Austrian Light Vehicle Proving Region for Automated Driving

ALP.Lab Services in a Nutshell

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Federal Ministry
Republic of Austria
Climate Action, Environment,
Energy, Mobility,
Innovation and Technology

FFG
Promoting Innovation.

ALP.Lab - Austrian Light vehicle Proving Region for Automated Driving

Alliance of automotive supplier companies

- AVL List
- Magna Steyr

and scientific partners

- JOANNEUM RESEARCH
- Graz University of Technology
- VIRTUAL VEHICLE Research

Supported by the

- Federal Ministry Republic of Austria Climate Action, Environment, Energy, Mobility, Innovation and Technology through the FFG Promotion Agency

Addressing customers and clients

- OEMs, Tier 1|2, sensor and components manufacturer, and mobility systems integrator
- Research and New Mobility organizations

Shareholders:

Supported by:

Federal Ministry
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Innovation and Technology

ALP.Lab Partners:

ALP.Lab - Austrian Light vehicle Proving Region for Automated Driving

Innovation lab for safe and secure testing of automated mobility solutions and vehicles

- Public road (highway, urban and rural) equipped with roadside sensors and V2X communication (C-ITS)
- Proving grounds for testing and prequalification of critical traffic scenarios (execution of NCAP active safety and ADAS/AD development tests)

ALP.Lab Cloud Data-broker Services

- Collect, process and provide data for analytics, simulation, AI and machine learning
- Data exchange between real und virtual testing

Sensor and traffic monitoring

- Mobile HiL platform for sensor data capturing
- Urban and rural traffic monitoring of real traffic and verification of critical maneuvers

More than 400 km public road digitized, available as Ultra HD map for simulation,
23 km highway equipped with sensors, detectors and C-ITS road-side units.
Trilateral cross border cooperation with Hungary and Slovenia

ADAS/AD development and EuroNCAP Active Safety Tests

ALP.Lab

Consulting, planning, and test execution

- Client specific test of components, sensors, and development tests of ADAS/AD functions
- EuroNCAP active safety vehicle tests

Partnering with national and international proving grounds

- All year automated driving testing

EuroNCAP certified testing equipment

- GPS controlled robot-platforms with preconfigured traffic scenario data base
- Vehicle and VRU-Dummies, steering/pedal robot for exact control of vehicle under test

International experienced test engineers

ADAS/AD … Advanced Driver Assistance Systems/Automated Driving
EuroNCAP … European New Car Assessment Program
VRU … Vulnerable Road Users (pedestrian, bicyclist …)

Snow and ice free NCAP development tests Rijeka/CRO

To start the video scan or click the QR-Code

EuroNCAP test scenarios, Testingday@ZalaZone/HU

ALP.Lab Mobile HiL Platform – SPIDER

SPIDER – Smart Physical Demonstration and Evaluation Robot

- Testing the driving behavior of vehicles during development and experimentation stages
- Repeatable, automated execution of defined paths with omnidirectional movements
- Safe test execution through geo-fencing and automated emergency stop
- Easy data acquisition and storage of sensor data (360° LiDAR, stereo camera, long-range and short-range radar, dGPS, ...)
- Verification and validation of
  - Sensor systems
  - Vehicle software and control algorithms

To start the video scan or click the QR-Code

Traffic scenario testing with SPIDER and robot platforms

Data and data processing

Generated Data and Related Services

Overview

Traffic data analysis

- Traffic flow characteristics
- Level of service
- Driving behavior analysis

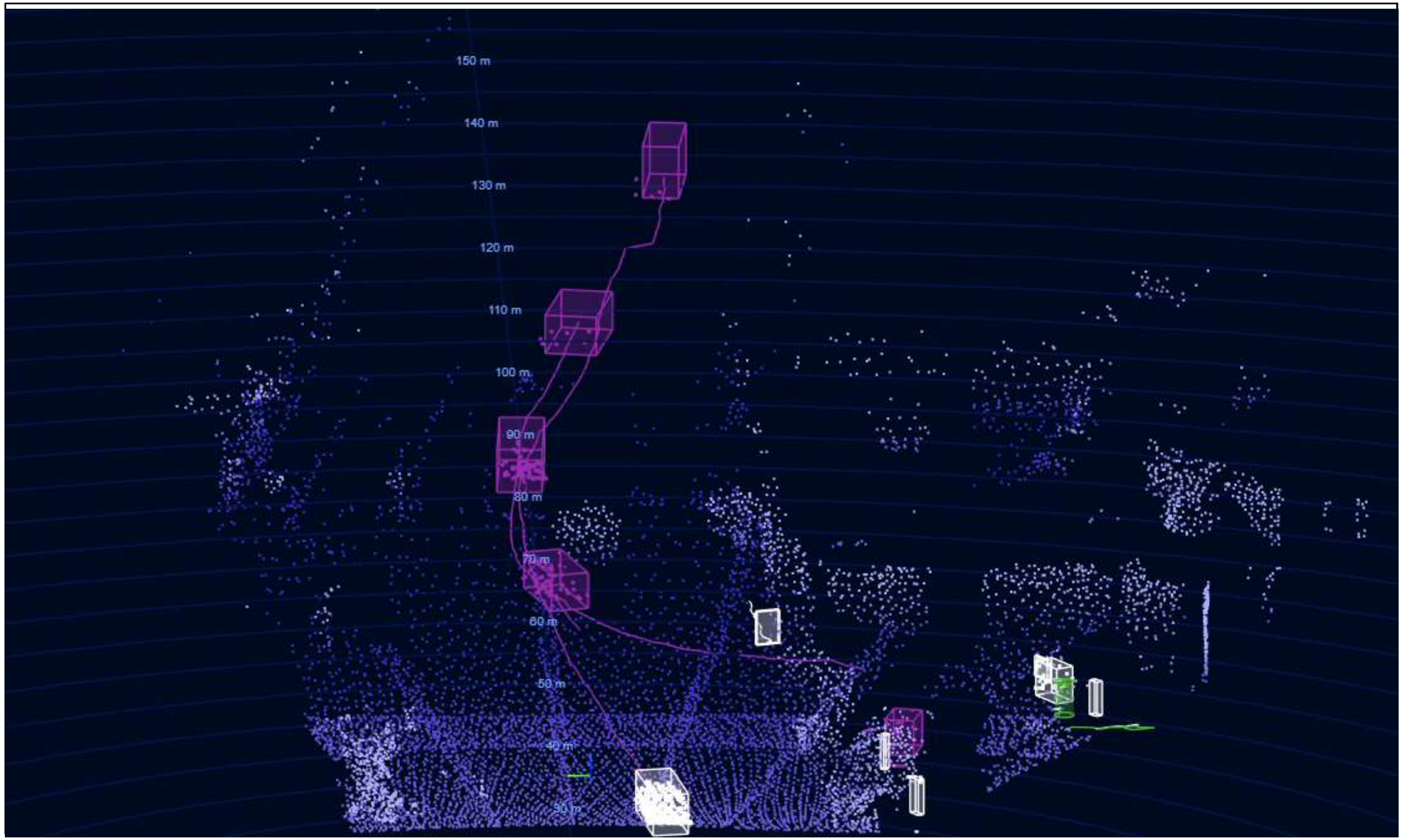
Objects list

- Objects position information along the whole road segment (sensors fusion)
- Object characteristics (dimensions, class)
- Re-build the whole vehicular fleet movements (OSI files);

LiDAR raw data

- Point clouds (pcap, rosbag)

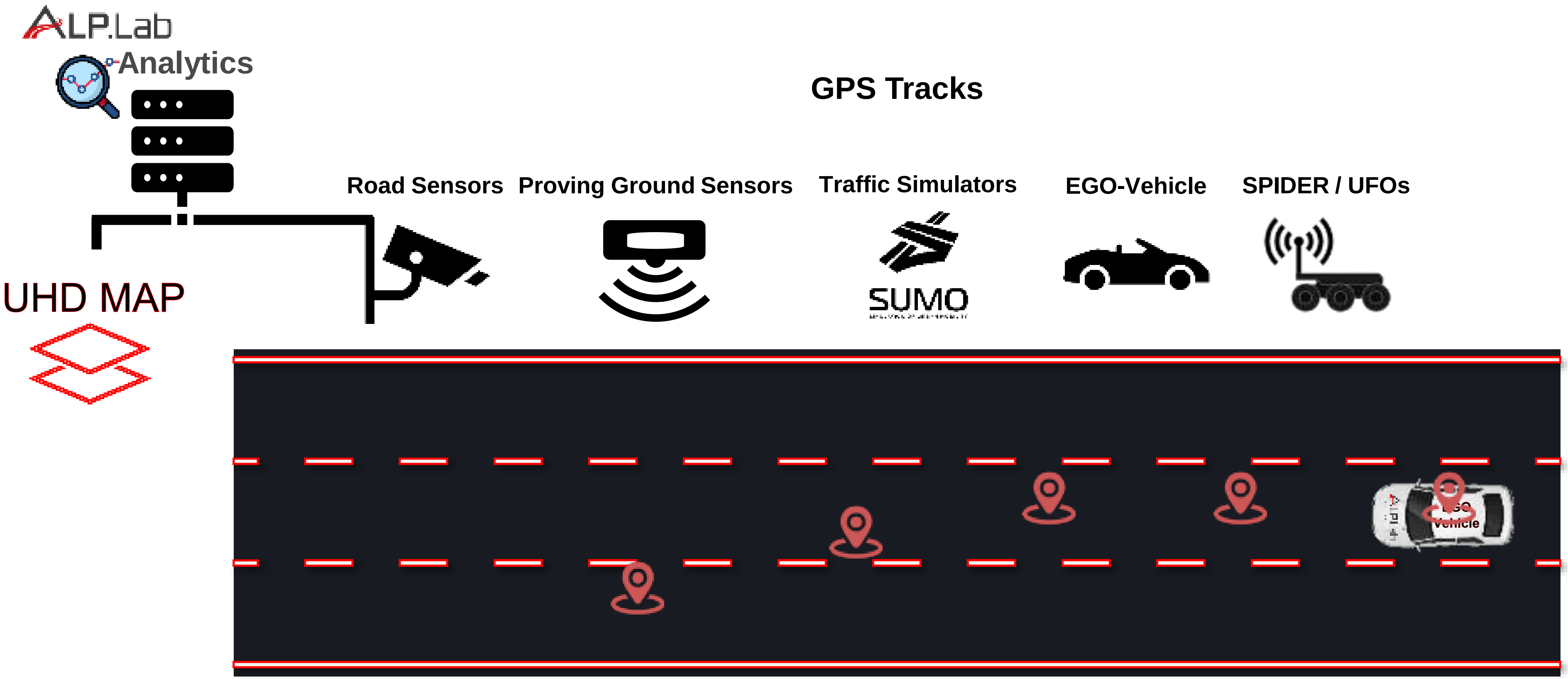
In-depth data analysis



Generated Data and Related Services

Movement Analysis

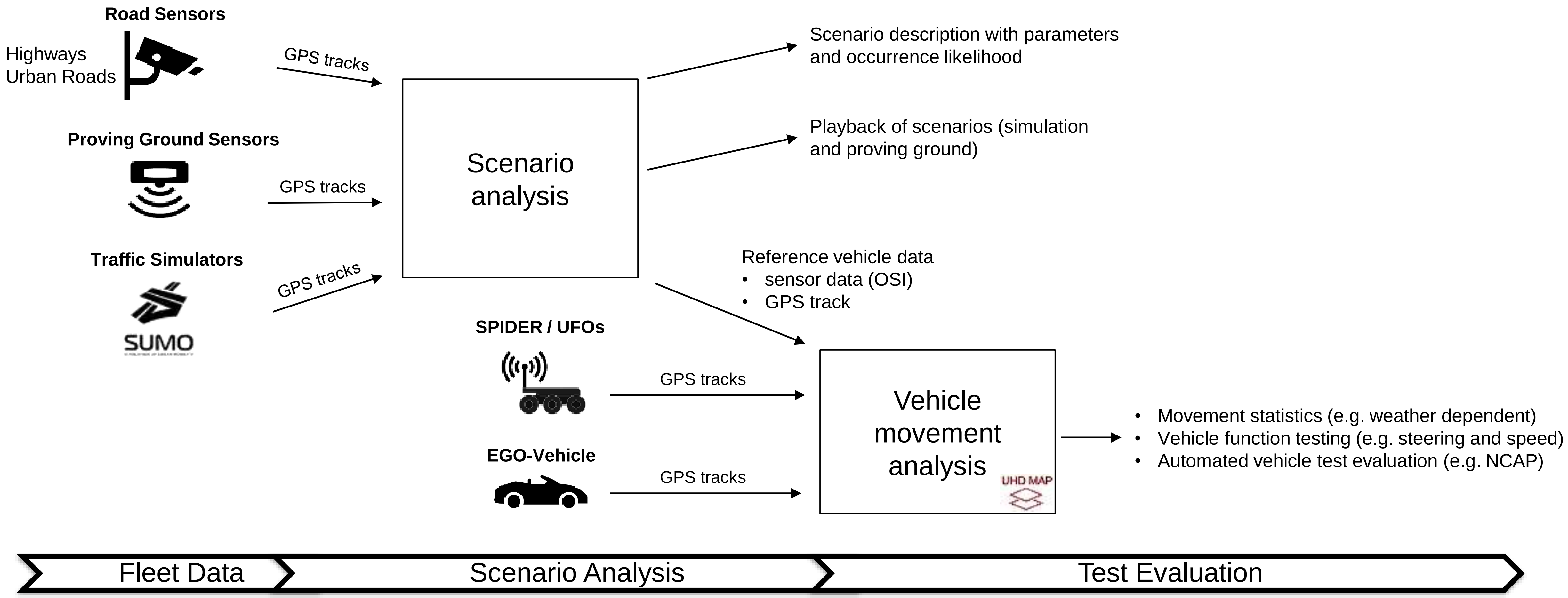
The collected data can be extended to a highly precise lane specific positioning using the UHD maps and the ALP.Lab analytics. This last can serve as a validation tool for the recorded tracks as well.



Generated Data and Related Services

Measurement Data Processing Toolchain

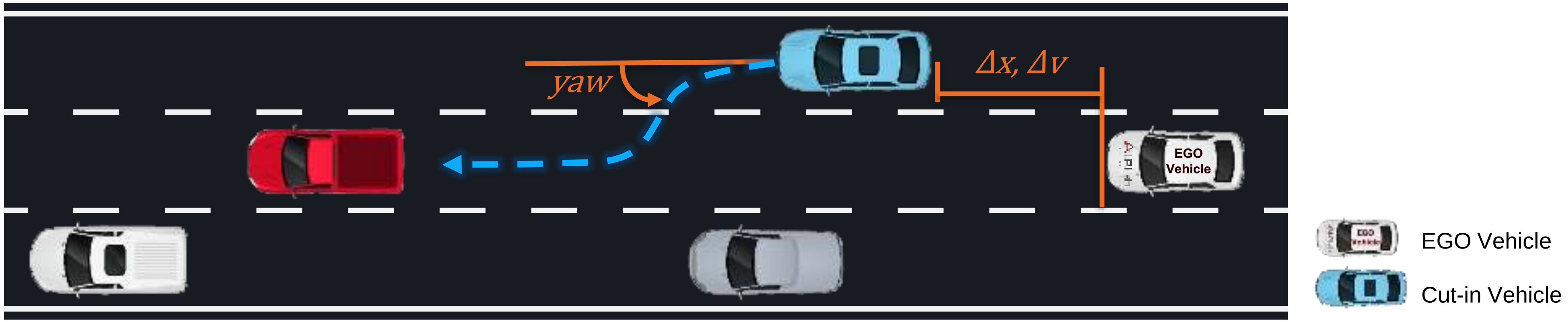
The data transformation tool can support inputs from multiple sources and enables the definition of diverse test scenarios using different vehicle types or agents.



Aggressive cut in maneuver of a vehicle from an adjacent lane:

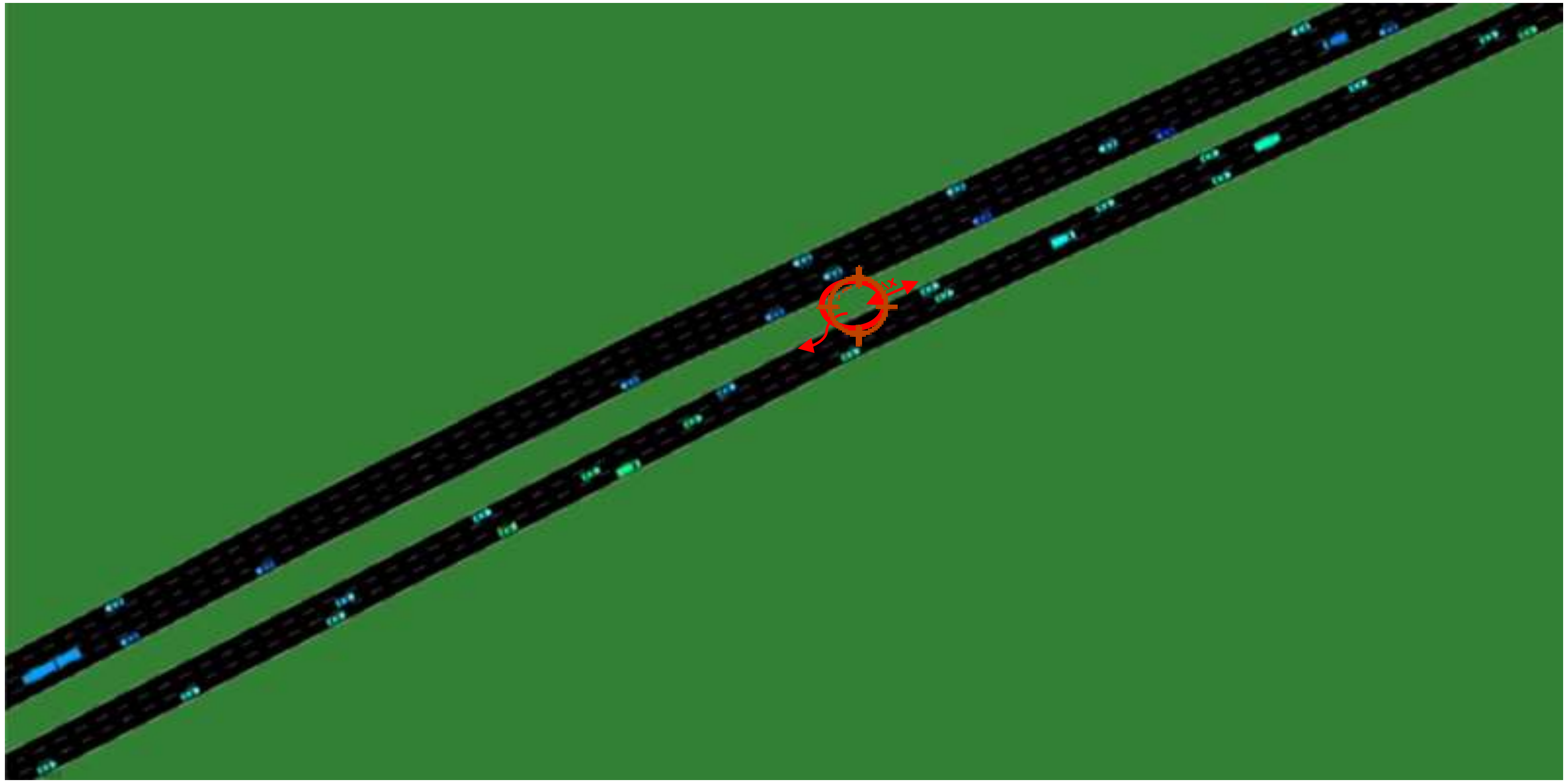
This scenario was selected from the JKU test cases catalogue [Zhou et al. 2017] which consists of 24 cases that cover 99% of the critical events related to highway driving within the SHRP 2 NDS1 database, with the following parameters intervals:

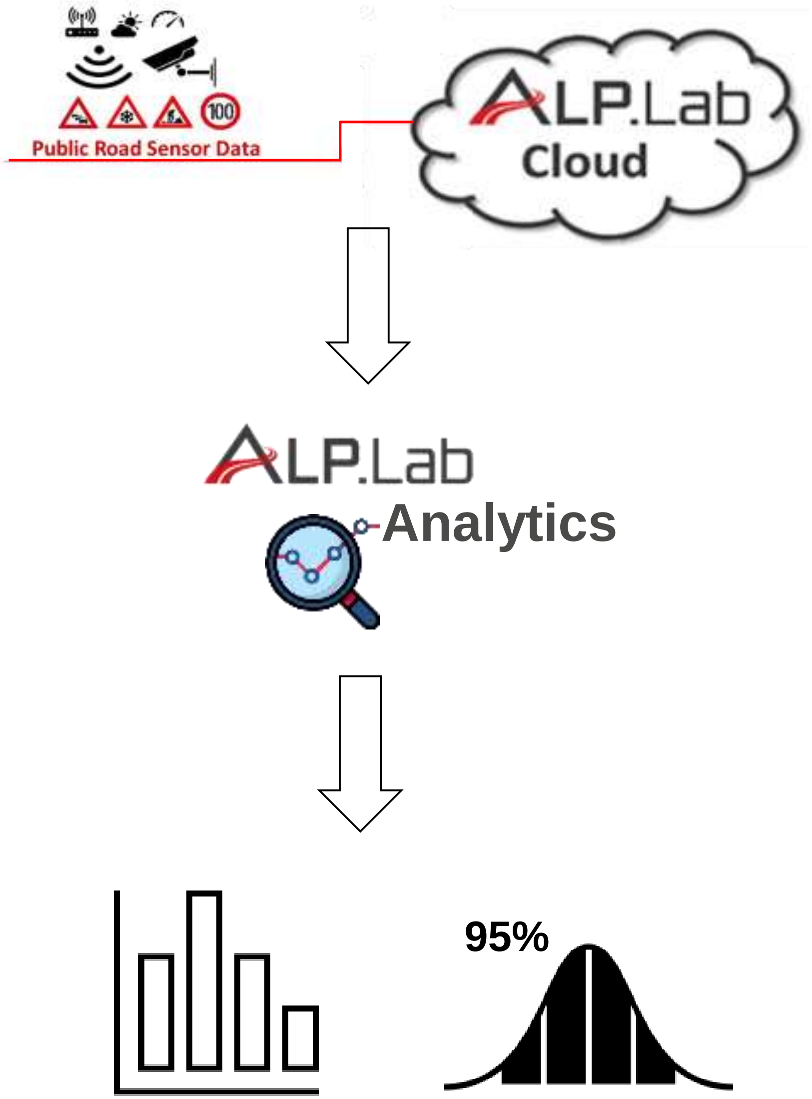
- Δx : Spacing, ranging between 1.7 and 110.1 meters.
- Δv : Relative Speed, ranging between -6.7 and 5.2 m/s.
- yaw : Cut-in angle, ranging between 0.01 and 0.2 rad.



Generated Data and Related Services

Scenario Detection



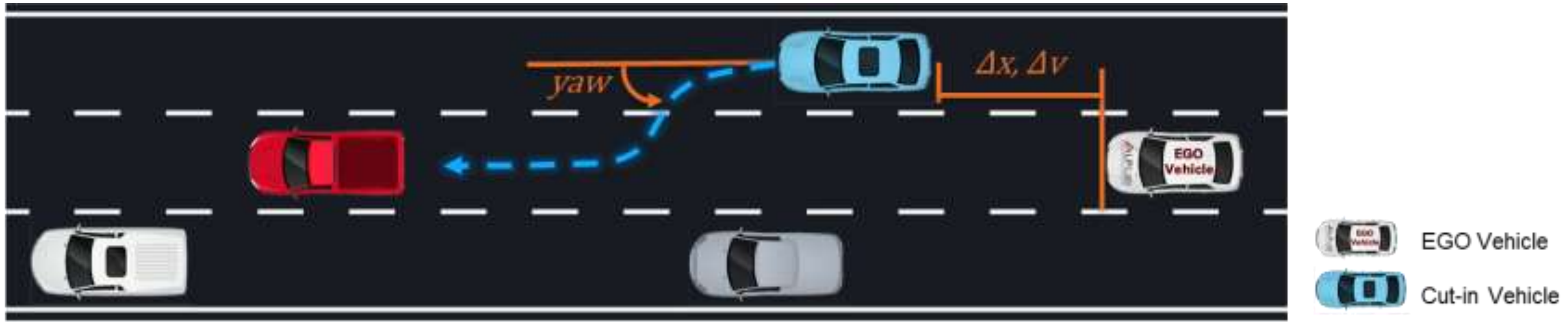


- Data collection
- Data processing
- Conclusions

Generated Data and Related Services

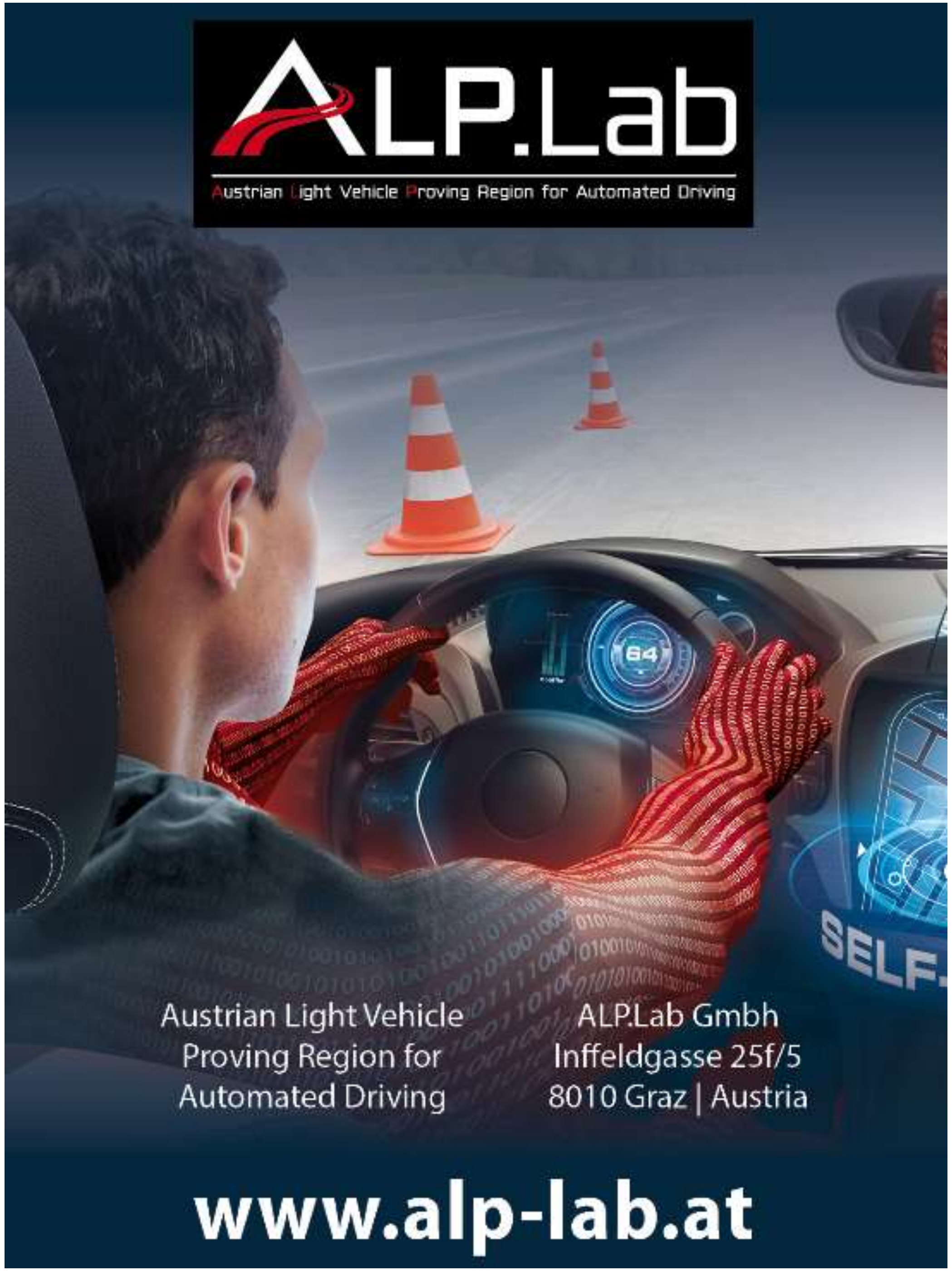
First Experimental Results

Scenario parameters



Scenario occurrences by parameter ranges (sample out of 10 min traffic monitoring)

Δx [m] Spacing	Δv [m/s] Relative Speed	yaw [rad] Cut-in Angle	Number of Occurrences	Number of Vehicles	Required Driving Time [hour]
$\Delta x > 50$	$\Delta v > 2.85$	$yaw > 0.033$	65	936	**0.64**
$25 < \Delta x \leq 50$	$0.22 < \Delta v \leq 2.85$	$0.013 < yaw \leq 0.033$	26	936	**1.60**
$10 < \Delta x \leq 25$	$-2.62 < \Delta v \leq 0.22$	$0.0044 < yaw \leq 0.013$	14	936	**2.97**
$\Delta x \leq 10$	$\Delta v \leq -2.62$	$yaw \leq 0.0044$	6	936	**6.93**
$\Delta x \leq 4$	$\Delta v \leq -5$	$yaw \leq 0.003$	1	936	**41.54**



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AVL MAGNA virtual vehicle TU Graz JOANNEUM RESEARCH