

Mid-Term Presentation 15 / 16 March 2022

Structure of Verification and Validation

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- V & V Concept starting point and allocation in the VVM overall method
- Goal and Challenges of V & V for ADS
- Our approach: Structuring of V & V
- How does our approach tackle the actual challenges?
- Methodological development of the VV concept
- Roadmap to following talks in stream 2

V & V Concept starting point and allocation





V & V Concept starting point and allocation





Goal and Challenges for V & V



Main goal of V & V:

> Deliver evidences for safety argumentation

Main Challenges for V & V of ADS:

- Conformity forces V&V to deliver evidences for argumentation of safety including safety goals.
- Feasibility in Open context forces V&V to cover a huge number of variations of conditions (test coverage).
- Changeability forces seamless V&V for tailored systems (subsystems/components/ variants) and forces seamless
 V&V for environmental changes (by open context) a also preservation of test-results of unmodified components.
- Efficiency forces the use of test instances according their strength and seamless test-integration including of virtual and real artefacts.















ERIFICATION VALIDATION FTHODS



Pre-requisites for efficient structuring of the test space:

- The underlying Layer-structure
- The decomposition strategy
- New methodological approaches





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VERIFICATION VALIDATION



How does our approach tackle the actual challenges?



Challenge: Feasibility

Approach for

Analysis

- Problem: the high complexity and amount of variations for ADS >
- VVM-Approach: Combination of probabilistic FMEA / Component Fault Trees >
 - Evaluation with focus on scenarios >
 - quantitative safety assessment (in contrast to classical FMEA) >





Challenge: Changeability



> Change will only be relevant on engineering layer and only for affected branches within the architecture

VERIFICATION VALIDATION METHODS

Challenge: Efficiency



- > Problem: the scenario variety leads to increase of the test amount
- > VVM Approach: Structuring of the test space by decoposition of the scenarios, the system and the safety argumentation



- Decomposition methods for scenarios and derivation of test requirements
 - → See talk 2.3 A Story of Scenarios - From Data and Knowledge to Scenarios for Testing



Methodological development of the VV concept



Methodological path from Requirements to Qualities





- ▶ "Goal Question Metric (GQM)" Method to create Quality criteria on all 3 layers
- Method to derive Test requirements (under current investigation)

→ See talk 2.2 An Approach for Decomposition and Analysis



Decomposition of safety requirements





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Validation through showing fulfilment of decomposed qualities



VERIFICATION

Test orchestration as a result of decomposition



- Vertical decomposition of system and safety argumentation
- Necessary prerequisite for structuring of the test space and for technical test orchestration



Test orchestration as a result of decomposition



- Vertical decomposition of system and safety argumentation
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Summary



- > The developed structuring of V & V is able to tackle the main challenges
 - Conformity
 - Feasibility
 - Changeability
 - Efficiency
- The V & V process contains decomposition strategies for
 - System design
 - Scenarios
 - Safety Goals
- It contains new methodological elements, for example for
 - decomposition
 - Deriving Qualities and Quality Metrics
 - Safety analysis

Roadmap to the following talks



VERIFICATION VALIDATION



Thank you!

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