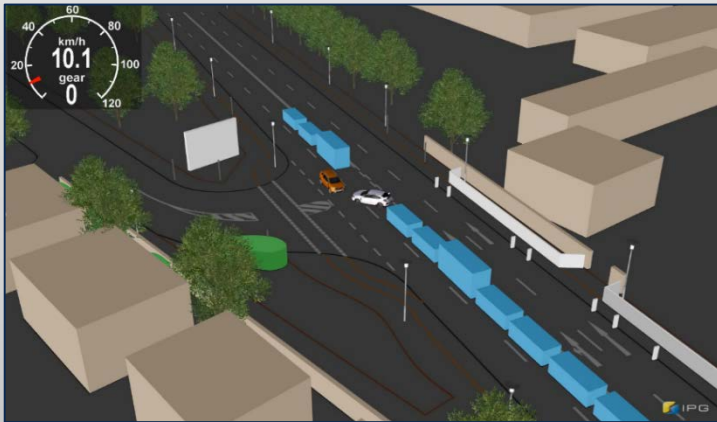


Creation of showcases

Automatically generated IPG CarMaker Scenario



High level of detail



IPG CarMaker Scenario detailed showcase preparation



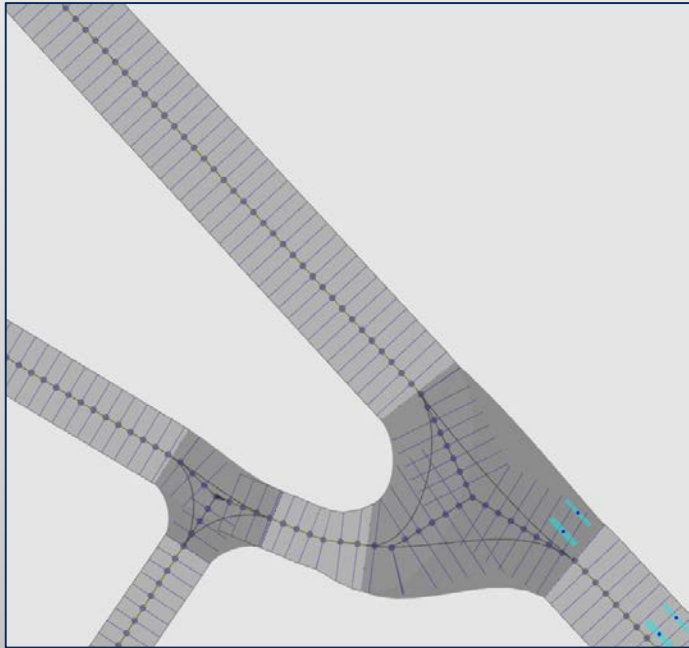
Illustrative preparation of individual cases as showcase possible





CM Road5 creation for intersections

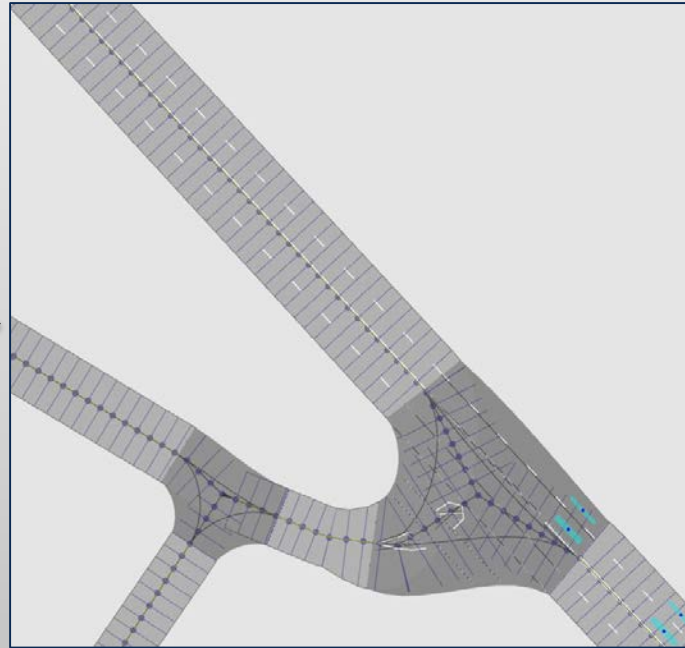
Automatically generated
IPG CarMaker Road5 File



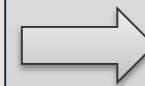
Road5 file created by pressing a button



Manual enhancement with
Scenario Editor



Add road markings



Definition of the route



CM Road5 creation for intersections

IPG CarMaker Scenario with Road5





Automated Road5 creation for roads without intersection

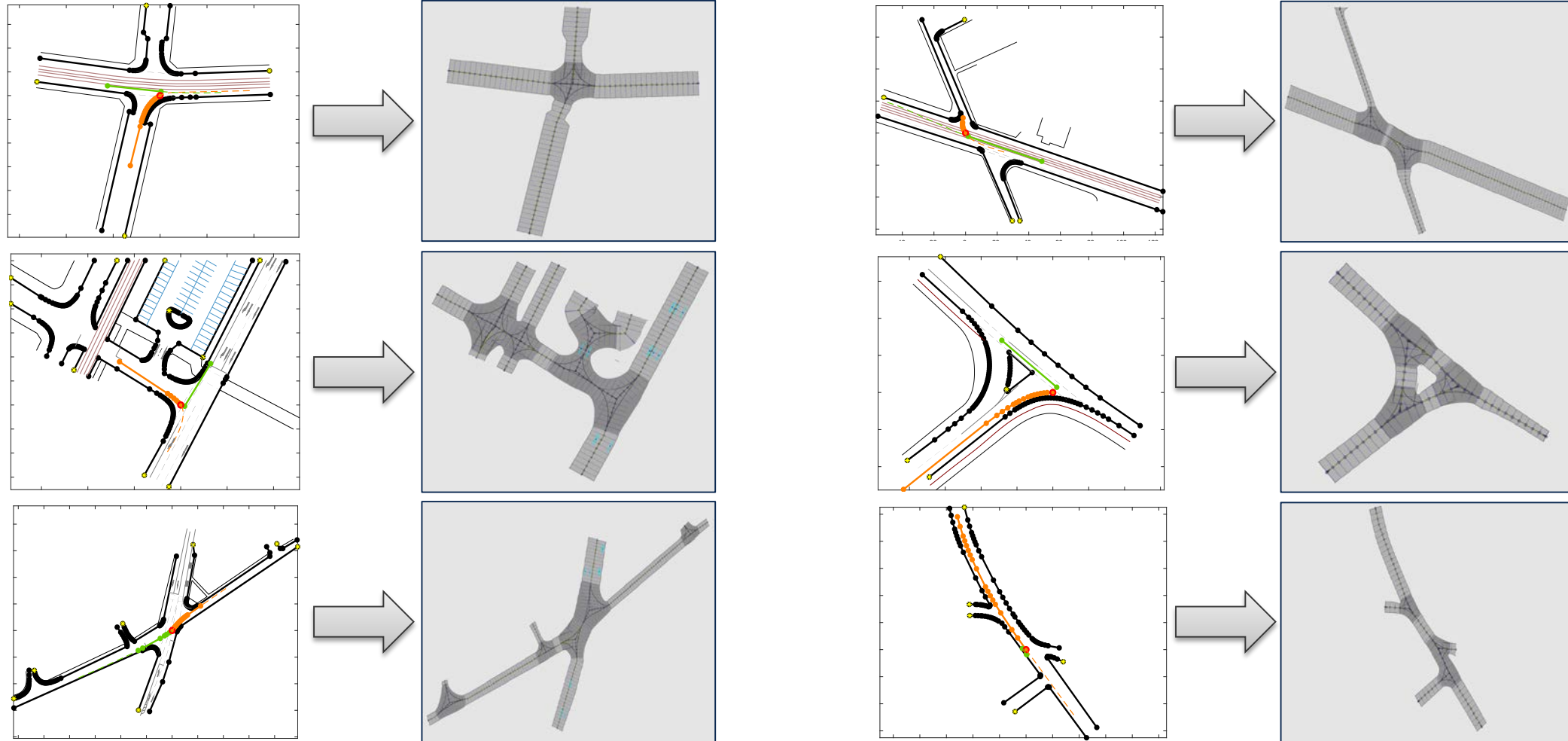
Automatically generated IPG CarMaker Scenario



Road5 file including road marks and route of the participants created by pressing a button



Automatic CM Road5 creation – even for complex road layouts



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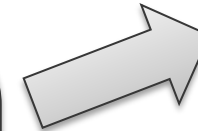
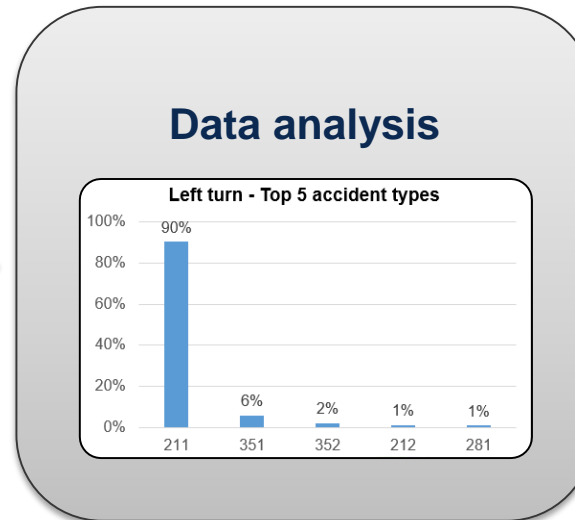
Possible usage of the GIDAS database

Creating a user specific dataset

GIDAS
GERMAN IN-DEPTH ACCIDENT STUDY

38.571 completely documented & reconstructed accidents

44.224 passenger cars	5.620 powered two-wheeler
4.344 trucks	13.276 bicycles
1.478 busses & trams	5.231 pedestrians



Possibility to weight
towards the German national
accident statistics

DISTATIS
Statistisches Bundesamt

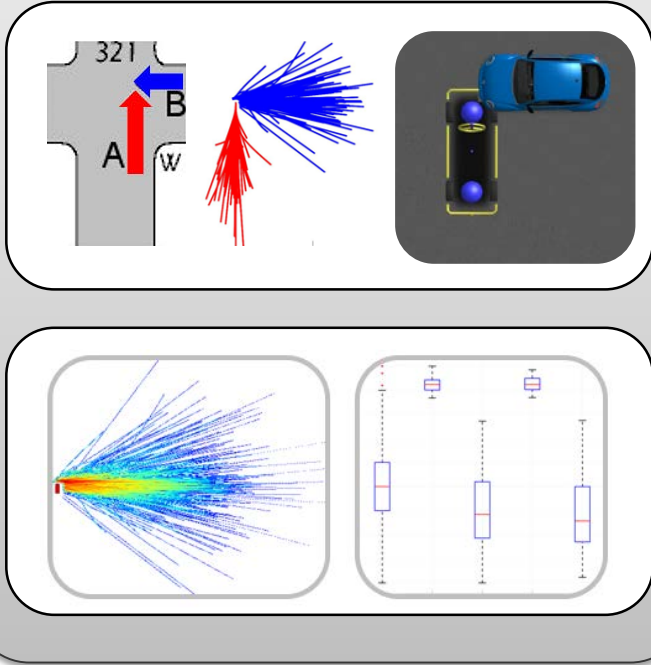


Scenario classification
e.g. select all accidents with
LTAP/OD scenario

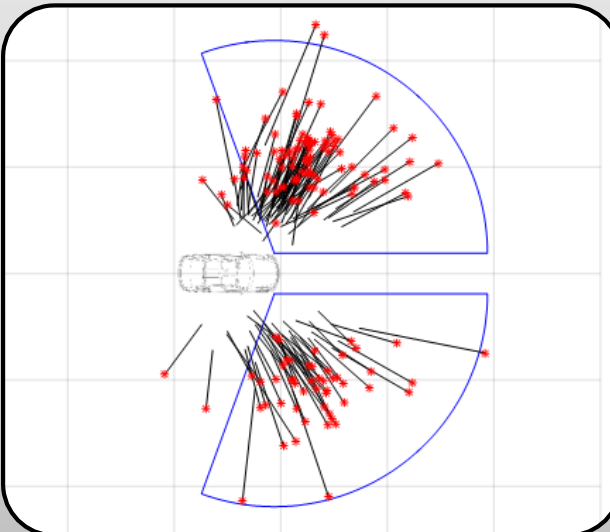
Application of the GIDAS-PCM and CarMaker accident scenarios

Scenario case selection
Creation of a user specific dataset

Data analysis



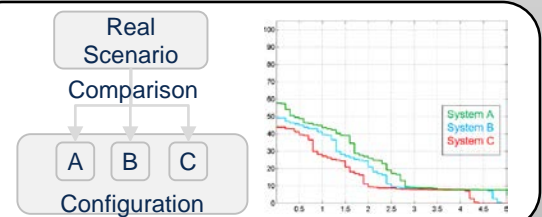
Derivation of sensor positions and configurations



Simulation of baseline scenario and scenario variation



Analysis of simulation results



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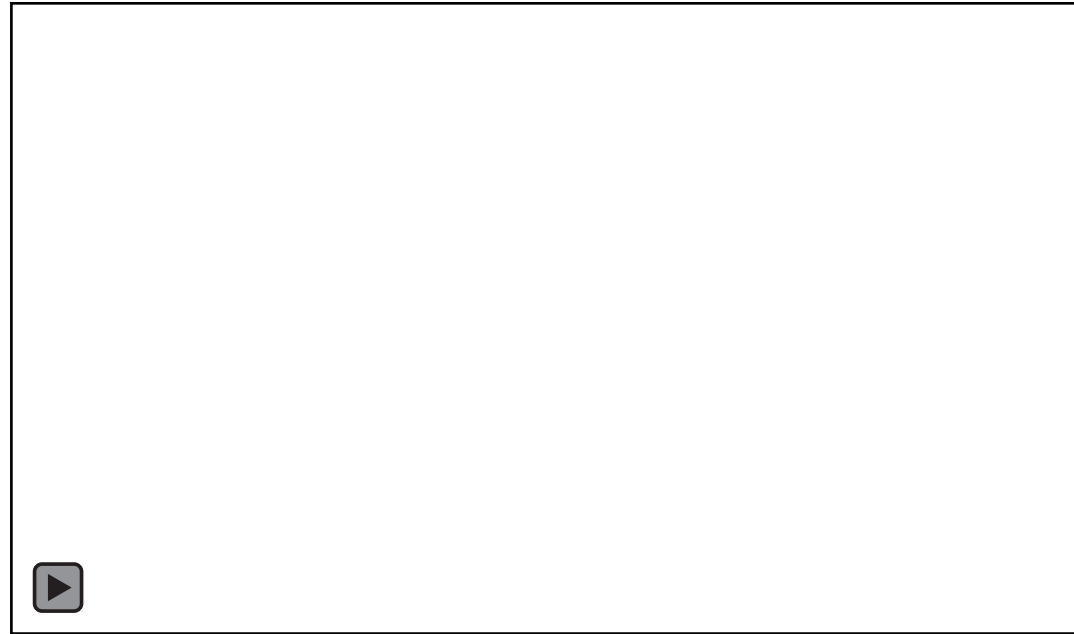
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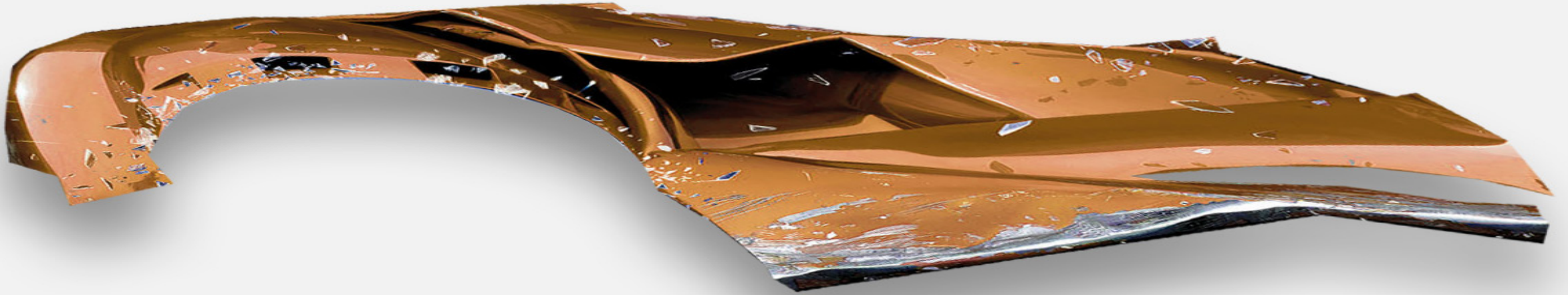
Perspectives

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Transfer of the process to IPG TruckMaker



- Process of automatic CarMaker file creation has been designed for easy adaptation and can easily be transferred to IPG TruckMaker
- More vehicle constellations possible, e.g. highly relevant scenarios like turning trucks and VRUs moving in the same / opposite direction



THANK YOU FOR YOUR ATTENTION!

Angela Schubert

Data analysis and simulation

Angela.Schubert@vufo.de

Tel.: +49 351 43 89 89 29

Marcus Petzold

Data analysis and simulation

Marcus.Petzold@vufo.de

Tel.: +49 351 43 89 89 27