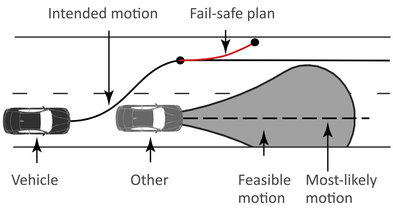
FUNCTION DEVELOPMENT

Ko-HAF
KOOPERATIVES HOCHAUTOMATISIERTES FAHREN

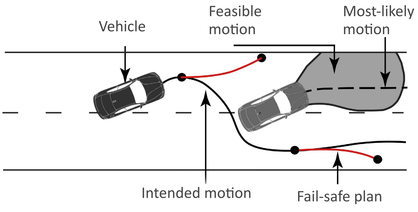
Fail-safe Motion Planning for Autonomous Vehicles

MOTIVATION

How to avoid a collision in safety-critical situations?



Initial scenario



Future scenario

GOAL

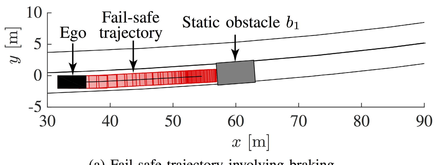
Generate fail-safe plans for the vehicle, which ensure safety in critical traffic situations by reaching safe states.

APPROACH

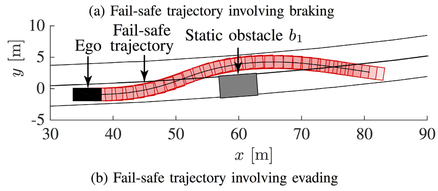
We use convex optimization techniques to

1. efficiently compute fail-safe motion plans, which
2. ensure safety by avoiding unsafe regions at any time.

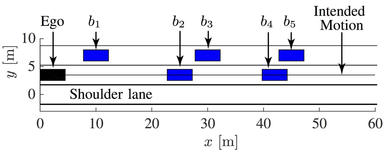
RESULTS



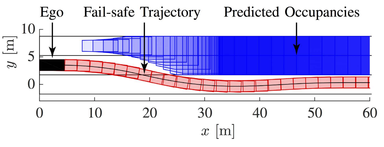
(a) Fail-safe trajectory involving braking



(b) Fail-safe trajectory involving evading



(a) Initial scenario at $t = 0\,\mathrm{s}$



(b) Fail-safe trajectory involving swerving to the shoulder lane

PUBLICATIONS

[1] Pek, C. and Althoff, M. “Computationally efficient fail-safe trajectory planning for self-driving vehicles using convex optimization”. Proc. of the IEEE Int. Conf. on Intelligent Transportation Systems, 2018.

[2] Miller, C., Pek, C., and Althoff, M. “Efficient mixed-integer programming for longitudinal and lateral motion planning of autonomous vehicles”. Proc. of the IEEE Intelligent Vehicles Symposium, 2018.

[3] Pek, C., Zahn, P., and Althoff, M. “Verifying the safety of lane change maneuvers of self-driving vehicles based on formalized traffic rules”. Proc. of the IEEE Intelligent Vehicles Symposium, 2017.

BMW

www.ko-haf.de

Gefördert durch:

Bundesministerium für Wirtschaft und Energie

aufgrund eines Beschlusses des Deutschen Bundestages