Testing Automated Driving on European Roads

Automated Vehicles Symposium 2018
12 July 2018, San Francisco

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1,000 drivers
100 cars
10 countries
European Projects on Automated Driving

- Automation level:
  - SAE L0
  - SAE L1
  - SAE L2
  - SAE L3
  - SAE L4
  - L3PILOT
  - PEGASUS (GER)

- Test Environment:
  - Field Test (ordinary roads):
    - KONVOI (GER)
    - TeleFOT
    - DRIVE C2X
    - euroFOT
    - UDRIVE
  - Field Test (dedicated areas):
    - V-Charge
    - Drive Me (SWE)
  - Test Track:
    - TEAM
    - iGame
    - Companion
    - AdaptiVe
    - PReVENT
    - HAVEIt
    - interactiVe

- Public Transport (dedicated areas):
  - CyberMove
  - CyberCars2
  - CityMobil
  - CityMobil2

- Time:
  - 2005
  - 2010
  - 2015
From euroFOT to L3Pilot
Longitudinal control functions
- Forward Collision Warning (FCW)
- Adaptive Cruise Control (ACC)
- Speed Restriction System (SRS)

Lateral control functions
- Blind Spot Information System (BLIS)
- Lane Departure Warning (LDW)
- Impairment Warning (IW)

Advanced applications
- Curve Speed Warning (CSW)
- Fuel Efficiency Advisor (FEA)
- Safe Human Machine Interaction (SafeHMI)
AdaptIVe

<table>
<thead>
<tr>
<th>SPEED</th>
<th>Exclusive area</th>
<th>Dedicated lane</th>
<th>Motor vehicles</th>
<th>All road users</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Highway applications</td>
<td></td>
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<tr>
<td>Mid</td>
<td>Urban applications</td>
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<tr>
<td>Low</td>
<td>Parking applications</td>
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</tbody>
</table>

TRAFFIC COMPLEXITY

- Highway applications < 130
- Urban applications < 70
- Parking applications < 30

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See SAE document J3016, "Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles", revised 2016-09-30, see also http://standards.sae.org/j3016_201609
Motorway
Traffic Jam
Urban
Parking

1,000 drivers
100 cars
10 European countries
Pilot across Europe

COUNTRY / REGION / OEM

- **BE / Brussels / NL** - Toyota
- **DE / Aachen** - Ford
- **DE / Munich** - BMW
- **DE / Offenbach** - Honda
- **DE / Wolfsburg** - VW
- **FR / Paris and other regions** - REN / PSA
- **IT / Turin and Trento** - CRF
- **LU / NL** - Delphi
- **SE / Gothenburg** - Volvo
- **UK / Coventry** - JLR

**CROSSBORDER**
- Austria
- Germany
- Italy
- Belgium
- Netherlands
- Finland
- Sweden
- France
- Germany
- Netherlands
Facts

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723051.

- €68 million BUDGET
- 48 months DURATION, starting in September 2017
- €36 million FUNDING
- 34 PARTNERS, among them OEMs, suppliers, research, SMEs, insurers, authorities and user groups
- 12 COUNTRIES involved: Austria, Belgium, France, Finland, Germany, Greece, Italy, Netherlands, Norway, Sweden, Switzerland, UK
<table>
<thead>
<tr>
<th>Partners</th>
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<tr>
<td><strong>OEMs</strong></td>
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<td>VOLKSWAGEN</td>
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<td>BMW GROUP</td>
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<td>DAIMLER</td>
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<td>FCA</td>
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<td><strong>Suppliers</strong></td>
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<td>GROUPE RENAULT</td>
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<td>HONDA</td>
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<tr>
<td>LAND ROVER</td>
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<td>PSA GROUPE</td>
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<td>TOYOTA</td>
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<td><strong>SMEs</strong></td>
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<td>DELPHI</td>
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<td>FEV</td>
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<td><strong>Research</strong></td>
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<td>DLR Deutsches Zentrum für Luft- und Raumfahrt</td>
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<td>German Aerospace Center</td>
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<td>INSTITUT FÜR KUNSTSTOFFE</td>
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<td>IMMAGEN</td>
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<td>UNIVERSITÀ DEGLI STUDI DI GENOVA</td>
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<tr>
<td>** Authorities**</td>
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<tr>
<td>UNIversity of Leeds</td>
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<tr>
<td><strong>User group</strong></td>
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<tr>
<td>ALLIANZ</td>
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<td>Swiss Re</td>
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<td><strong>User group</strong></td>
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<td>RDW</td>
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<td><strong>User group</strong></td>
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<td>FIA</td>
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Timeline

**Preparation**
- Functions implemented into cars
- Testing plan completed

**Execution**
- Execution of pre-tests & tests

**Evaluation**
- Pilot evaluation results
- Code of Practice delivered

*User acceptance survey*

**Showcases**

**FESTA**
- Preparing
- Using
- Analyzing

Sep, 2017 - Aug, 2021
1,000 drivers 100 cars 10 European countries Piloting Automated Driving on European Roads.
Code of Practice

Provide a comprehensive guideline with best practices for the development of functions: **Code of Practice for Automated Driving.**

- Collect best practices on relevant topics.
- Describe a typical process for an Automated Driving function.
- Include hands-on checklists.
- Include safety aspects and methods to confirm a safe operation of Automated Driving functions.
Evaluation Objectives

The **evaluation will draw conclusions** on technical aspects, user acceptance, driving and travel behaviour, and impact on traffic and society.

- Assess long-term effects of automated driving on user attitudes and acceptance.
- Investigate interactions between different traffic participants in different automation modes.
- Assess the readiness and reliability of automated driving functions.
- Develop tools for the effective analysis and evaluation of field data and enhance simulation tools for simulation in the impact assessment.
- Determine safety, efficiency, mobility and economic impact of automated driving applications under mixed automated traffic conditions based on collected in the real world pilot data.
# Evaluation Methodology

<table>
<thead>
<tr>
<th>Socio-Economic Impact Evaluation</th>
<th>Single Vehicle</th>
<th>Fleet</th>
<th>Europe</th>
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<tbody>
<tr>
<td>Cost benefit</td>
<td></td>
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<table>
<thead>
<tr>
<th>Impact Evaluation</th>
<th>Frequency of relevant situations</th>
<th>Environmental impact</th>
<th>Safety impact</th>
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<tbody>
<tr>
<td>User Evaluation</td>
<td>Interaction</td>
<td>Intercultural difference</td>
<td>Transition of control</td>
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<tr>
<td>Technical &amp; Traffic Evaluation</td>
<td>Security</td>
<td>Analysis of driving situations</td>
<td>System effect</td>
</tr>
<tr>
<td>Data Management</td>
<td>Individual data (vehicle data)</td>
<td>Fleet data center (vehicle data and PIs)</td>
<td>Aggregated data (Pis)</td>
</tr>
</tbody>
</table>
Thank you for your kind attention.

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SP7 Lead

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