

## Exercise 3

October 28, 2019

Submission online until **Thursday, 05.11.2019, 11:55 a.m.**

### Assignment 3-1: Simple Parking Maneuver (7 Points)

The goal of this task is to park the model car between two boxes.

Please look at the source code of the `simple_drive_control` and `simple_parking_maneuver` packages:

<https://github.com/AutoMiny/AutoMiny-exercises>

You should have a copy of these two packages in your repository. You will find boxes in the lab to use for the assignment.

```
cd catkin_ws_TEAMNAME/src
git clone https://github.com/AutoMiny/AutoMiny-exercises
catkin build simple_parking_maneuver
source devel/setup.bash # for bash
source devel/setup.zsh # for zsh
```

Then you need to start the service:

```
roslaunch simple_parking_maneuver simple_parking_maneuver.launch
```

You can start the parking maneuver with:

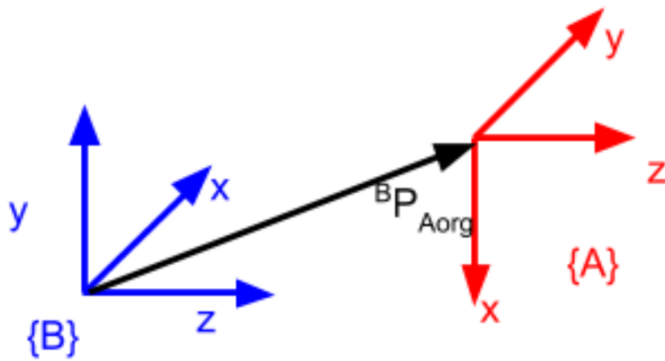
```
rosservice call /simple_parking_maneuver/backward_longitudinal "direction: 'left'"
```

The default maneuver will not park the car properly between the boxes. Your task is to tune the parameters and / or the driving sequence in the `parking_maneuver.py` file.

[https://github.com/AutoMiny/AutoMiny-exercises/blob/master/simple\\_parking\\_maneuver/src/parking\\_maneuver.py](https://github.com/AutoMiny/AutoMiny-exercises/blob/master/simple_parking_maneuver/src/parking_maneuver.py)

**Commit the source code to your `catkin_ws_TEAMNAME` git repository. Record the parking maneuver and attach the video file (OBS, Kazam etc., maximum file size is 5 MB, video formats: mp4 or ogv), put a link to your source code in your final pdf.**

### Assignment 3-2: Coordinate System Transformation (2 Points)



Please provide the homogeneous transformation matrix  ${}^B_A T$ , which maps a vector represented in coordinate frame  $\{A\}$  into the coordinate frame  $\{B\}$ . The translation vector between both coordinate frames is  ${}^B P_{Aorg} = (-1, 4, 5)$ .

What is the inverse of your transformation matrix?

### Assignment 3-3: Coordinate Frames (1 Point)

Assume, you have the following vectors for coordinate axes of frame (or coordinate system)  $\{A\}$ :

$$\{A\} : x = (-\sqrt{0.5}, \sqrt{0.5}, 0); y = (\sqrt{0.5}, \sqrt{0.5}, 0)$$

Calculate the vector for the z-axis of this frame  $\{A\}$ .