Constraint-Based Critical Scene Generator for Navigation Learning of Autonomous Cars

For obvious safety reasons, teaching Deep Learning Systems for Autonomous Driving necessarily needs to be performed – at least at the beginning - within virtual environments such as driving simulators. To this end, we make use of OpenDS, a driving simulator that has been developed at the DFKI. Within OpenDS driving scenarios are described in an XML-style description language that allows the modeler to introduce complex situations that not only include the surrounding but also the pedestrians and vehicles that are involved.

A deep learning system that is supposed to learn how to drive safely should be confronted with a huge amount of typical, but also critical, driving scenarios. At DFKI, we develop an automated critical scene generator, which is based on the computation of suitable variants of other scenes with the help of constraint solving mechanisms acting on a formal model of the pedestrian’s and the vehicle’s dynamics.

The aim of this Master Thesis is to implement and to refine this method, and to evaluate its performance.

Requirements:

- Programming Skills (Java, experience with the Eclipse IDE)
- Formal Methods (Constraint Solving, Symbolic Reasoning)

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