Model Documentation of the 'L-1011 aircraft in cruise flight conditions'

1 Nomenclature

1.1 Nomenclature for Model Equations

x state vector
u control input vector
w noise vector
z regulated output vector
y measurement vector

2 Model Equations

State Vector and Input Vector:

$$x \in \mathbb{R}^5 u \qquad \in \mathbb{R}^2 w \in \mathbb{R}^5 z \qquad \in \mathbb{R}^5 y \in \mathbb{R}^4$$

System Equations:

$$\dot{x}(t) = Ax(t) + B_1 w(t) + Bu(t) \tag{1a}$$
$$z(t) = C_1 x(t) + D_{11} w(t) + D12u(t) \tag{1b}$$
$$y(t) = Cx(t) + D21w(t) \tag{1c}$$

Outputs: z

2.1 Exemplary parameter values

Symbol	Value
A	$\begin{bmatrix} 0 & 0 & 1.0 & 0 & 0 \\ 0 & -0.154 & -0.0042 & 1.54 & 0 \\ 0 & 0.249 & -1.0 & -5.2 & 0 \\ 0.0386 & -0.996 & -0.0003 & -0.117 & 0 \\ 0 & 0.5 & 0 & 0 & -0.5 \end{bmatrix}$
B	$\begin{bmatrix} 0 & 0 \\ -0.744 & -0.032 \\ 0.337 & -1.12 \\ 0.02 & 0 \\ 0 & 0 \end{bmatrix}$
B_1	$\begin{bmatrix} 0 & 0 \\ -0.744 & -0.032 \\ 0.337 & -1.12 \\ 0.02 & 0 \\ 0 & 0 \end{bmatrix}$
C_1	$\begin{bmatrix} 1.0 & 0 & 0 & 0 & 0 \\ 0 & 1.0 & 0 & 0 & 0 \\ 0 & 0 & 1.0 & 0 & 0 \\ 0 & 0 & 0 & 1.0 & 0 \\ 0 & 0 & 0 & 0 & 1.0 \end{bmatrix}$
C	$\begin{bmatrix} 0 & 1.0 & 0 & 0 & -1.0 \\ 0 & 0 & 1.0 & 0 & 0 \\ 0 & 0 & 0 & 1.0 & 0 \\ 1.0 & 0 & 0 & 0 & 0 \end{bmatrix}$
D_{11}	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
D_{12}	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 1.0 & 0 \\ 0 & 1.0 \end{bmatrix}$
D_{21}	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

3 Derivation and Explanation

This model is part of the "'COMPleib"' - library and wasautomatically imported into ACKREP.

The original description was:

AC3 L-1011 aircraft in cruise flight conditions C. Edwards and S. K. Spurgeon, "On the development of discontinuous observers", IJOC, Vol. 59, Nr. 5, pp. 1211-1229, 1994
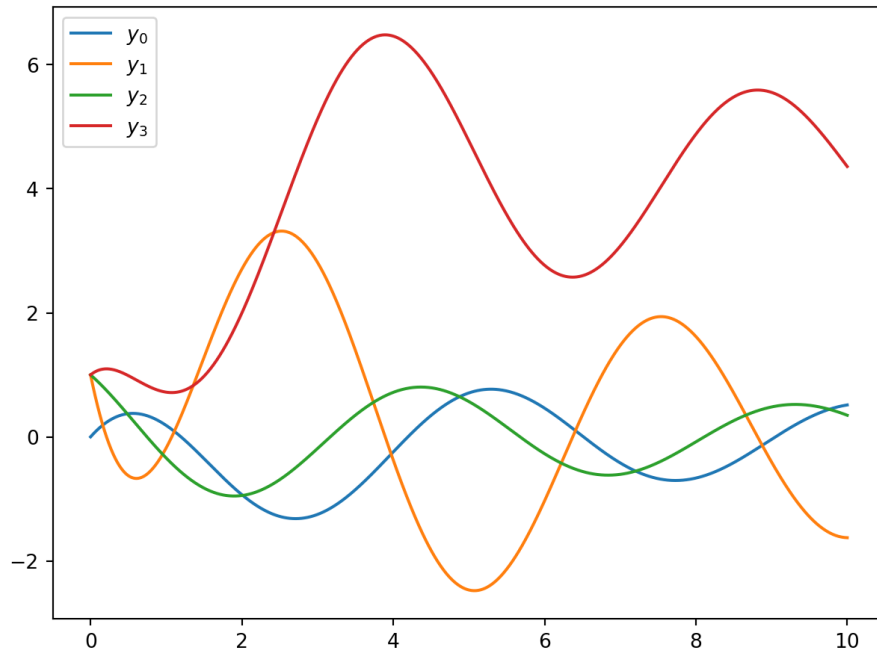
4 Simulation

Figure 1: Simulation of the L-1011 aircraft in cruise flight conditions.

References

[1] . Edwards and S. K. Spurgeon, "On the development of discontinuous observers", IJOC, Vol. 59, Nr. 5, pp. 1211-1229, 1994