

# Master Thesis

## Dynamic priorities to increase feasibility in graph-based trajectory planning for networked model-scale vehicles

### Problem Statement

The project GROKO-Plan aims at developing a graph-based trajectory planning method for interacting vehicles. In a broad sense, the goal of trajectory planning is to find a sequence of control inputs that take a vehicle from a starting position to an end position.

The computational load of a centralized control problem for multiple networked agents can be reduced by a priority-based distribution of the control problem among the agents. Whether the distributed control problem is feasible depends highly on the priority assignment. Consider the situation in Figure 1 where three vehicles follow a straight reference trajectory and encounter an obstacle.

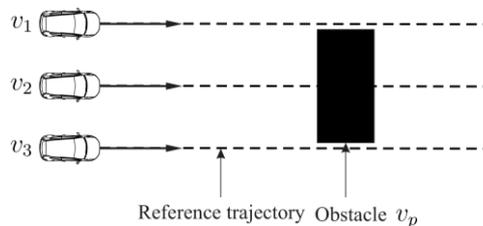


FIGURE 1 PRIORITY ASSIGNMENT PROBLEM OF THREE VEHICLES DRIVING IN FORMATION.

Assume that the vehicles drive with constant velocity and can only use steering as a control input. There are six possibilities for priority assignment. Four of them are valid, but if  $v_2$  has the lowest priority, the vehicle cannot find a feasible solution to its control problem.

The dynamic priority assignment is to be applied to trajectory planning of networked vehicles. The vehicles are to drive in a scenario reflection urban and highway traffic. An existing receding horizon graph search approach for free space needs to be adjusted to incorporate knowledge about the road geometry ahead.

### Task

- ▶ Find and adapt strategies for priority distribution with the goal of increasing feasibility of trajectory planning for ground vehicles at an urban intersection
- ▶ Analyze the strategy regarding recursive feasibility and real-time capability
- ▶ Generate motion primitives suitable for the road geometry in the CPM Lab
- ▶ Evaluate distributed, priority-based receding horizon graph search with dynamic priority assignment in experiments in the CPM Lab

### Qualifications

- ▶ Knowledge of MATLAB and/or C++
- ▶ Affinity to mathematics
- ▶ Student of Automation Engineering, Computer Science, Mechanical Engineering, Electrical Engineering or a similar study program

### Contact

Patrick Scheffe, M. Sc. RWTH

[scheffe@embedded.rwth-aachen.de](mailto:scheffe@embedded.rwth-aachen.de)

Please include in your application: transcript of records, CV and certificates.