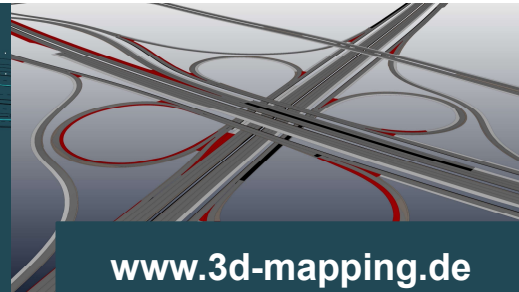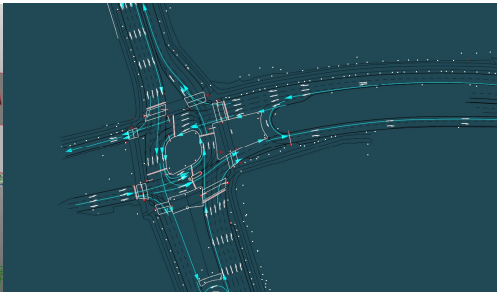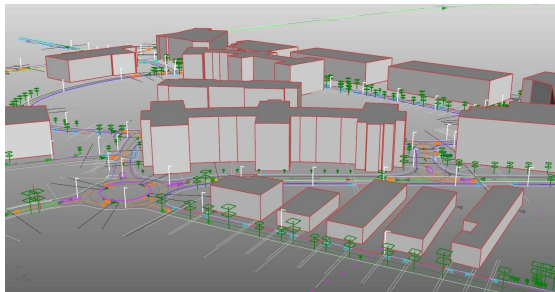# 3D MAPPING SOLUTIONS

HIGH-ACCURACY, INTELLIGENT HD MAPS

as basis for autonomous driving validation and testing and
as basis for 3D Simulation including 3D models of the environment

Dr.-Ing. Gunnar Gräfe

www.3d-mapping.de

3D MAPPING SOLUTIONS

THE COMPANY

- Headquarters: Holzkirchen, Germany
  Subsidiary: 3D Mapping Solutions Inc., Pittsburgh, PA, USA

- Founded 2007 by Gunnar Gräfe and Martin Lang, both with more than 20 years experience in kinematic surveying

- 54 highly skilled employees

- Almost all automobile manufacturers/suppliers worldwide as customers

- Active internationally (Europe, USA, China, Japan) with various own survey-systems of type KiSS and MoSES

- In addition, we can use our mobile mapping partner-systems worldwide.
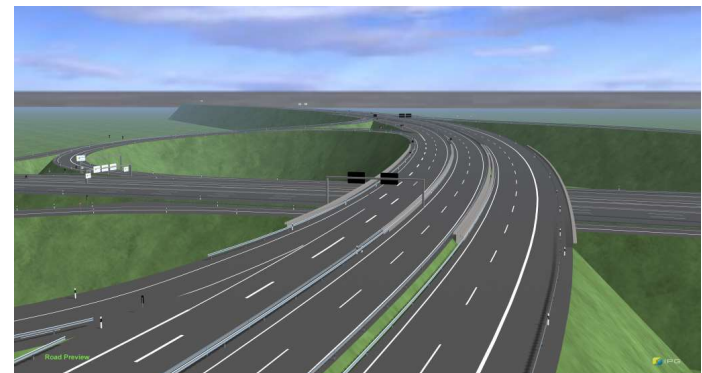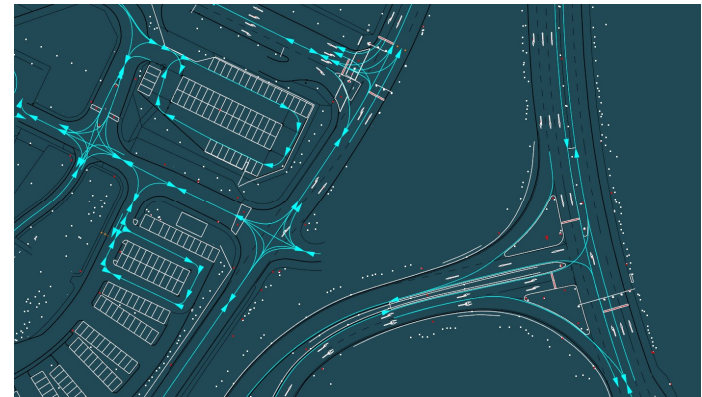
Worldwide kinematic survey service for Automotive Applications

- Precise as-built digital HD Map road data production
- Driving simulator applications and Race track simulation
- High-end Surface models of (OpenCRG format)
  - Race tracks
  - Proving grounds, test areas and special tracks with multiple resolutions
  - Public roads

3D MAPPING SOLUTIONS
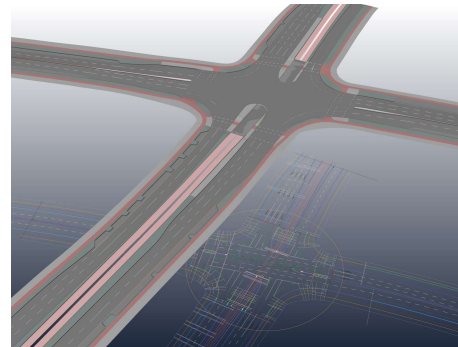
## Worldwide Automotive high-definition Surveying Services

3D Mapping Solutions provides the bridge between real world and the perfect digital twin


3D Mapping Solutions digitizes the reality for projects worldwide using 3D Mapping owned high-end mobile mapping systems or partner systems.
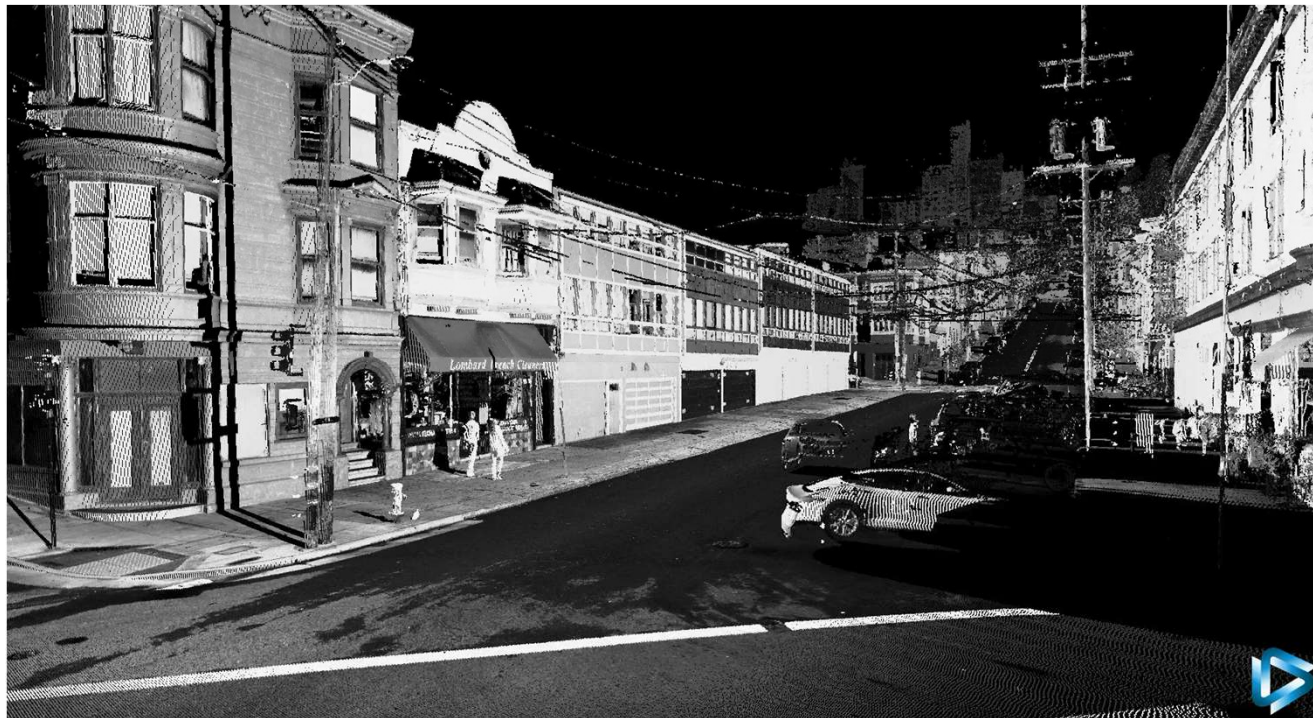
3D Mapping Solutions extracts all object and attribute information from scanner and camera data with outstanding quality.
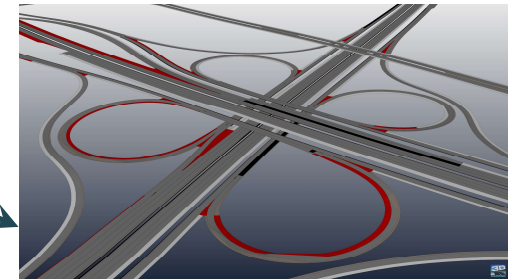
3D Mapping Solutions produces as-built maps for engineering or automotive HD Maps as perfect **Digital Twin.**
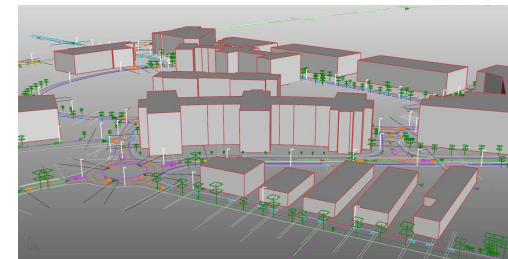
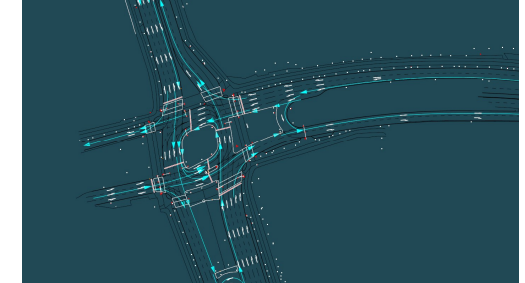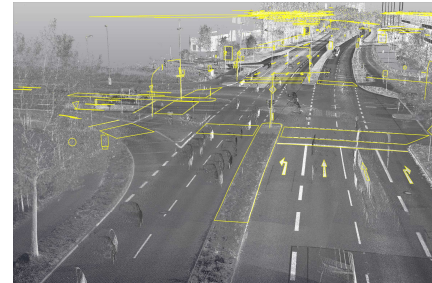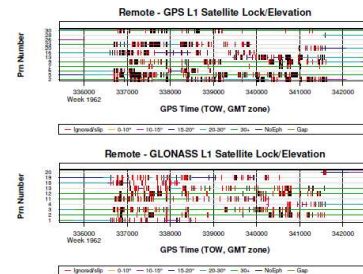## Precise Digitalization as a basis for digital road data production

3D MAPPING QUALITY FOR EACH STEP

Mobile Mapping	Data processing	Data analysis	Ultra HD-Map

- Mission Planning
- Mapping of any Kinds of roads
- Digitalization of the 360 Degree Road Corridor with max. 10 Cameras and 2 Laser Scanners

- Post-Processing
- Quality Management
- Homogenization
- Scanner and Image Data-Processing

- Object Data Extraction
- All Elements in One „As-Built-Plan"

- Traffic and Connection Logic
- Precise, intelligent HD Map in appropriate formats, e.g. OpenDrive, which is most widely used as ultra HD Map format for testing and simulation

Continuous development of our own software + customer support during the entire project
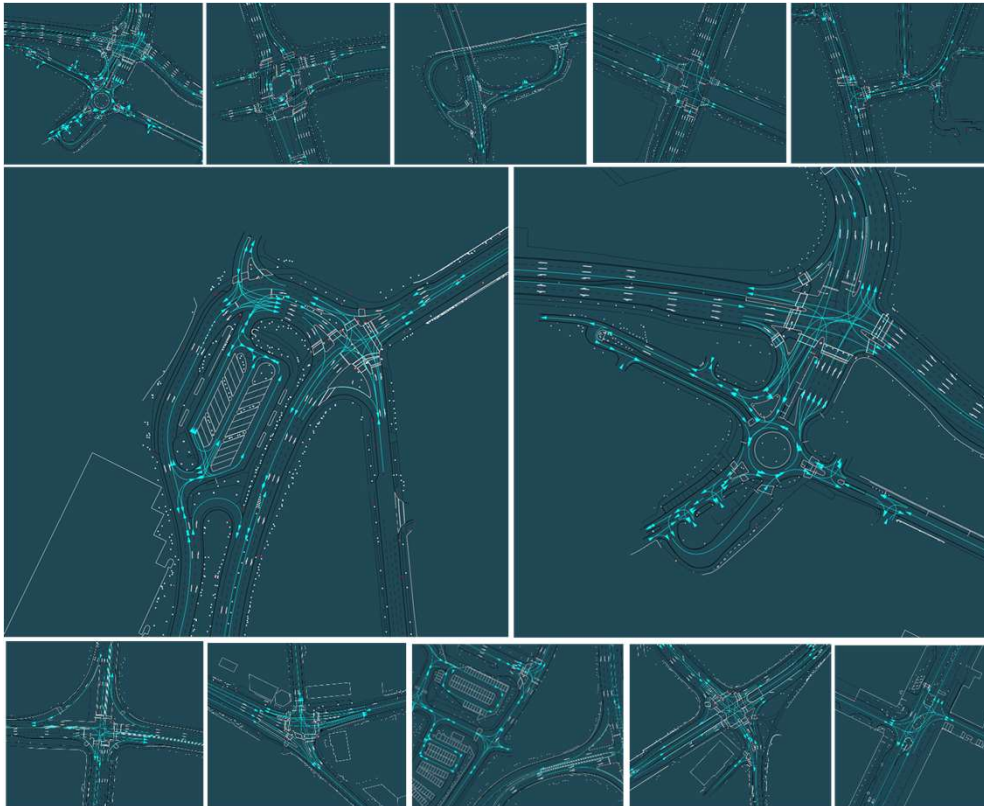
The complexity of the ultra HD Map data is a USP for 3D Mapping Solutions and guaranteed by a rigid quality management.

- The production of perfect digital twins of complex real road networks is based on
  - many years of expertise in CAD and in-house software- development and
  - automated, semi-automated and manual processes.
- Export is possible into established formats like OpenDrive, Road5 or customer defined formats.

3D MAPPING SOLUTIONS

## Example: exact digital twin including traffic and connection logic
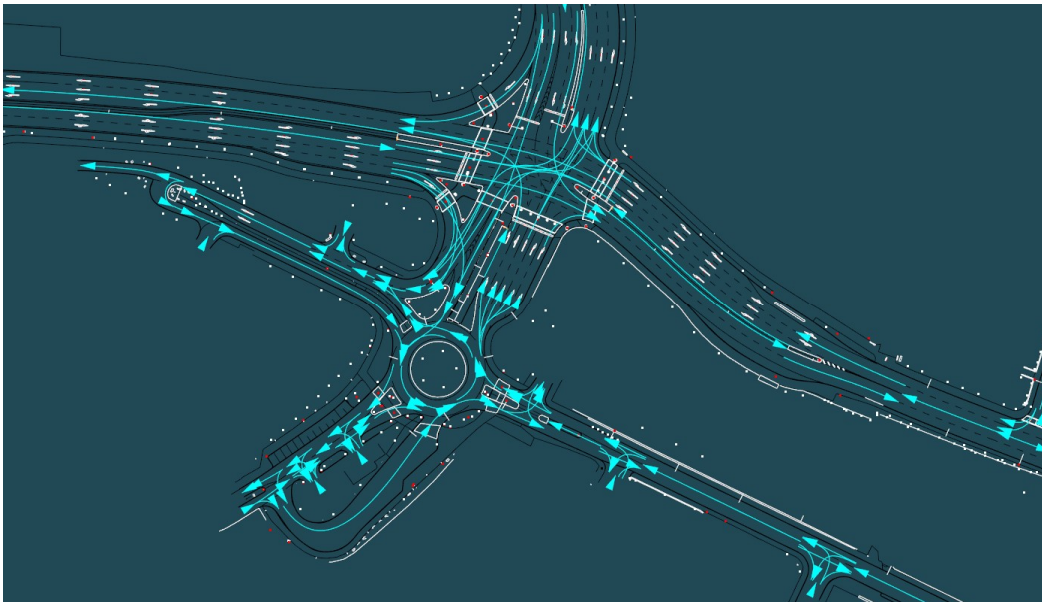
The 3D Mapping ultra HD Maps contain the complete vectorized as-built plan and object data.
This example of a complex intersection shows:

- 150 lines with a total length of 7 km
- 33 km lane borders (driving, shoulder, green, curbs, sidewalk, biking)
- 500 Traffic signs
- 240 trees
- 208 traffic light bulbs
- 200 vegetation
- 110 streetlamp
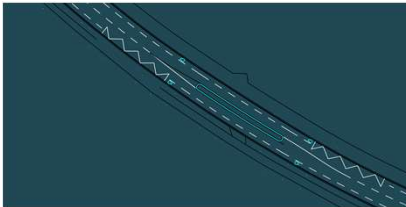- 87   traffic lights
- 14   road marks

3D MAPPING SOLUTIONS

OpenDrive Data Production Example

3D MAPPING SOLUTIONS
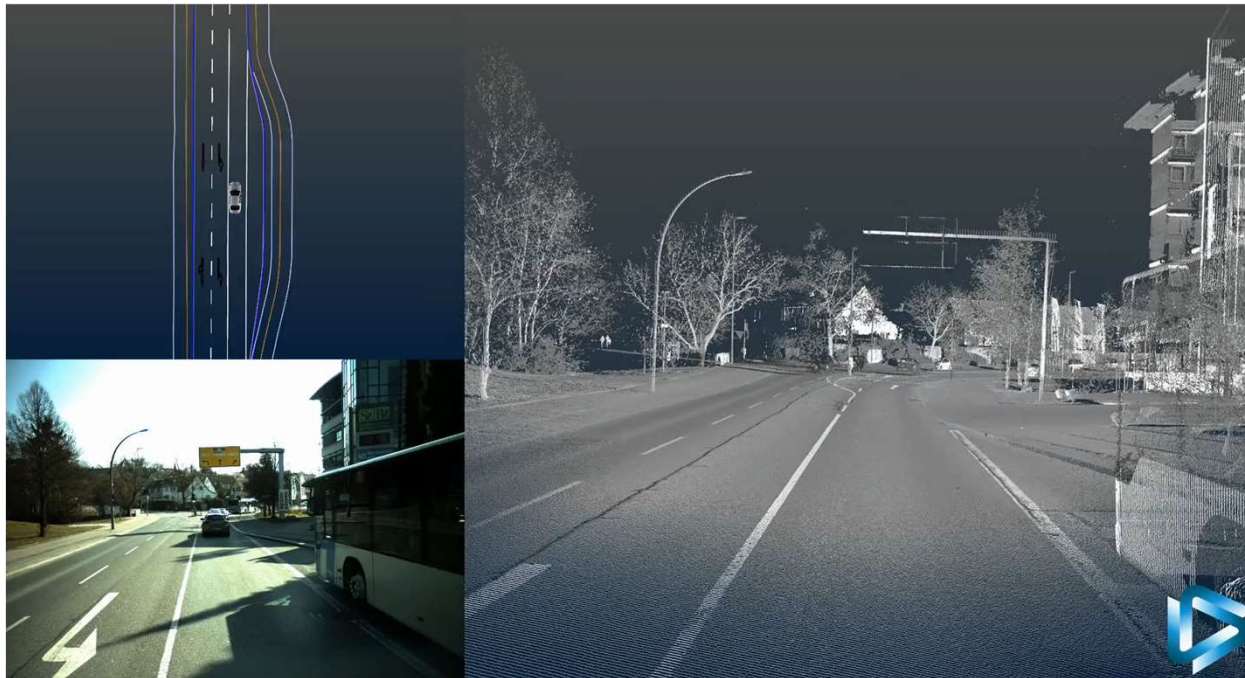
Ultra HD Maps as basis for simulation applications like Road5 Format for IPG CarMaker

Object information extraction – e.g. traffic signs, markings, guide posts etc. with the help of camera- and scanner-data
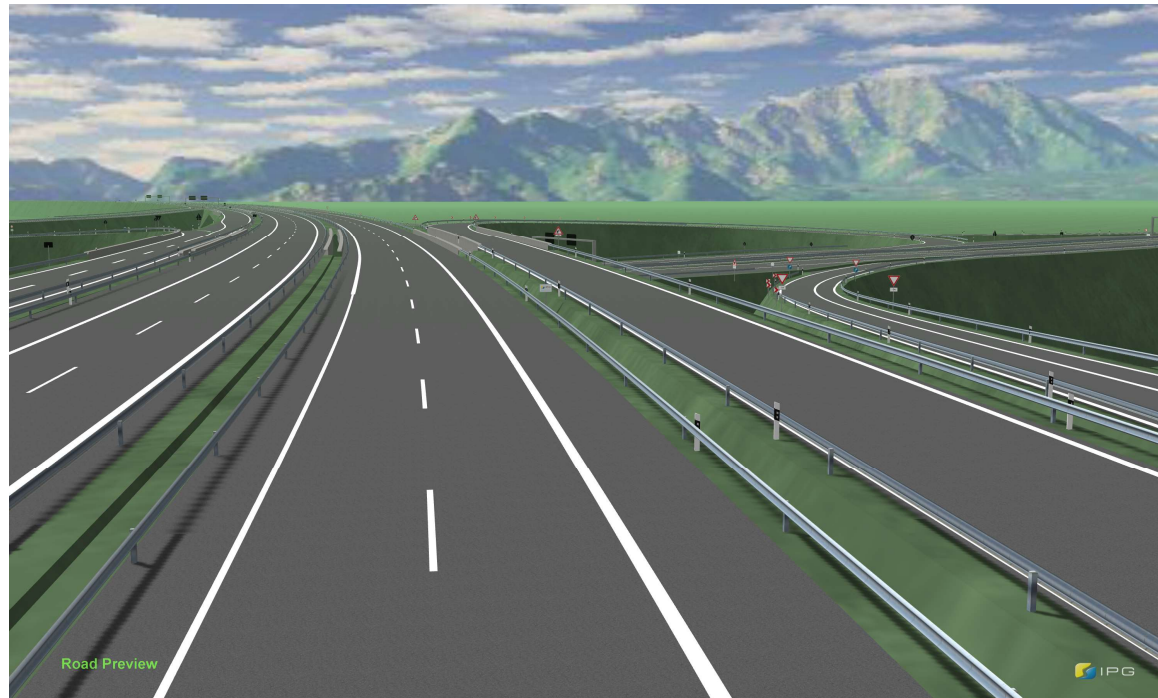

Vectorized 3D Map production, using the 3D Mapping CAD system including the complete complexity of the topological structure

Export the precise as-built-plan into Road5 Format for IPG CarMaker which can directly be used for costumer applications

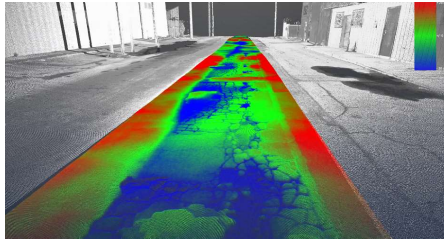# 3D MAPPING SOLUTIONS

IPG Road5 Data Production example

IPG Road5 Data Production example

Applications for 3D Mapping Solutions Digital Twin data
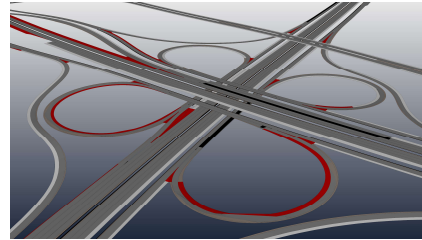
- **Surface Model Formats**

- **OpenCRG**

- **RGR** cosin scientific software

- **OpenDrive**

VIRES TESIS VECTORZERO

TRIANGRAPHICS Intelligent Terrain Solutions

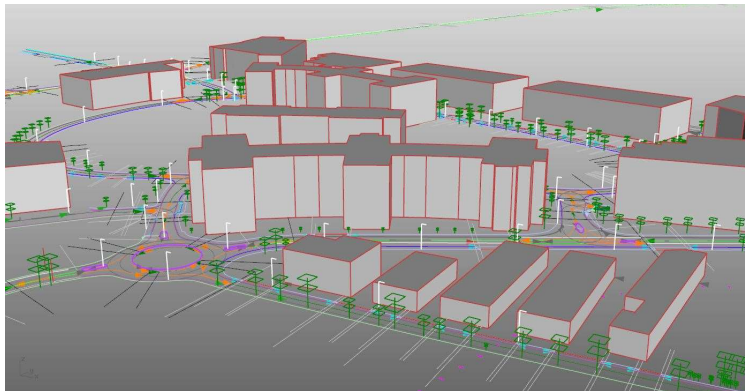- Cognata, dSpace, Siemens, many more…

- **ROAD5 for IPG CarMaker**

IPG CarMaker and other software Applications by IPG

3D Simulation Environment Applications for 3D Mapping Solutions Digital Twin data
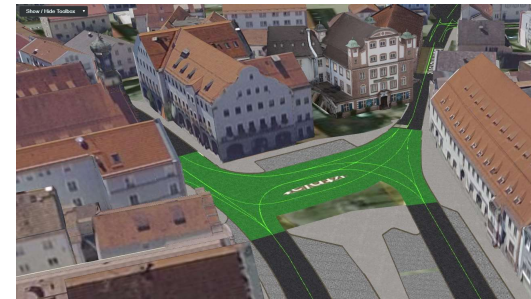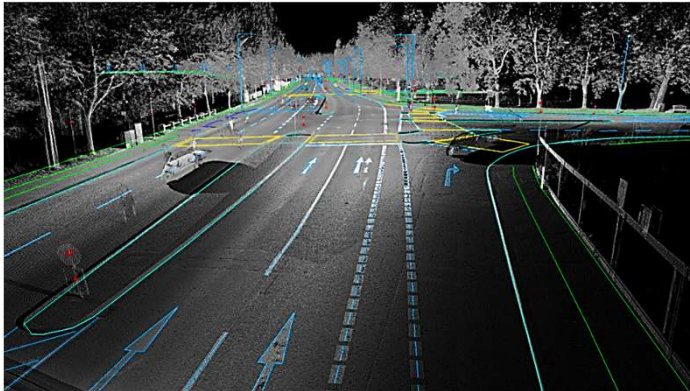
- Precise HD Map data as input for simulation environment
- High resolution Scanner and Camera data as input for 3D simulation environment modelling

- Various Gaming and simulation manu-facturers…

3D city models combined with OpenDrive

- Integration of 3D HD road space models into 3D city models
- Cooperation between virtualcitysystems and 3D Mapping Solutions
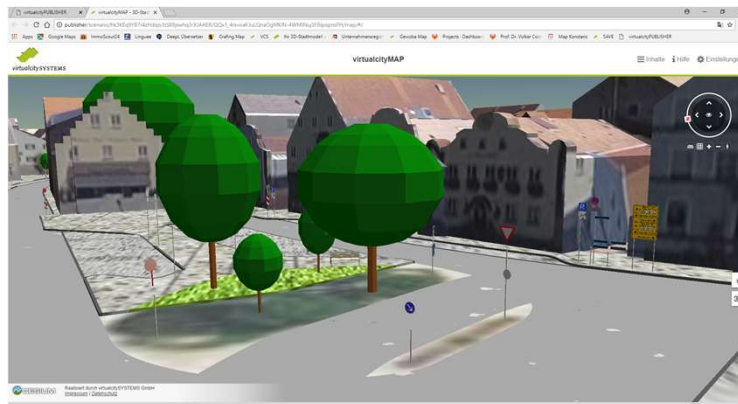- Interface OpenDrive + cityGML + CAD / CAE

3D city models combined with OpenDrive

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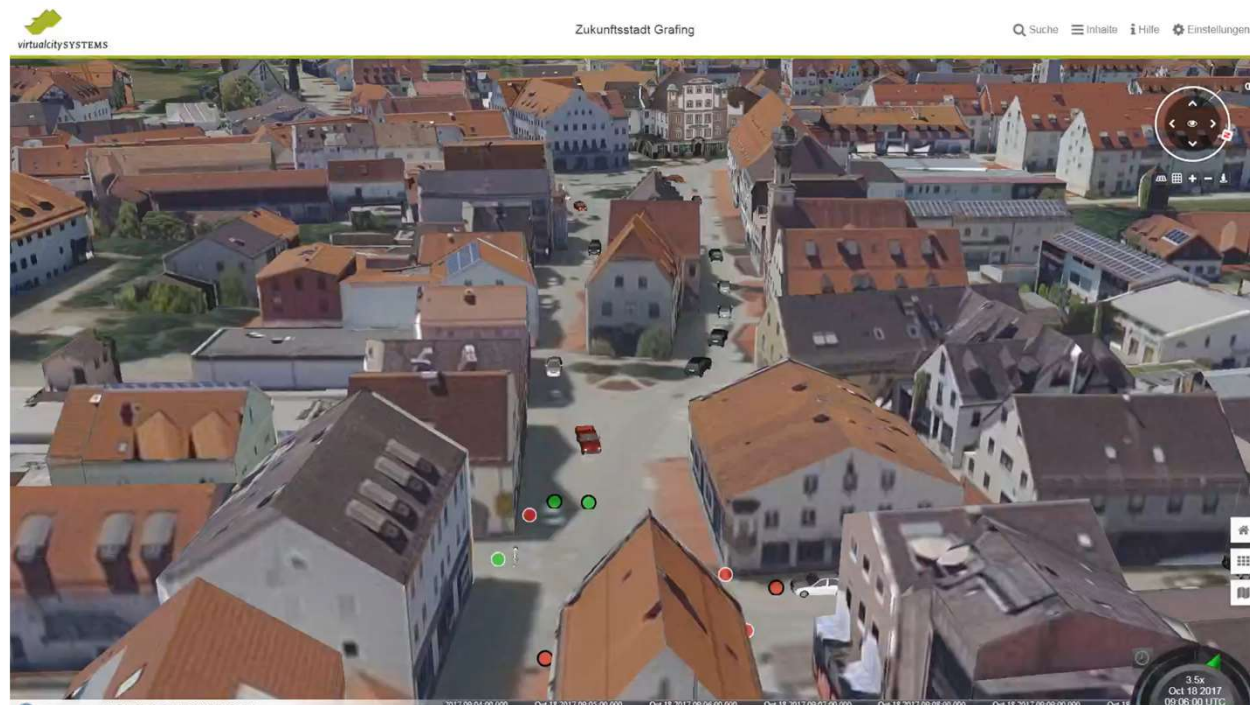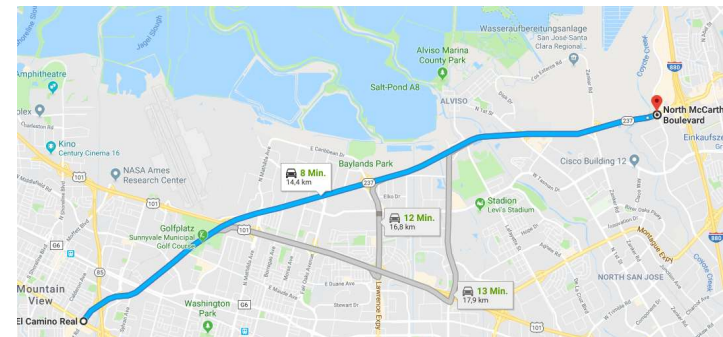- Interface OpenDrive + cityGML + CAD / CAE

3D MAPPING SOLUTIONS

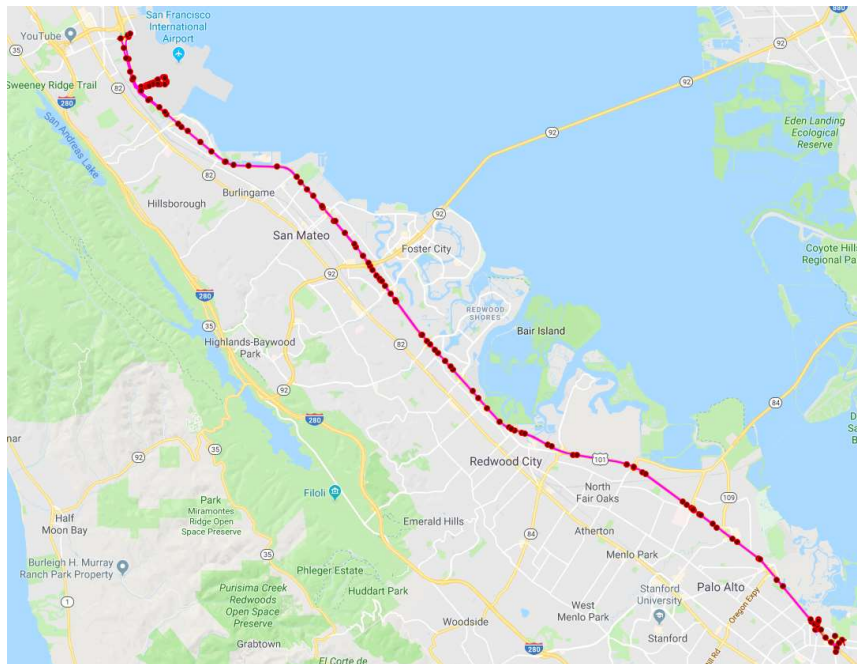## 3D city models combined with OpenDrive

3D MAPPING SOLUTIONS

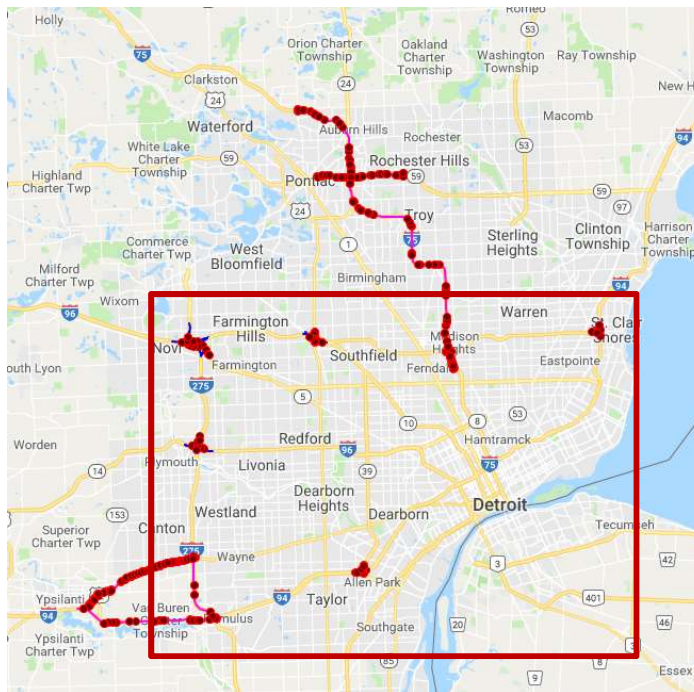## Worldwide HD Map Data Collection for Validation and Testing

Examples for tracks within the HD Map Data Collection

Among various other routes, HD Map data for US 101 or CA 237 is available in OpenDrive data format ready to be used for validation, testing or as basis for simulation.

3D MAPPING SOLUTIONS

Examples for tracks within the HD Map Data Collection

HD Map data for large parts of the interstates around Detroit is available in OpenDrive data format ready to be used for validation, testing or as basis for simulation, e.g. I75 to Auburn Hills or I696 .

Additionally, the American Centre for Mobility (ACM) is also available.

3D MAPPING SOLUTIONS

Pikes Peak International Hill Climb – Hill Climb Race Track, USA
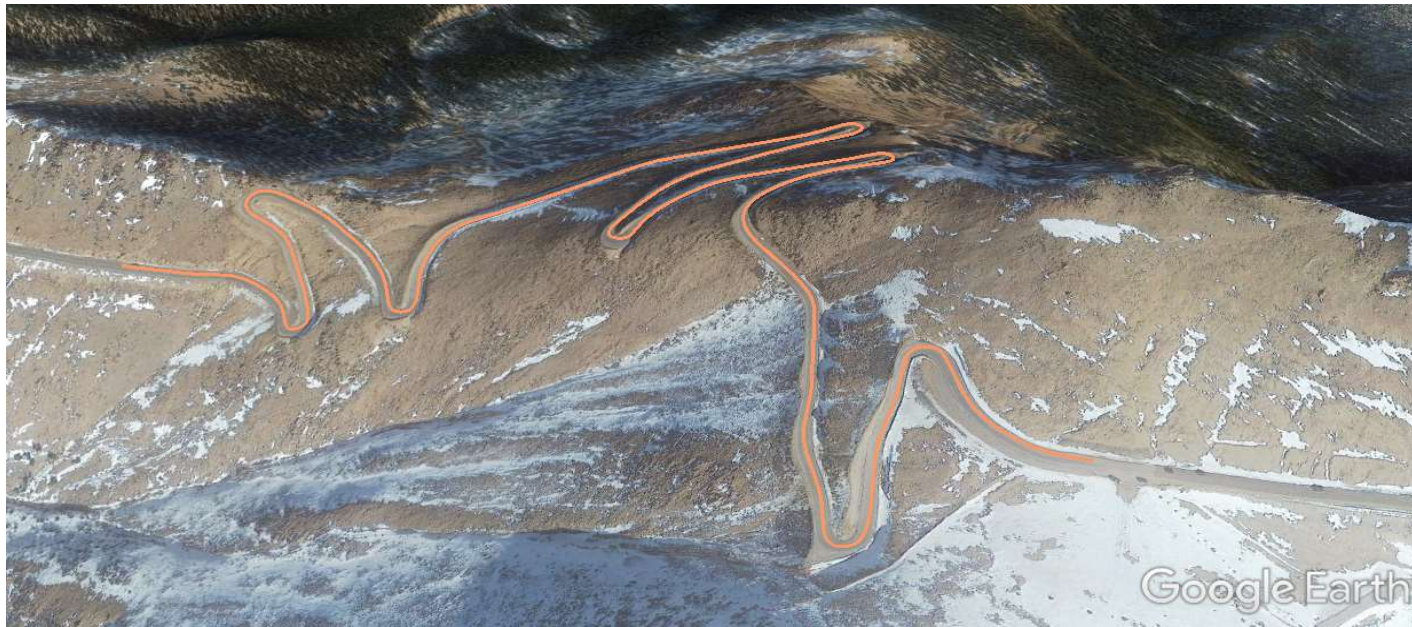
Location: Colorado | Type: Racetrack | Surface: Asphalt | Length: 2,5 km | Turns: 9
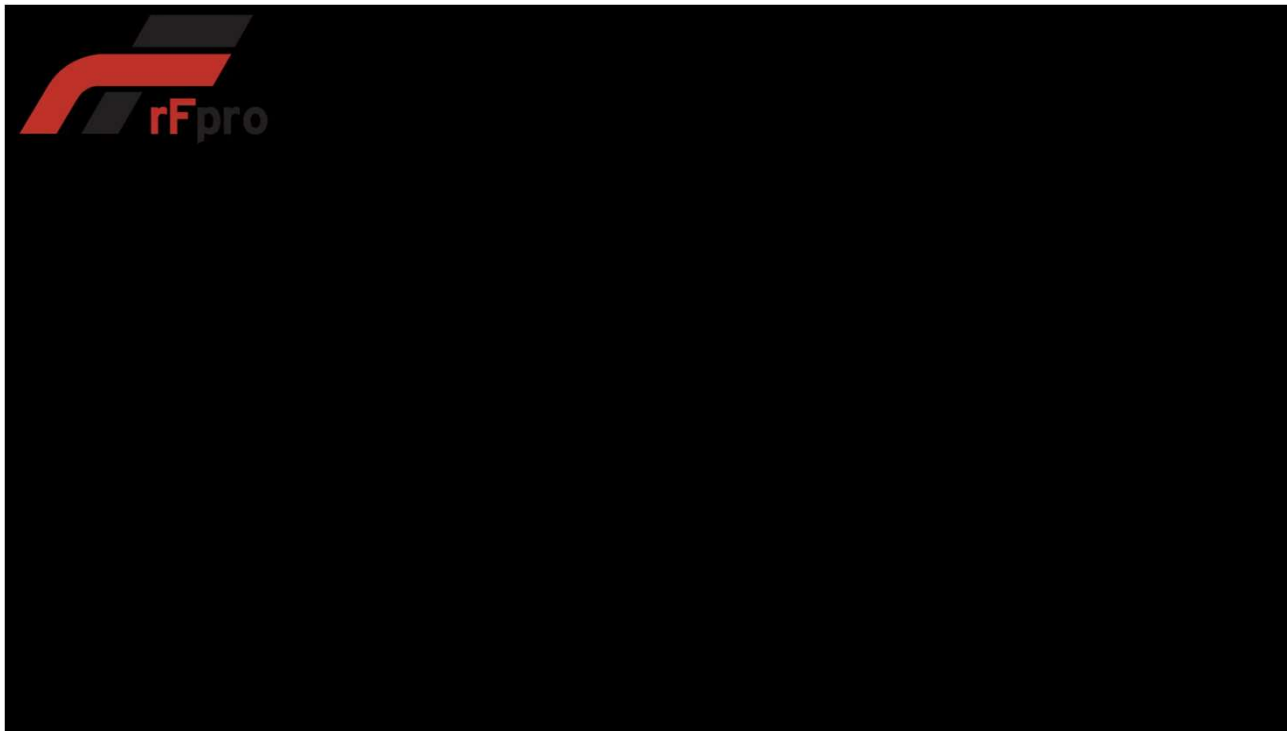
3D MAPPING SOLUTIONS

Pikes Peak International Hill Climb – Hill Climb Race Track, USA

Vectorized 3D Road data and high-definition laser scanner point cloud

Pikes Peak International Hill Climb – Hill Climb Race Track, USA

3D environment by rFpro

3D MAPPING SOLUTIONS

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