

Model Documentation of the 'Boeing B-747 aircraft'

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:

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

System Equations:

$$\dot{x}(t) = Ax(t) + B_1w(t) + Bu(t) \tag{1a}$$

$$z(t) = C_1x(t) + D_{11}w(t) + D_{12}u(t) \tag{1b}$$

$$y(t) = Cx(t) + D_{21}w(t) \tag{1c}$$

Outputs: z

2.1 Exemplary parameter values

Symbol	Value
A	$\begin{bmatrix} 0.9801 & 0.0003 & -0.098 & 0.0038 \\ -0.3868 & 0.9071 & 0.0471 & -0.0008 \\ 0.1591 & -0.0015 & 0.9691 & 0.0003 \\ -0.0198 & 0.0958 & 0.0021 & 1.0 \end{bmatrix}$
B	$\begin{bmatrix} -0.0001 & 0.0058 \\ 0.0296 & 0.0153 \\ 0.0012 & -0.0908 \\ 0.0015 & 0.0008 \end{bmatrix}$
B_1	$\begin{bmatrix} -0.0001 & 0.0058 \\ 0.0296 & 0.0153 \\ 0.0012 & -0.0908 \\ 0.0015 & 0.0008 \end{bmatrix}$
C_1	$\begin{bmatrix} 1.0 & 0 & 0 & 0 \\ 0 & 1.0 & 0 & 0 \\ 0 & 0 & 1.0 & 0 \\ 0 & 0 & 0 & 1.0 \end{bmatrix}$
C	$\begin{bmatrix} 1.0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1.0 \end{bmatrix}$
D_{11}	$\begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$
D_{12}	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 1.0 & 0 \\ 0 & 1.0 \end{bmatrix}$
D_{21}	$\begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

3 Derivation and Explanation

This model is part of the "COMpleib" - library and was automatically imported into ACKREP.

The original description was:

AC5 Boeing B-747 aircraft T. Ishihara, H.-J. Guo and H. Takeda, "A Design of Discrete-Time Integral Controllers with Computation Delays via Loop Transfer Recovery", AUTO, Vol. 28, Nr. 3, pp. 599-603, 1992

4 Simulation

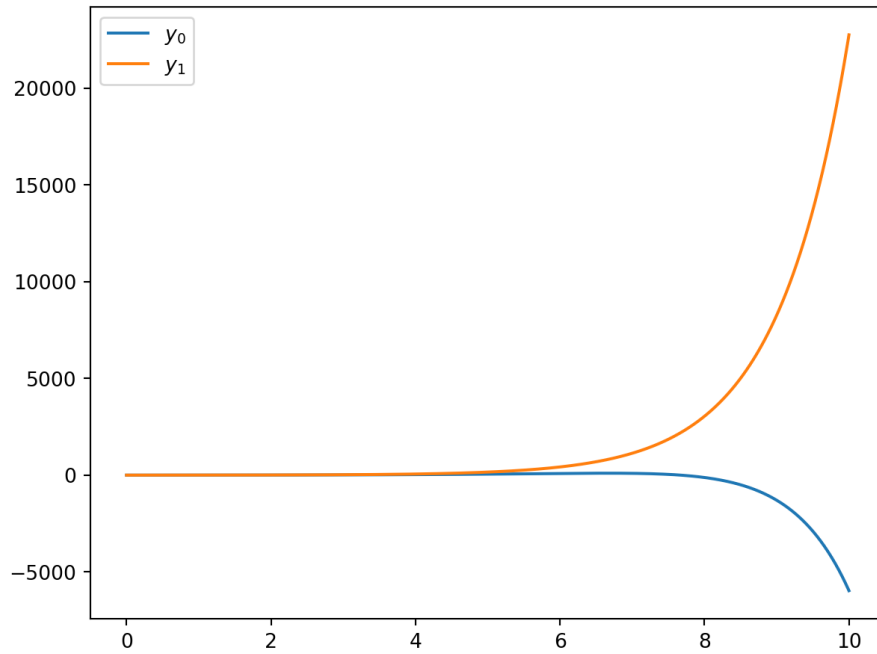


Figure 1: Simulation of the Boeing B-747 aircraft.

References

- [1] . Ishihara, H.-J. Guo and H. Takeda, "A Design of Discrete-Time Integral Controllers with Computation Delays via Loop Transfer Recovery", *AUTO*, Vol. 28, Nr. 3, pp. 599-603, 1992