Set-Based Prediction of Traffic Participants

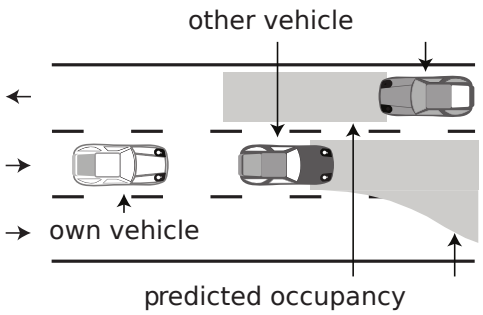
Background

Around 1.2 million people are killed every year in road accidents. New developments in sensors, control algorithms, and path planning make it possible to fully take over the vehicle control in case of an almost inevitable collision. In order to realize the vision of collision-free vehicles, one has to ensure that the vehicle will not cause a crash when taking over the control.

Description

The difficulty in deciding whether a collision avoidance maneuver is safe, lies in the unknown future behavior of surrounding traffic participants. Other vehicles might perform lane changes, brake, accelerate, etc. where within each of those actions it is unclear with what intensity they are performed, e.g. how strong will another car brake?

In this work, the set of all possible behaviors of other traffic participants should be predicted. For that purpose, traffic participants should be modeled by hybrid automata, which describe the decision logic and the continuous dynamics of traffic participants. Based on the models, set-based methods are used to obtain the set of behaviors rather than a single solution. The results are tested with measurement data from BMW.



Tasks

- Induction into set-based techniques
- Introduction to the existing MATLAB code for set-based behavior prediction
- Extension of the existing code to curved roads
- Implementation of the decision logic of traffic participants
- Tests with measurement data from BMW

References

[1] M. Althoff and J. M. Dolan. Set-based computation of vehicle behaviors for the online verification of autonomous vehicles. In *Proc. of the 14th IEEE Conference on Intelligent Transportation Systems*, pages 1162–1167, 2011.

[2] M. Althoff, D. Heß, and F. Gambert. Road occupancy prediction of traffic participants. In *Proc. of the 16th International IEEE Conference on Intelligent Transportation Systems*, pages 99–105, 2013.

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Research project:
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Type:
BA/MA

Research area:
Automated vehicles, verification

Programming language:
MATLAB

Required skills:
Knowledge in dynamic systems, good mathematical background

Language:
englisch

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