Robotik Ws 21/22
Übung 3

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

Video: S. Anhang, `https://git.imp.fu-berlin.de/thob97/thornavid/-/blob/thore/src/assignment3_parking_maneuver/video/parking_demo.mp4`

Code: `https://git.imp.fu-berlin.de/thob97/thornavid/-/blob/thore/src/assignment3_parking_maneuver/src/simple_parking_maneuver/src/parking_maneuver.py`

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

$$
{}_A^B R = \begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}
$$

$$
{}_A^B T = \begin{bmatrix} 0 & 1 & 0 & -1 \\ -1 & 0 & 0 & 4 \\ 0 & 0 & 1 & 5 \\ 0 & 0 & 0 & 1 \end{bmatrix}
$$

$$
{}_B^A R = \begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}
$$

$$
{}_A^B T^{-}1 = {}_B^A T = \begin{bmatrix} 0 & -1 & 0 & (0*(-1)+(-1)*4+0*5) \\ 1 & 0 & 0 & (-1+0+0) \\ 0 & 0 & 1 & (0+0+5) \\ 0 & 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0 & -1 & 0 & 4 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & -5 \\ 0 & 0 & 0 & 1 \end{bmatrix}
$$

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

③ $\{A\}: x = (-\sqrt{0.5}, \sqrt{0.5}, 0); y = (\sqrt{0.5}, \sqrt{0.5}, 0)$

$\vec{x} = \begin{pmatrix} -1 \\ 1 \\ 0 \end{pmatrix} \quad \vec{y} = \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix}$

$\vec{z} = \vec{x} \times \vec{y}$

$\begin{pmatrix} -1 \\ 1 \\ 0 \end{pmatrix} \times \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix} = \begin{pmatrix} (1\cdot0) - (1\cdot0) \\ (-1\cdot0) - (0\cdot1) \\ (-1\cdot1) - (1\cdot1) \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 2 \end{pmatrix} \Rightarrow \vec{z} = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$