Motion Planning with partially ordered Rulebooks

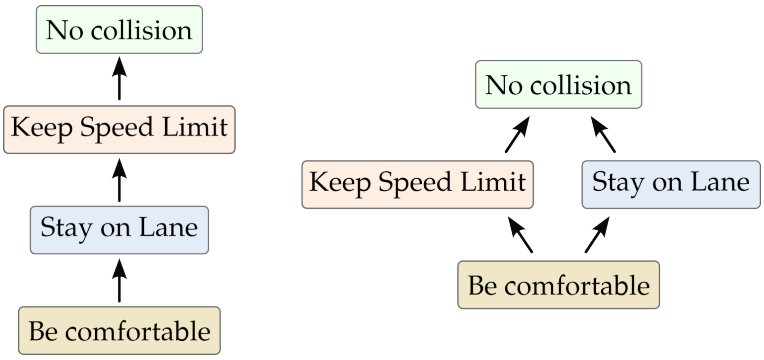

Fig. 1. A totally ordered Rulebook and a partially ordered Rulebook.

Description

As the development of autonomous vehicles is gaining momentum, the need for defining desired behavior for all possible scenarios is becoming a challenge for manufacturers. One of the main challenges in designing autonomous vehicle behavior is that there are multiple constraints to be considered simultaneously, such as safety, traffic rules, comfort, and mission goals. Traditionally, these multiple objectives are handled by assigning scalar weights to express their importance, but this approach has some limitations. In this thesis, we are using an alternative approach to handling potentially contradicting goals which is called Rulebook [1]. In a Rulebook the constraints are ordered in a hierarchical fashion.

The goal of this thesis is to design a motion planner that can handle partially ordered Rulebooks. Partially ordered Rulebooks allow considering constraints, which are incomparable and thus, cannot be ordered in a linear manner. Currently, there are excursively planners that can handle totally ordered Rulebooks, which means they can only handle linear orders (e.g. see [2, 3]). The proposed solution will be evaluated on CommonRoad scenarios, which is a suitable environment for testing the effectiveness of the approach.

Tasks

- Literature research on Rulebooks and multi-objective optimization methods
- Investigation of the extension of lexicographic optimization problems to the more general case of partially ordered cost functions
- Development of an efficient motion planning algorithm capable of handling partially ordered rulebooks (e.g. optimization or sampling based)
- Evaluation of the motion planner based on CommonRoad scenarios

References

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