UC1.2 - CONNECTED PERCEPTION TESTING

UC1 - URBAN AD

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SUNRISE
SAFETY ASSURANCE FRAMEWORK FOR CONNECTED, AUTOMATED MOBILITY SYSTEMS

Use case overview

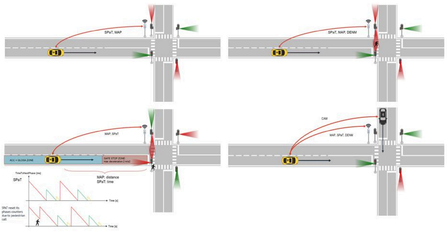

Figure 1. Overview of Use Case 1.2

UC1.2 addresses an overall safety argumentation for urban pilots with a focus on connected perception testing.

Objectives

The objectives of UC1.2 are to address current gaps in extended virtual perception through V2X cooperation, as well as ODD and scenario coverage, which include connectivity with vehicles and infrastructure (in this case, connected traffic lights).

SAF blocks demonstrated

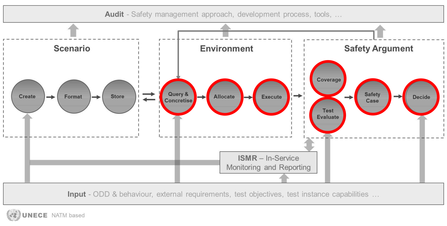

Figure 2. Overview of demonstrated SAF blocks

Test case setup

Figure 3. Test case setup

To address the objectives mentioned above, UC1.2 partners selected 4 scenarios to be tested in simulation and on proving ground. These scenarios are targeting the combination of GLOSA and C-ACC systems, as well as several types of V2X messages.

Results

The Concretization Steps in UC1.2 are extensively tested using expert-derived logical scenarios, with an initial test matrix created via Latin Hypercube Sampling and further scenarios sampled using a Gaussian Process-based surrogate model.

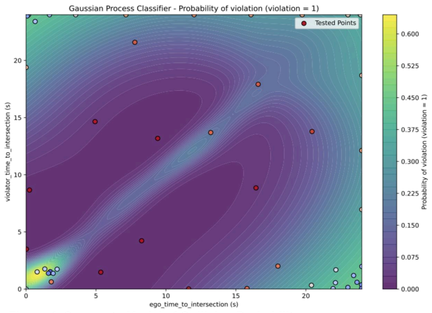

Figure 4: Surrogate Model of Collision Probability

The selected test scenarios are first allocated to a simulation environment. The main KPI's evaluated are the legal compliance with the traffic light, as well as crash avoidance depending on the scenario. The evaluated concrete test scenarios could then be used to further refine the surrogate model, identifying additional concrete scenarios for testing. Using this approach, regions of the parameter space are successfully identified where the CCAM system unexpectedly fails to prevent a crash, as shown in Figure 4.

Key take aways

- The SAF Methodology has been successfully applied to explore multi-dimensional scenario parameter spaces.
- The SAF Methodology successfully revealed a parameter subspace with a significant unexpected failure rate of the CCAM system.
- The SAF successfully demonstrated the use of multiple test instances to evaluate the same scenarios.

References

- SUNRISE Deliverable D3.4
- SUNRISE Deliverable D7.1
- SUNRISE Deliverable D7.2
- SUNRISE Deliverable D7.3

CCAM = Cooperative, Connected and Automated Mobility
ODD = Operational Design Domain
SAF = Safety Assurance Framework
UC = Use Case

C-ACC = Cooperative Adaptive Cruise Control
GLOSA = Green Light Optimal Speed Advisory
KPI = Key Performance Indicator
V2X = Vehicle-to-Everything

Partners

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