Multi-Goal Trajectory Planning for an Obstacle Course

Project Seminar (3 students)

In this project seminar, methods to solve multi-goal trajectory planning problems will be developed. In particular, we consider a scenario in which a ground vehicle has to drive through predefined targets, while avoiding obstacles. This should be formulated in an optimization problem, minimizing the traveling time. For this a simple dynamic model of the vehicle has to be considered.

The project starts with a theoretical analyses of the problem and a brief literature research. Then approaches to solve the problem should be proposed and tested in simulation. Finally, the methods can be used in a real-world scenario, using a CogniTeam Hamster in combination with an OptiTrack motion tracking system.

The problem can be separated into the following subproblems:

- Find suitable initial guesses and the order in which the targets should be visited.

- Formulate and solve a time-optimal optimization problem.

- Demonstrate the results on real hardware.

The hardware available for this project is ready to use and does not require prior knowledge in this field. An onboard controller for the Hamster to follow a predefined trajectory exists and can be used. Within this project the hardware will only be used to demonstrate the developed methods.

Hands-on Python skills and a fundamental understanding of dynamic Optimization problems are required.
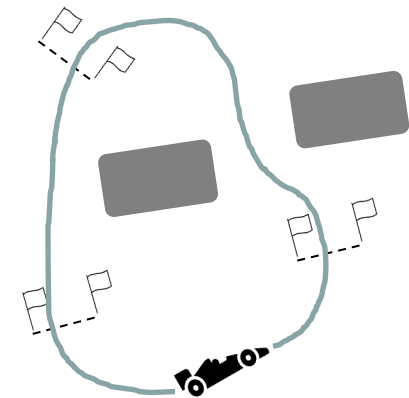
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