

## Supplementary document of the paper

# “State Estimation Using a Network of Distributed Observers With Unknown Inputs”

by G. Yang, A. Barboni, H. Rezaee, and T. Parisini

In this document, the parameters of the proposed observers designed in the simulation part (Section 5) are provided. We keep 4 significant digits for noninteger elements in all matrices. The following parameters are used for all four scenarios.

$$F = \begin{bmatrix} 2.404 & 0.1865 & 2.105 & -0.1596 & 0.8768 & 1.092 & -0.2621 & -0.05384 & -0.1079 \\ -0.3782 & 1.437 & -0.08662 & 2.520 & -3.237 & 1.640 & -1.382 & 3.576 & -0.1159 \\ 0.3261 & -0.04889 & 3.520 & 0.04430 & 1.873 & -2.950 & 0.4366 & -0.4201 & 1.394 \end{bmatrix},$$

$$P_1 = P_2 = P_3 = P_4 = 0.1000 \times I_9,$$

$$N_1 = \begin{bmatrix} -0.3000 & 0.2500 & 0 & 0.05000 & 0 & 0 & 0 & 0 & 0 \\ 0.2500 & -0.6500 & 0.2500 & 0 & 0.1000 & 0 & 0 & 0 & 0 \\ 0 & 0.2500 & -0.6500 & 0 & 0 & -0.2667 & 0 & 0 & 0 \\ 0.05000 & 0 & 0 & -0.6000 & -0.1000 & 0 & 0.4000 & 0 & 0 \\ 0 & 0 & 0 & 0 & -824.2 & -0.03333 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -0.03333 & -824.2 & 0 & 0 & -0.02857 \\ 0 & 0 & 0 & 0.4000 & 0 & 0 & -0.5000 & 0.1000 & 0 \\ 0 & 0 & 0 & 0 & -0.2333 & 0 & 0.1000 & -0.6000 & 0 \\ 0 & 0 & 0 & 0 & 0 & -0.02857 & 0 & 0 & -618.3 \end{bmatrix},$$

$$N_2 = \begin{bmatrix} -0.3000 & -0.1667 & 0 & 0.05000 & 0 & 0 & 0 & 0 & 0 \\ 0 & -824.2 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -0.1667 & -0.6500 & 0 & 0 & -0.2667 & 0 & 0 & 0 \\ 0.05000 & 0 & 0 & -0.6000 & 0.1500 & 0 & 0.4000 & 0 & 0 \\ 0 & 0.1000 & 0 & 0.1500 & -0.7500 & 0.06667 & 0 & 0.3500 & 0 \\ 0 & 0 & 0 & 0 & 0 & -824.2 & 0 & 0 & -0.02857 \\ 0 & 0 & 0 & 0.4000 & 0 & 0 & -0.5000 & 0.1000 & 0 \\ 0 & 0 & 0 & 0 & 0.3500 & 0 & 0.1000 & -0.6000 & 0 \\ 0 & 0 & 0 & 0 & 0 & -0.02857 & 0 & 0 & -618.3 \end{bmatrix},$$

$$N_3 = \begin{bmatrix} -0.3000 & -0.1667 & 0 & 0.05000 & 0 & 0 & 0 & 0 & 0 \\ 0 & -824.2 & 0 & 0 & -0.05000 & 0 & 0 & 0 & 0 \\ 0 & -0.1667 & -0.6500 & 0 & 0 & 0.4000 & 0 & 0 & 0 \\ 0.05000 & 0 & 0 & -0.6000 & -0.1000 & 0 & 0.4000 & 0 & 0 \\ 0 & -0.05000 & 0 & 0 & -824.2 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0.4000 & 0 & 0.06667 & -0.7000 & 0 & 0 & 0.1714 \\ 0 & 0 & 0 & 0.4000 & 0 & 0 & -0.5000 & 0.1000 & 0 \\ 0 & 0 & 0 & 0 & -0.2333 & 0 & 0.1000 & -0.6000 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -618.3 \end{bmatrix},$$

$$N_4 = \begin{bmatrix} -0.3000 & -0.1667 & 0 & 0.05000 & 0 & 0 & 0 & 0 & 0 \\ 0 & -824.2 & 0 & 0 & -0.05000 & 0 & 0 & 0 & 0 \\ 0 & -0.1667 & -0.6500 & 0 & 0 & -0.2667 & 0 & 0 & 0 \\ 0.05000 & 0 & 0 & -0.6000 & -0.1000 & 0 & 0.4000 & 0 & 0 \\ 0 & -0.05000 & 0 & 0 & -824.2 & -0.03333 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -0.03333 & -824.2 & 0 & 0 & -0.02857 \\ 0 & 0 & 0 & 0.4000 & 0 & 0 & -0.5000 & 0.1000 & 0 \\ 0 & 0 & 0 & 0 & -0.2333 & 0 & 0.1000 & -0.6000 & 0 \\ 0 & 0 & 0 & 0 & 0 & -0.02857 & 0 & 0 & -618.3 \end{bmatrix}.$$

[illegible]

$$L_1 = \begin{bmatrix} 0 & 0 & 0 \\ 0.1500 & 0 & 0 \\ 0 & 0.4000 & 0 \\ 0.1500 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0.3500 & 0 & 0.1500 \\ 0 & 0 & 0 \end{bmatrix}, L_2 = \begin{bmatrix} 0.2500 & 0 & 0 \\ 0 & 0 & 0 \\ 0.2500 & 0.4000 & 0 \\ 0 & 0 & 0 \\ 0.1500 & 0.1000 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0.1500 \\ 0 & 0 & 0 \end{bmatrix},$$

$$L_3 = \begin{bmatrix} 0.2500 & 0 & 0 \\ 0 & 0 & 0 \\ 0.2500 & 0 & 0 \\ 0 & 0.1500 & 0 \\ 0 & 0 & 0 \\ 0 & 0.1000 & 0.2000 \\ 0 & 0 & 0 \\ 0 & 0.3500 & 0.1500 \\ 0 & 0 & 0 \end{bmatrix}, L_4 = \begin{bmatrix} 0.2500 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0.2500 & 0 & 0.4000 & 0 \\ 0 & 0.1500 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0.3500 & 0 & 0.1500 \\ 0 & 0 & 0 & 0 \end{bmatrix}.$$

$$H_1 = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}, H_2 = \begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}, H_3 = \begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}, H_4 = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}.$$