

Model Documentation of the 'Application for an large space structure'

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:

$$x \in \mathbb{R}^8 \quad u \in \mathbb{R}^4 \quad w \in \mathbb{R}^8 \quad z \in \mathbb{R}^4 \quad y \in \mathbb{R}^4$$

System Equations:

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

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

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

Outputs: z

2.1 Exemplary parameter values

Symbol	Value
A	$\begin{bmatrix} 0 & 1.0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -0.42 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1.0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -0.1849 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1.0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -4.41 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1.0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -4.84 & 0 & 0 \end{bmatrix}$
B	$\begin{bmatrix} 0 & 0 & 0 & 0 \\ -0.92 & -1.4 & 0.92 & -1.4 \\ 0 & 0 & 0 & 0 \\ 0.65 & 1.6 & 0.65 & -1.6 \\ 0 & 0 & 0 & 0 \\ 1.4 & -1.0 & 1.4 & 1.0 \\ 0 & 0 & 0 & 0 \\ 2.0 & -0.8 & -2.0 & -0.8 \end{bmatrix}$
B_1	$\begin{bmatrix} 0 & 0 & 0 & 0 \\ -0.92 & -1.4 & 0.92 & -1.4 \\ 0 & 0 & 0 & 0 \\ 0.65 & 1.6 & 0.65 & -1.6 \\ 0 & 0 & 0 & 0 \\ 1.4 & -1.0 & 1.4 & 1.0 \\ 0 & 0 & 0 & 0 \\ 2.0 & -0.8 & -2.0 & -0.8 \end{bmatrix}$
C_1	$\begin{bmatrix} 0.065 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0.065 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
C	$\begin{bmatrix} 0 & -1.8 & 0 & 1.3 & 0 & 2.9 & 0 & 4.1 \\ 0 & -2.7 & 0 & 3.2 & 0 & -2.1 & 0 & -1.6 \\ 0 & 1.8 & 0 & 1.3 & 0 & 2.9 & 0 & -4.1 \\ 0 & -2.7 & 0 & -3.2 & 0 & 2.1 & 0 & -1.6 \end{bmatrix}$
D_{11}	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
D_{12}	$\begin{bmatrix} 1.0 & 0 & 0 & 0 \\ 0 & 1.0 & 0 & 0 \\ 0 & 0 & 1.0 & 0 \\ 0 & 0 & 0 & 1.0 \end{bmatrix}$
D_{21}	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

3 Derivation and Explanation

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

The original description was:

NN16 Application for an large space structure A. J. Calise and D. D. Moerder, "Optimal Output Feedback Design of Systems with Ill-conditioned Dynamics", AUTO, Vol. 21, Nr. 3, pp. 271-276, 1985

4 Simulation

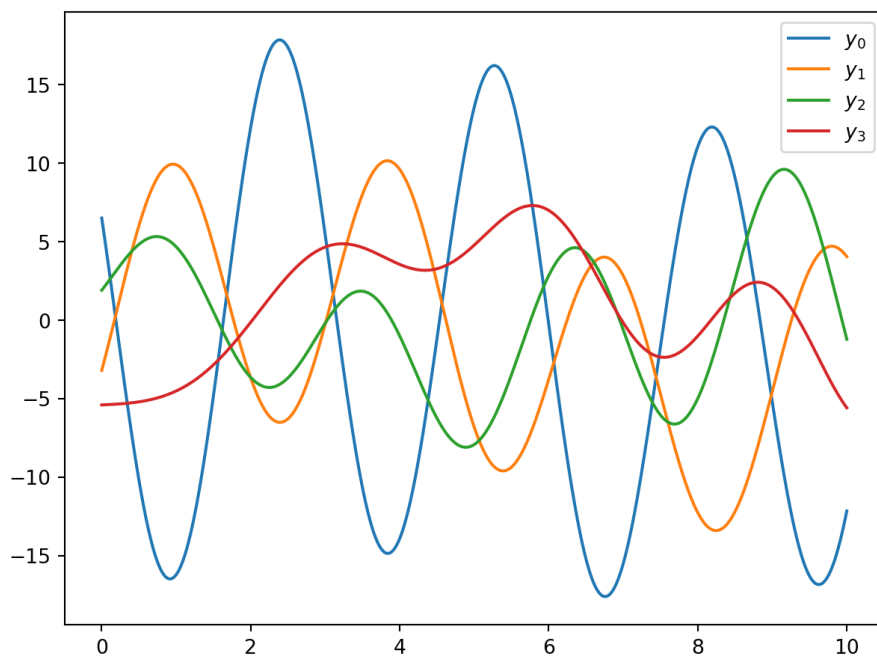


Figure 1: Simulation of the Application for an large space structure.

References

- [1] . J. Calise and D. D. Moerder, "Optimal Output Feedback Design of Systems with Ill-conditioned Dynamics", AUTO, Vol. 21, Nr. 3, pp. 271-276, 1985