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# StreetWise: scenario-based approach to describe real-world traffic

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**ABSTRACT**: For the assessment of operational safety of vehicles and vehicle systems, it is becoming common to follow a data-driven scenario-based approach. Already in the development stages of a vehicle, it needs to be investigated whether vehicle systems respond appropriately to all situations that the vehicle may encounter during its lifetime on the public road. A first challenge is to provide a structured way to describe all situations. This paper shows how the concept of scenarios can be used, and how to determine a set of scenarios to describe traffic situations.

**KEY WORDS**: **safety, automated driving, ADAS, scenario-based assessment**

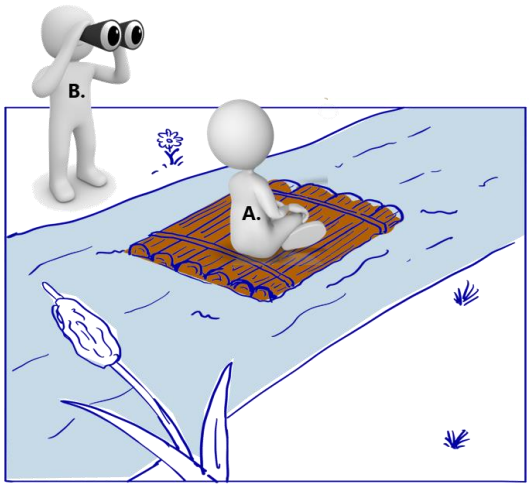
The use of scenarios for development and testing puts requirements to scenario databases that need to be established. A scenario database should provide a (complete) view on scenarios (and their variations, also depending on region, traffic rules, and driving culture) that a vehicle can encounter on the road during its lifetime. This includes how scenarios evolve over time with the changes in the mobility system. Scenarios should cover nominal everyday driving and more rare and extreme cases such as edge and corner cases.

Most important is the possibility to determine scenario statistics, with metrics such as:

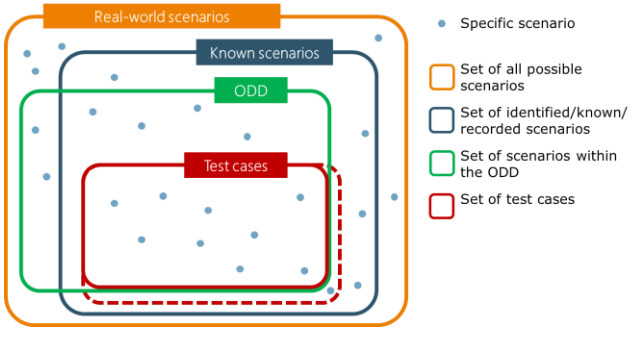
- Exposure: what is the probability of encountering a scenario within certain parameter ranges or given characteristics e.g. expressed in the number per 100.000 km of driving;
- Completeness: a metric that determines how well the scenarios (and their variations) included in the scenario database cover the occurrence of scenarios in the real world.

In safety assessment, scenario statistics are used to indicate how relevant the sampling of scenarios from the database is for the generation of test cases. Moreover, in quantifying the risk of introducing an AV onto the road, the exposure of scenarios within the field of application (sometimes referred to as the actual operational domain (OD), or deployment domain) needs to be known.

In this paper, we will describe different approaches for collecting scenarios and to combine the observed scenarios in a scenario database for use in AV development and safety assessment.




Different references for collecting scenarios:
A. as part of the traffic flow with a reference point attached to a traffic participant,
B. at a fixed geographical location in the infrastructure.




Relation between scenarios, test cases and a system's Operational Design Domain (adapted from www.asam.net).