Research project PEGASUS

EFFECTIVELY ENSURING AUTOMATED DRIVING.
Goals and Work Contents of PEGASUS

Key Figures

- **42 Months Duration**: January 1, 2016 – June 30, 2019

- **17 Partners**
  - OEM: Audi, BMW, Daimler, Opel, Volkswagen
  - Tier 1: Automotive Distance Control, Bosch, Continental Teves
  - Test Lab: TÜV SÜD
  - SME: fka, iMAR, IPG, QTronic, TraceTronic, VIRES
  - Scientific institutes: DLR, TU Darmstadt

- **12 Subcontracts**
  - i.a. IFR, ika, OFFIS

- **Project Volume**
  - approx. 34.5 Mio. EUR
  - Funding: 16.3 Mio. EUR

- **Personnel Deployment**
  - approx. 1.791 man-month or 149 man-years
Goals and Work Contents of PEGASUS

Current State of Development of HAD

Prototypes

Lab / Proving Ground

Products

current status
## Current State of Development of HAD

### Prototypes
- Multitude of prototypes built by OEM with HAD-functionality
- Evidence, that HAD is technologically possible
- Partially tested in real traffic situations
- Test drives involve backup safety driver at all times

### Lab / Proving Ground
- Individual analyses to optimize prototypes
- Current test methods/ proving grounds do not provide enough test coverage for all HAD features currently in focus
- There is no procedure for adequate testing (particularly performance) of HAD-systems

### Products
- No release or introduction of variety of HAD features without sufficient assurance
Goals and Work Contents of PEGASUS

PEGASUS - Selected Goals of the Project

- Development of a procedure for the determination of design criteria and establishment of quality measures.
- Considering the driver in regards to his abilities.
- Design of the development process for the release of highly automated vehicle systems.
- Conceptual design, assembly and demonstration of building blocks for an efficient tool chain for simulation, proving ground and field test.
- Embedding of findings into the industry.
- Distribution and pioneering of standardization.
### Goals and Work Contents of PEGASUS

#### Central Issues of the Project

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<th>Implementation Process</th>
<th>Testing</th>
<th>Reflection of Results &amp; Embedding</th>
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<td>What human capacity does the application require?</td>
<td>Which tools, methods and processes are necessary?</td>
<td>How can completeness of relevant test runs be ensured?</td>
<td>Is the concept sustainable?</td>
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<td>What about technical capacity?</td>
<td></td>
<td>What do the criteria and measures for these test runs look like?</td>
<td>How does the process of embedding work?</td>
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<td>Is it sufficiently accepted?</td>
<td></td>
<td>What can be tested in labs or in simulation? What must be tested on test grounds, what must be tested on the road?</td>
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**SP 1 Scenario Analysis and Quality Measures**

- **Description of application scenario**
  (sample application: Autobahn-Chauffeur + enhanced application scenario)

- **Determination of critical traffic situations**

- **Determination of safety level**
  through assessment of probability of occurrence and mechanical manageability in critical situations

- **Determination of safety level**
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- **Deduction of requirements**
  based on the accepted measure of quality

- **Deduction of an accepted quality measure**
  for automated driving features

- **Deduction of requirements**
  based on the accepted measure of quality

- **Determination of human and mechanical performance** as well as **effectiveness**
  (accident avoidance potential)
SP 2 Implementation Process

Analysis
of modification needs of existing metrics and automobile series development processes

Transfer
of systematic scenario guidelines into process steps in consideration of system classifications and levels of vehicle utilization

Preparation
of requirements definition for simulation, lab tests, testing ground and field coverage

Guidelines and Protocols
for the documentation of technological state-of-the-art compliance during the development process

Transfer
of target value parameters into process steps

Refinement
of the guidelines for required documentation of process steps

Goals and Work Contents of PEGASUS
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SP 3 Testing

- Detailing and completion of test scenarios of subproject 1, including technical quality measures as well as approval criteria
- Construction and filling of test specification database
- Establishment and verification of testing methods, interfaces, tools in the lab, on testing grounds and in real traffic
- Development and coordination of industrywide established models, tools and interfaces for the simulation
- Compilation of a test catalog and requirements for lab, testing ground and field coverage
- Construction of reference elements for practical testing and demonstration of functions
- Testing in the lab, on proving grounds and on the street
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**SP 4 Reflection of Results & Embedding**

**Statement**
about the distribution ratio between the applied test methods (from simulation to testing ground to field test)

**Assessment**
whether the test goal can be achieved with the utilized processes and methods in PEGASUS

**Verification**
of methods to identify relevant situations, quality and criticality measures for the assurance of HAD features

**Proof of Concept**

**Assistance**
with embedding of acquired results with our project partners

**Lessons learned**
regarding the implementation of the results in existing corporate structures
Testing and validation of automated vehicles requires new methods and tools for an efficient safeguarding process.

Core element of the circuit process is a database and a data processing chain for the relevant scenarios.

Available and known methods and tools can be utilized in the overall circuit process and therefore increase effectiveness.

The data processing chain needs to be able to process different data sources and heterogeneous data quality in order to provide common test specifications.

The presented database concept allows an efficient processing of high data volumes by means of a flexible tool chain.
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