rFpro & DS Products: Integrated development software for **human** and **autonomously** driven vehicles
rFpro & DS Products:
Integrated development software for **human** and **autonomously** driven vehicles
rFpro  The Return On Investment

Test more in simulation

Technical leadership
Intro to rFpro
rfpro on Ansible:
Driving Simulator Systems Integrators

info@rfpro.com
rFpro on MTS/McLaren:
Test Equipment & Driving Simulator Systems Integrators
Voted 'Development Tool of the Year' by Vehicle Dynamics International magazine

Virtual testing of ADAS/Autonomous systems is overtaking use of passive simulation system testing
rFpro The Return On Investment

Test more in simulation

Technical leadership
Leverage your investment in all your Vehicle Models across all Use Cases

We can wrap around your vehicle model

rFactor Pro

Video: Multi Channel Projection

Audio

Dymola

Hardware Integration

Your Vehicle Model & IP

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Leverage your investment in Vehicle Modeling

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VeSyMA – Driver In The Loop
Integration between Dymola developed vehicle dynamics models and rFpro.

Using this solution, the vehicle model is plugged into a model template in Dymola and then functions guide the user through the export process and produce a PTWinSim or vTAG app ready to be plugged into rFpro.
A traditional polygon contact patch calculation

Single vector hub-to-polygon
Accurate contact patch centre for force resolution

Superior bandwidth/fidelity over traditional polygon contact patch

TERRAINSERVER^HD
[Volumetric Intersection]
Ideal for physical tyre models with custom envelope calculations

Works offline allowing simulation to benefit from HD road surface
rFpro + SIMPACK
High Definition Road Elements with TerrainServer

rFpro TerrainServer is a built in Road Element in SIMPACK

- High Definition LiDAR scanned road surfaces fed to each wheel
- Built in volumetric intersection enveloping model
  or
  Custom Enveloping API available for user’s own code
- Large library of datasets available for public roads, proving grounds, test and race track facilities worldwide with matching high definition graphics models for driver in the loop testing
Passive Vehicle Dynamics

Chassis Control Systems

Drivetrain calibration and control systems

ADAS tool chain
rFpro
Test more in simulation
Nürburgring Nordschleife:
Entire 20.8km mapped to 1cm resolution in x and y with sub-millimetre accuracy
Public road, European.
50km mapped to 1cm resolution in x,y
1mm accuracy in z
"In the space of 10 days we were able to evaluate around 25 different vehicle configurations using three professional drivers."

"More importantly, because of the high fidelity visual cueing using rFpro software, driver immersion was very convincing which led to good correlation between their subjective ratings and the objective data."

“For the first time, we have generated so much data that we are able to use statistical methods effectively to interpret the results.”
Passive Vehicle Dynamics

Chassis Control Systems

Drivetrain calibration and control systems

ADAS tool chain
ERIK BOGNER: MANAGER FOR DRIVEABILITY AND SIMULATION, ENGINEERING & TECHNOLOGY AT AVL

"AVL estimates that over 30 percent of the costs incurred in developing driving attributes could be saved through frontloading the engineering activity on a DIL simulator."

AVL chose rFpro software because it provides seamless integration of the vehicle model and the best level of immersive experience for the driver conducting the assessment testing.

ERIK BOGNER

"Simulation software from rFpro not only provides the greatest possible graphical realism for the driver but also the ability to 'feel' events such as gear shifts and vehicle movements and experience them in ways that are not possible with offline desktop simulation."

ERIK BOGNER

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Test more in simulation
Why Driver-in-the-loop for ADAS and Autonomous?

DLAD (Deep Learning Autonomous Driving)

DLAD Training, Testing, Validation

Test with a Human driver

Test with a human passenger

ADAS (Passive)

Human car share virtual road with DLAD / ADAS

ADAS (Active)

Vehicle Localisation

A vehicle dynamics driving simulator offers representative behaviour, **even** in dynamic manoeuvres
Testing entire toolchain

- Sensor model
- Algorithms
- Validate vs Ground truth
- ADAS control systems
- Chassis control systems

HUMAN TEST DRIVER

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Road Networks
OpenDRIVE, SUMO, IPG Roads 5, Forum 8

Intelligent Traffic

SUMO
IPG Roads 5
OpenDRIVE
Forum 8
Intelligent Traffic – Pedestrians, Cyclists, Animals
Intelligent Traffic – Pedestrians, Cyclists, Animals

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Low light affects camera

Reflections
All objects can reflect
Reflections in vehicles’ paint and glass
Advanced Lighting model
Reflections confuse white line detection
Physically based materials
rFpro
Physically based materials
HiDef Video bandwidth
Exercise toolchain with realistic lighting & atmosphere
Importance of consistency
In Simulation quality

Testing with high video bandwidth

Testing with low video bandwidth

Change to system is statistically significant

Change to system not statistically significant

Reaction Time To Sign – 1st response (s)
New HiDef examples
New HiDef
examples

info@rFpro.com
New HiDef examples
Statistically **accurate scenery** over imported road network
Statistically accurate
Digital Road Models

Statistically representative
US Interstate,
Early morning, high speed run
Replicating reality over LiDAR and Spherical Photography

1. GPS
2. IMU
3. Phase Scanner
4. TOF Scanner
5. Video Camera
6. DSLR Cameras
From survey...
...to digital
road model
The Return On Investment

Test more in simulation

Technical leadership
rFpro & DS Products:
An Introduction to rFpro
Driving Simulation and
Solutions

Any questions?