Open issues for Automated Driving Assessment & Test and Suggestions

For the 14th meeting of WP.29/GRVA

Submitted by the experts from China
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**Question 1**: How to assess the robustness of the Validation & Verification? How to assess the boundary of the three test pillars?

**Question 2**: Is it necessary to define proving ground scenarios and concrete test cases to ensure the bottom line of safety? At present, the testing and certification scheme is negotiated between the manufacturer and the certification authority.
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Questions 1: How to assess the robustness of the Validation & Verification? How to assess the boundary of the three test pillars?

Assessment of the Verification strategy (e.g. verification plan and matrix) that describe the validation strategy and the integrated use of the pillars to achieve **adequate coverage**.

Produce an efficient, comprehensive, and cohesive process, considering their **strengths and limitations**. The methods should complement one another, avoiding excessive overlaps or redundancy to ensure an efficient and effective validation strategy.

- **Track tests**: Assess the performance of an ADS in a discrete number of physical tests. It can also be used as additional data to validate the virtual tests.
- **Real-world testing**: Scenarios may not be precisely represented virtually or on a track test. It can be used for virtual validation and/or track tests.
- **Virtual testing**: A large number of tests for different parameters can be carried out.
Questions & Answers

Questions 1: Answers from UN R157.01

Results of validation and verification may be assessed by analyzing coverage of the different tests and setting coverage minimal thresholds for various metrics.

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<tr>
<td>5. System Safety and Fail-safe Response</td>
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<td>6. Human Machine Interface/operator information</td>
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<td>7. Object and Event Detection and Response (OEDR)</td>
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<td>8. Data Storage System for Automated Driving</td>
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- Verifying functions of “The System” under non-failure conditions by testing on a track and real-world testing.
- **Simulation** tool and mathematical models for verification of the safety concept, (checked under the influence of faults)
- Simulation **shall not be a substitute** for physical tests in Annex 5 and Annex 6 of this UN Regulation.
- **Verify the accuracy** of simulation tools used by means of results from track and/or real-world testing.
Questions 2: Answers from NATM Guideline

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**Questions 2:** Is it necessary to define proving ground scenarios and concrete test cases to ensure the bottom line of safety?

Annex II Functional Scenarios for divided highway application.

It is recommended that **sampling techniques** be used when selecting parameters to be used in creating logical and concrete scenarios for ADS validation for a particular ADS and its ODD.
Questions 2: Answers from UN R157.01

Is it necessary to define proving ground scenarios and concrete test cases to ensure the bottom line of safety?

R157 Appendix V is about the third-party proving ground test. The third-party proving ground test is carried out from seven items: lane keeping, avoiding collision with road users or obstacles, following the vehicle in front, cutting in the vehicle in front, encountering static obstacles after the vehicle in front cutting out, FOV test, lane change, and avoiding emergency operation.

However, the scenarios to be tested for each project are not given directly, but rather the scenario elements to be considered.

The current understanding of the scheme is that this part of scenarios and test cases are determined by the certification authority and testing agency through joint consultation according to the product function of the enterprise.

4. Test scenarios to assess the performance of the system with regard to the dynamic driving task

Test scenarios shall be selected depending on the Operational Design Domain (ODD).

At the time of type approval, the type-approval authority shall conduct or shall witness at least the following tests to assess the behaviour of the ALKS:

4.1 Lane Keeping

4.1.1 The test shall demonstrate that the ALKS does not leave its lane and maintains a stable motion inside its ego lane across the speed range and different curvatures within its system boundaries.

4.1.2 The test shall be executed at least

(a) With a minimum test duration of

(i) 5 minutes for systems limited to 60 km/h operational speed, and

(ii) sufficient length to allow for an assessment of the lane keeping behaviour for systems with operational speeds above 60 km/h.

(b) With a passenger car target as well as a PTW target as the lead vehicle / other vehicle;

(c) With a lead vehicle swerving in the lane; and

(d) With another vehicle driving close beside in the adjacent lane.
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China has explored the allocation of ADS assessment & test methods in relevant standards. For the ADS general technical requirements, by consideration of the complementarity of simulation tests, track tests, road tests, audits, and other pillars, the assignment recommendation of pillars for relevant safety requirements is given. Concrete test cases for specific scenarios in the track & simulation test standard are listed as not exhausted. In the future, we will also actively contribute to the work of GRVA-related IWGs.

### GB/T General technical requirements for automated driving systems

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### GB/T Field test methods and requirements for automated driving function

#### 5.15.1 试验场景

试验道路：至少为具备障碍车辆的长直道，长度1km。

1. 障碍车辆：车辆驶入试验道路，车辆行驶速度设定为60km/h，车辆与障碍车辆之间相隔10m。
2. 行人：车辆驶入试验道路，行人沿车道行驶，行人距离障碍车辆10m。
3. 抢行障碍车辆：车辆驶入试验道路，行人与障碍车辆相隔10m。
4. 行人横穿试验道路，行人距离障碍车辆10m。

### GB/T Automated driving function simulation test methods and requirements

- GB/T Field test methods and requirements for automated driving function
- GB/T General technical requirements for automated driving systems
- GB/T Automated driving function simulation test methods and requirements
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04 Suggestions from China
During the following activities of **FRAV & VMAD**, two deliverables are suggested as supplements for guideline documents.

1. **Assessment for Verification strategy** including the methodology of integrated use of the pillars to achieve adequate coverage and the method to define coverage thresholds.

2. **Examples of Verification strategy**

3. **Concrete test case catalog** (necessary bottom line of safety)
Thank you for your attention!

Contacts: Sun Hang, sunhang@catarc.ac.cn
Wu Jiajie, wujiajie@catarc.ac.cn