Model Documentation of the 'Flexible actuator'

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:

$$x \in \mathbb{R}^5 u \qquad \in \mathbb{R}^2 w \in \mathbb{R}^1 z \qquad \in \mathbb{R}^3 y \in \mathbb{R}^3$$

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	$\begin{bmatrix} 0 & 1.0 & 0 & 0 & 0 \\ -1.0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1.02 & 0 \\ 0.2 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
B	$\begin{bmatrix} 0 & 0 \\ 0 & -0.2 \\ 0 & 0 \\ 0 & 1.0 \\ 1.0 & 0 \end{bmatrix}$
B_1	$\begin{bmatrix} 0 & 0 \\ 0 & -0.2 \\ 0 & 0 \\ 0 & 1.0 \\ 1.0 & 0 \end{bmatrix}$
C_1	$\begin{bmatrix} 0.1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0.1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
C	$\begin{bmatrix} 0 & 0 & 0 & 0 & 1.0 \\ 1.0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1.0 & 0 & 0 \end{bmatrix}$
D_{11}	$\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$
D_{12}	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0.2 \end{bmatrix}$
D_{21}	$\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$

3 Derivation and Explanation

This model is part of the "'COMPleib"' - library and wasautomatically imported into ACKREP.
The original description was:
ROC7 Flexible actuator B. Fares, P. Apkarian and D. Noll, "An Augmented Lagrangian Method for a Class of LMI-Constrained Problems in Robust Control Theory", IJOC, Vol. 74, Nr. 4, pp. 348-360 nc=1

4 Simulation

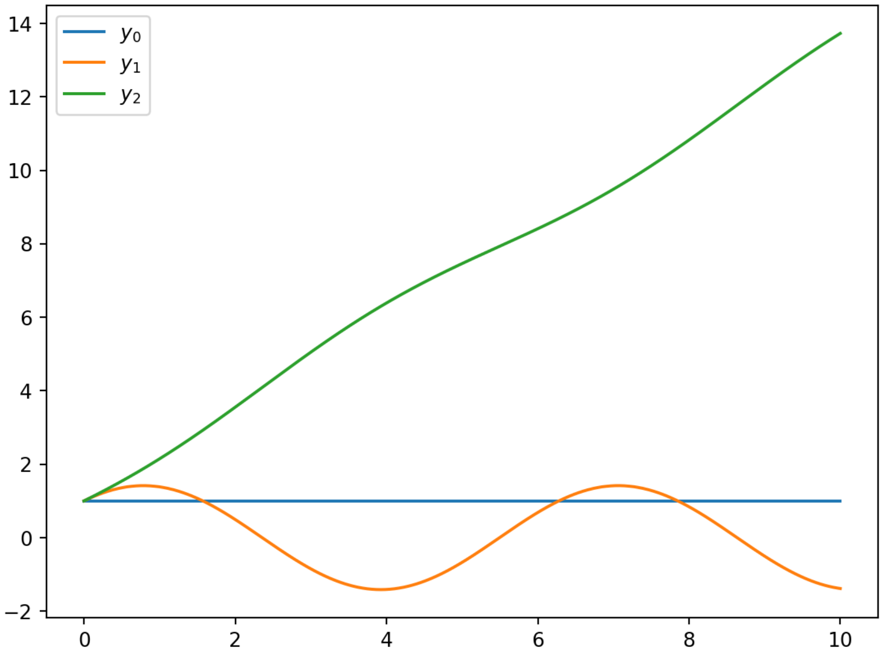

Figure 1: Simulation of the Flexible actuator.

References

[1] . Fares, P. Apkarian and D. Noll, ”An Augmented Lagrangian Method for a Class of LMI-Constrained Problems in Robust Control Theory”, IJOC, Vol. 74, Nr. 4, pp. 348-360 nc=1