RobustSENSE

Robust and Reliable Environment Perception and Situation Prediction for Driver Assistance and Automated Vehicles

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Today's driver assistance systems offer comfort and safety in sound environmental conditions. However, in harsh environment conditions – when needed the most – systems stop working due to reduced sensor information quality. Targeting the area of highly automated driving the improvement of perception, decision and planning under adverse conditions is one of the main challenges to be addressed.

The goal of RobustSENSE is to develop metrics to measures sensor system reliability on every level of assistance and automation systems, to investigate approaches to improve system performance throughout a robust vehicle architecture and to enable systems to cope with varying levels of uncertainty. RobustSENSE objectives therefore are to

- Define reliability measures and metrics for sensors, sensor fusion, scene understanding and trajectory planning.

- Develop enhancement concepts for sensor performance ranging from redundancy, multi sensor evaluation to clutter analysis and advanced fusion algorithms.

- Evaluate the extent to which data from interconnected vehicles and infrastructure can be integrated in the sensor system to enrich robustness.

- Design vehicle architectural solutions to guarantee that sensor robustness will be reflected in robust performances.

- Develop situation prediction systems allowing for a continuous assessment of current performance and reliability.

- Develop approaches for auto-supervision of perception by scene understanding.

- Develop approaches for safe trajectory planning within provable spatio-temporal safety margins and conditions.

- Develop means for aggregating and annotating localized sensor information in map data to improve future sensor fusion.

The holistic approach of RobustSENSE enables an assistance system to cope with uncertainty. Continuous inference of probabilistic states on different layers supports auto-supervision of the perception and reasoning. By modeling the system and environment in a unified probabilistic manner RobustSENSE allows conclusions about conflicts and specific degradation of component performance.

In consequence, RobustSENSE will define, develop and evaluate reliability measures for the next generation of automated driving.