Ansys

CASE STUDY /

Ansys + Daimler

Validation of ADAS using Reliability Analysis Methods to save a factor of 1000 simulations per scenario

"The advanced reliability methods available in Ansys optiSLang enable Mercedes-Benz AG to make a safety statement for Level 3 ADAS using scenario-based simulation. Thanks to the efficient and robust methods, the number of necessary traffic simulations could be dramatically reduced in comparison to Monte Carlo Sampling. The Ansys optiSLang postprocessing, with which detailed analyzes of the results could be carried out, should also be emphasized."

Maximilian Rasch
ADAS validation engineer / Mercedes-Benz AG

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ADAS validation engineer / Mercedes-Benz AG

CASE STUDY

One of the most important current trends in the automotive industry is the development of advanced driver assistance systems (ADAS). Due to the ever-increasing complexity of ADAS, the safety validation of such systems is a major challenge. New methods have to be developed, as the previous certification and approval methods are not suitable for this use case.

/ CHALLENGES

The required mileage needed to proof the probability of failure of the system is impossible to reach in field operational tests. Therefore, simulation is a key component to find critical scenario characteristics for safety function testing, validation, and even certification of highly automated driving systems. One of the greatest challenges here is the high number of simulations needed for testing, especially for very rare events (logical scenarios with low probability of failure 10^-6).

/ TECHNOLOGY USED

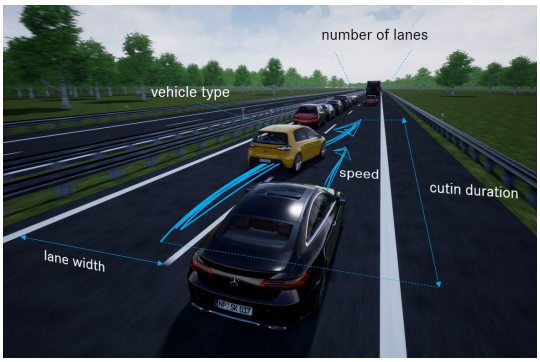
optiSLang Premium & optiSLang Enterprise

/ ENGINEERING SOLUTION

In this Pegasus conform simulation approach for AD Level 3, specific traffic scenarios are parameterized, simulated, and analyzed by a set of criteria. To reduce the parameter space, safety-critical input parameters are determined by applying Ansys optiSLang's Sensitivity Analysis with surrogate models including neural networks. The probability of failure for each traffic scenario is approximated using advanced reliability analysis methods (e.g., importance sampling) in Ansys optiSLang by using distribution functions for each input parameter.

/ BENEFITS

- Reliability analysis methods available in Ansys optiSLang enable Mercedes-Benz AG to reduce the number of concrete scenarios needed to proof a function by a factor of 1000 compared to classical Monte Carlo Sampling.
- Reliability analysis can determine the risk per scenario class even for very low probabilities of failure (10^-9), which is a crucial requirement for certification and impossible with Monte Carlo Sampling.
- With the advanced reliability analysis methods, the time savings is 90% compared to Monte Carlo Sampling.
- This approch contributes the certification of Mercedes-Benz level 3 ADAS as one of the validation pillars.



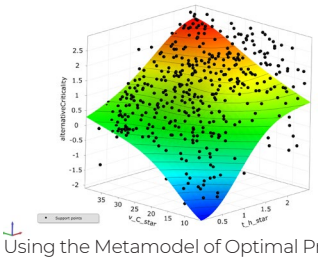
Logical cut-in scenario with parameters within the simulation environment.

The Mercedes EQS with market-leading advanced drive assistance systems.

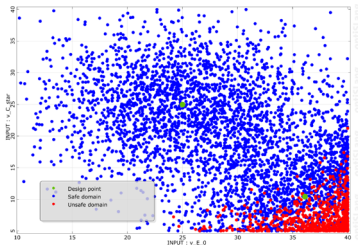
/ COMPANY DESCRIPTION

Mercedes-Benz AG is one of the world's most successful automotive companies and one of the world's largest manufacturer of premium and luxury cars and commercial vehicles. Furthermore, safety is one of Mercedes-Benz core values, which is why the company aspires to be leading in the field of advanced driver assistance systems.

Mercedes-Benz



Using the Metamodel of Optimal Prognosis by optiSLang for sensitivity analysis.



Use of Importance Sampling at the most probable failure points to reduce the number of simulations required.

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