Automated Conversion of CommonRoad Scenarios to OpenDRIVE and OpenSCENARIO

Background

Autonomous vehicles require accurate maps to safely participate in traffic. For example, maps are needed to plan a route and to obey traffic rules. Additionally, test scenarios are important to evaluate motion planning algorithms. Different scenario formats are used by industry and research groups, e.g., Lanelet2 [1], OpenDRIVE/OpenSCENARIO, or GeoScenario [2]. We created our own format called CommonRoad [3], for which we provide scenarios online1. We also developed a converter from OpenDRIVE to CommonRoad [4]. To enable the usage of our scenarios in tools which use OpenDRIVE/OpenSCENARIO, a converter to these formats is necessary.

Description

The aim of this thesis is to develop a converter from CommonRoad to OpenDRIVE and OpenSCENARIO. Since the formats differ in the representation of certain key elements, a novel concept for the conversion is necessary. A big difference is the modeling of lanes. In OpenDRIVE lanes are modeled by different mathematical primitives, e.g., clothoids (spirals), lines, or polynomials, whereas in CommonRoad lanes are modeled by lanelets which in turn are represented by two polylines. As part of the thesis, different algorithms for the conversion should be compared, e.g., [5], [6]. Additionally, OpenSCENARIO and CommonRoad differ in the modeling of traffic. OpenSCENARIO uses actions which trigger maneuvers, whereas CommonRoad contains predefined trajectories of other traffic participants.

Tasks

- Familiarizing with CommonRoad
- Familiarizing with OpenDRIVE2 and OpenSCENARIO3
- Implement a converter from CommonRoad to OpenDRIVE
- Develop a converter from CommonRoad to OpenSCENARIO
- Evaluate the accuracy and the runtime performance of the developed converters

1https://commonroad.in.tum.de/scenarios/
2http://opendrive.org/ and https://asam.net/standards/detail/opendrive/
3http://openscenario.org/ and https://asam.net/standards/detail/openscenario/
• Optional: Develop an automated validation of CommonRoad scenarios (for the conversion to CommonRoad)

References


