Bachelor thesis - Collision checking via database query

What it is about

Collision checking is often computationally expensive, because the position of the ego vehicle has to be compared with all possible positions of the object for all points in time of the planned trajectory. We want to implement a fast collision check via database query [1]. Of course, not every possible scenario can be saved in a database. Therefore, we discretize the relative positions and orientation such that a database query is possible.

![Diagram of collision checking](image)

To guarantee freedom of collisions, we want to check the planned trajectory for collisions against the reachable set (all possible future positions of the object). For that, we propagate the ego vehicle with some over-approximation along the trajectory. If we approximate the reachable set by rectangles (orange), we can check for collision via database query for each of those rectangles.

What is your task

- How can we approximate the reachable set with rectangles with a good compromise between approximation error and number of rectangles?
- Generation of the database.
- Implementation of the collision check in a simulation environment in python or Matlab.

References