

# ECC2025: Simulation Parameters

Ruixuan Zhao, Guitao Yang, Thomas Parisini, and Boli Chen

This is a supplementary document for the conference paper “Distributed Unknown Input Observer Design with Relaxed Conditions: Theory and Application to Vehicle Platooning” published at the European Control Conference 2025.

$$\begin{aligned}
 W_{g,1}^* &= \begin{bmatrix} \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} \\ 0 & 0 & 0 & -1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0.0350 & 0 & 0 & 0 & 0 & 0 & 0.9994 & 0 \\ 0 & -0.9994 & 0 & 0 & 0 & 0 & 0 & 0.0350 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0.0350 & 0 & 0 & 0 & -0.9994 & 0 & 0 \\ 0 & 0 & -0.9994 & 0 & 0 & 0 & -0.0350 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0.0350 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0.9994 \\ -0.9994 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0.0350 \end{bmatrix} \\
 W_{g,2}^* &= \begin{bmatrix} 0 & 0 & 0 & 0.0030 & -0.0008 & -1 & 0 & 0 & 0 \\ 0 & 0 & 0.0350 & 0 & 0 & 0 & 0.9988 & 0.0096 & 0.0333 \\ 0 & 0 & -0.9994 & 0 & 0 & 0 & 0.0350 & 0.0003 & 0.0012 \\ \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} \\ 0 & 0 & 0 & 0.0705 & 0.9975 & -0.0006 & 0 & 0 & 0 \\ 0 & -0.0350 & 0 & 0 & 0 & 0 & -0.0347 & 0.2764 & 0.9598 \\ 0.0006 & 0.9994 & 0 & 0 & 0 & 0 & -0.0012 & 0.0097 & 0.0336 \\ 0 & 0 & 0 & 0.9975 & -0.0705 & 0.0030 & 0 & 0 & 0 \\ -0.0350 & 0 & 0 & 0 & 0 & 0 & 0 & -0.9604 & 0.2766 \\ 0.9994 & -0.0006 & 0 & 0 & 0 & 0 & 0 & -0.0337 & 0.0097 \end{bmatrix} \\
 W_{g,3}^* &= \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0.0350 & 0 & 0 & 0 & 0 & 0.9994 & 0 & 0 \\ 0 & -0.9994 & 0 & 0 & 0 & 0 & 0.0350 & 0 & 0 \\ 0 & 0 & 0 & 0 & -1 & 0 & 0 & 0 & 0 \\ 0.0350 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -0.9994 \\ -0.9994 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -0.0350 \\ \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0.0350 & 0 & 0 & 0 & 0 & 0.9994 & 0 \\ 0 & 0 & -0.9994 & 0 & 0 & 0 & 0 & 0.0350 & 0 \end{bmatrix}
 \end{aligned}$$

$$W_{g,4}^* = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0.0350 & 0 & 0 & 0 & 0 & 0.9994 & 0 & 0 \\ 0 & -0.9994 & 0 & 0 & 0 & 0 & 0.0350 & 0 & 0 \\ 0 & 0 & 0 & 0 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -0.9994 \\ 0.0350 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -0.0350 \\ -0.9994 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0.0350 & 0 & 0 & 0 & 0 & 0.9994 & 0 \\ 0 & 0 & -0.9994 & 0 & 0 & 0 & 0 & 0.0350 & 0 \\ \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} & \mathbf{0}_{3 \times 1} \end{bmatrix}$$

$$L_1^\top = \begin{bmatrix} -5.9998 & 0.2479 & -1.9959 & \mathbf{0}_{1 \times 9} \\ -0.9964 & 2.2855 & -67.6522 & \mathbf{0}_{1 \times 9} \end{bmatrix},$$

$$L_2^\top = \begin{bmatrix} \mathbf{0}_{1 \times 3} & -5.9987 & -0.6217 & 5.0035 & \mathbf{0}_{1 \times 6} \\ \mathbf{0}_{1 \times 3} & -1.0089 & 2.2844 & -67.6476 & \mathbf{0}_{1 \times 6} \end{bmatrix},$$

$$L_3^\top = \begin{bmatrix} \mathbf{0}_{1 \times 6} & -5.9992 & 0.4895 & -3.9398 & \mathbf{0}_{1 \times 3} \\ \mathbf{0}_{1 \times 6} & -0.9930 & 2.2849 & -67.6497 & \mathbf{0}_{1 \times 3} \end{bmatrix},$$

$$L_4^\top = \begin{bmatrix} \mathbf{0}_{1 \times 9} & -5.9980 & -0.7597 & 6.1126 \\ \mathbf{0}_{1 \times 9} & -1.0108 & 2.2837 & -67.6448 \end{bmatrix}.$$