

## Lab 7: Distributed Platoon Control 2

### Exercise 1. (*Distributed platoon control*)

Your goal in this exercise is to realize a platoon using priority-based non-cooperative distributed model predictive control (DMPC). Use the folder TEAMREPO/+dmPC for this exercise.

- Communicate information between high-level controllers through the message format you created previously. Your goal is to achieve the best performance, so use any information allowed by your control strategy and communication structure that helps you in that regard.
- If necessary, revisit your implementation of a slack variable for the output in the class `ModelPredictiveControl` and adjust it for DMPC.
- Maintain a constant reference distance  $d_{\text{ref}}$  between the center of gravities of consecutive vehicles of

$$d_{\text{ref}} = 0.5 \text{ m.} \quad (1)$$

Apply the following state constraint on the distance and the input and change of input constraints:

$$\begin{aligned} d_{\text{min}} = 0.3 \text{ m} & & v_{\text{min}} = 0 \text{ m/s} & & a_{\text{min}} = -1 \text{ m/s}^2 \\ v_{\text{max}} = 1.5 \text{ m/s} & & a_{\text{max}} = 0.5 \text{ m/s}^2 & & \end{aligned} \quad (2)$$



We would be grateful if you evaluated this lab exercise. Please take the time to fill out the form you have received per email to help us improve this course. We are especially happy to read what you wrote in the text field, e.g. what you have liked, what you haven't liked and how it could be improved.

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### Checkpoint

Get a tutor to check your work. You should be able to

- control a platoon consisting of multiple vehicles with DMPC
- evaluate the lab exercise

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### Exercise 2. (*Ideas for advanced features [optional]*)

Have some fun and experiment with the tools you have now mastered. Here are some ideas on what you might want to work on, but feel free to try anything that tickles your fancy.

- Increase the number of vehicles in the platoon.
- Have vehicles join and leave the platoon.

- c) Have multiple platoons drive, consider collision avoidance between platoons.
- d) Have different constraints on agent dynamics drive in the same platoon.