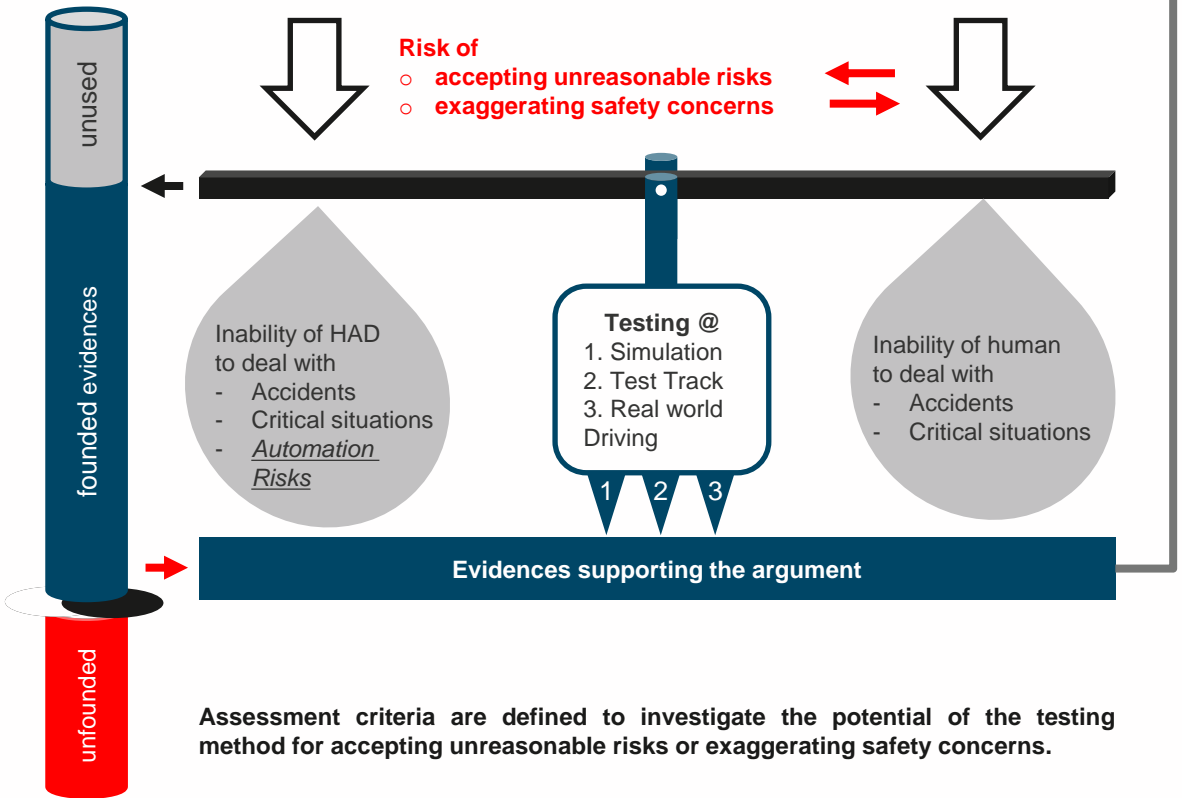


CHALLENGES OF A SCENARIO-BASED APPROACH



How credible are the evidences provided by a scenario-based testing methodology with regard to the following question:

Is automated driving as good as a human driver?



Assessment criteria are defined to investigate the potential of the testing method for accepting unreasonable risks or exaggerating safety concerns.

Types of Evidences	Assessment Criteria	Description
<i>Unused</i>	Unused evidence	Refers to evidences being explicitly/unintentionally omitted
<i>Founded</i>	Assumption coverage	States the sufficiency of assumptions w.r.t. the test intent (founded argument)
<i>Unfounded</i>	Unfounded argument	Refers to arguments without supporting evidences



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CHALLENGES OF A SCENARIO-BASED APPROACH



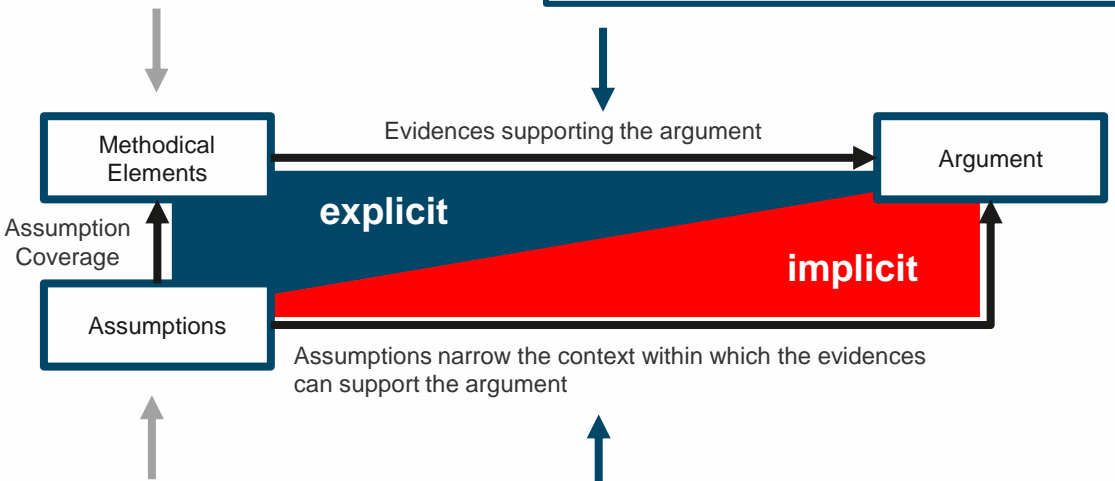
Relationship

Methodical elements, their assumptions & argument of why (HAD >= human)

#	Methodical Elements
A	Information base
B	Preprocessing
C	Preparing
D	Evaluation

Relation (explicit)
requires an assessment of whether an element satisfies the assumptions being made

$$Evidences = (Assumption\ Coverage) / (Unused\ Evidences)$$



#	Assumptions on
A	What information is needed?
B	Why a scenario needs to be tested?
C	How to set up tests?
D	How to assess test results?

Relation (implicit)
requires bridging the implicit relation for instance by formulating concerns that can then be dispelled using further tests or methods.

$$(Evidences | Assumptions) \rightarrow Argument$$

The identification of **challenges** requires an assessment of **each element**.



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CHALLENGES OF A SCENARIO-BASED APPROACH



Assessment of methodical elements

Aspects that imply founded, unused or even unfounded evidences

	A.) Information base	B.) Preprocessing
Description	Provision of scenarios specifying accidents, critical situations & automation risks	Attribution of the functional scope, criticality & appearing context elements to a scenario
Founded – degree to which	Information is represented in terms of a respective scenario	Attribute is correct
Unused	Information not representable e.g. HAD does not drink alcohol	Incapability of preprocessing e.g. false negatives
Unfounded	Information unknowingly simplified while incorporating into a scenario	Due to (unknown) scenarios being different from what is known

	C.) Preparing	D.) Evaluation
Description	Provision of a test specification based on the data base	Decision on whether the tested HAD is actually as good as a human driver
Founded – degree to which	Test strategy allows transforming a scenario into a testable instance	Test outcome supports the argument
Unused	Scenario not selected from data base or not incorporated into tests	Resulting from conservative evidences
Unfounded	Scenario unknowingly changed while generating the test specification	Claims based on implicit assumptions that become violated

Consider that the listed aspects **propagate** towards the evaluation. Therefore, the **effect** of each aspect on the evaluation must be **investigated**.



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CHALLENGES OF A SCENARIO-BASED APPROACH



Evaluation

Critical cases entail *acceptance of risks*

- Unfounded evidences provided for accident rated positive – *indicates a safety capability that is actually not available*
- Unused evidences regarding critical situations or automation risks that would have been tested negative – *masks the inabilities/risks of a HAD system*

Critical cases entail an *exaggeration of safety concerns*

- Unused evidences provided for accident rated positive – *underrates safety capabilities*
- Unfounded evidences regarding critical situations or automation risks that would have been tested negative – *overrates the incapability of the HAD system*

Intended cases

- Founded evidence provided for accident rated positive – *positive indication for a HAD system being better than a human driver*
- Neutral evidence provided for positive tests of critical situations & automation risks – *absence of negative indication that HAD system is weaker than a human driver*

		Accidents		Critical Situations & Automation Risks	
"Test Result" complies with "Acceptance Criteria"		Positive	Negative	Positive	Negative
Indication for "at least as good as" is:		Positive	Neutral	Neutral	Negative
Assessment Criteria	Unused	Conser- vative	None		Too neutral
	Founded	Increase	None		Decrease
	Unfounded	Increase	None		Decrease

Conclusion

The challenges require explicit attention to the process of providing, preprocessing and preparing and evaluating scenarios while testing a HAD system and may serve as a checklist of what needs to be considered and argued for the test method as such.



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