Model Documentation of the 'Flexible satellite Buschek, Calise'

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:

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

System Equations:

$$\dot{x}(t) = Ax(t) + B_1 w(t) + Bu(t) \tag{1a}$$

$$z(t) = C_1 x(t) + D_{11} w(t) + D12 u(t) \tag{1b}$$

$$y(t) = Cx(t) + D21 w(t) \tag{1c}$$

Outputs: z

2.1 Exemplary parameter values

Symbol	Value
A	$\begin{bmatrix} 0 & 0 & 1.0 & 0 & 0 \\ 0 & 0 & 0 & 1.0 & 0 \\ 0 & 0.00153449139 & 0 & 3.55730354 \cdot 10^{-5} & 0 \\ 0 & -0.479403314 & 0 & -0.0111136701 & 0 \\ 1.0 & 0 & 0 & 0 & 0 \end{bmatrix}$
B	$\begin{bmatrix} 0 \\ 0 \\ 6.26668898 \cdot 10^{-5} \\ -0.0155476553 \\ 0 \end{bmatrix}$
B_1	$\begin{bmatrix} 0 \\ 0 \\ 6.26668898 \cdot 10^{-5} \\ -0.0155476553 \\ 0 \end{bmatrix}$
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	$\begin{bmatrix} 1.0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1.0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1.0 \end{bmatrix}$
D_{11}	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
D_{12}	$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 1.0 \end{bmatrix}$
D_{21}	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

3   Derivation and Explanation

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

The original description was:

FS Flexible satellite Buschek, Calise "mu-controllers mixed and fixed" Proc. AIAA Guidance, Nav. and Control Conf. Baltimore, 1995
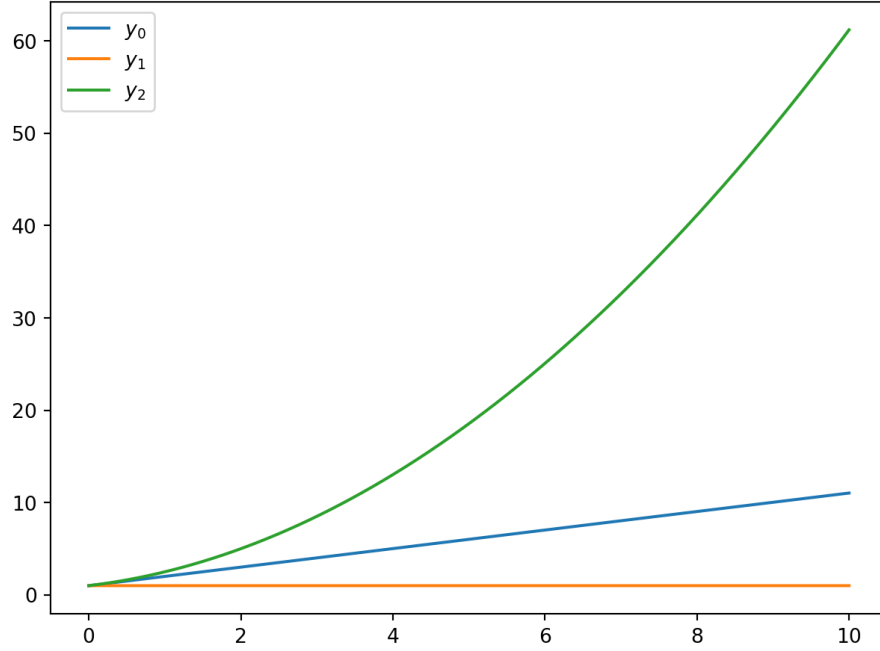
4 Simulation

Figure 1: Simulation of the Flexible satellite Buschek, Calise.

References

[1] mu-controllers mixed and fixed" Proc. AIAA Guidance, Nav. and Control Conf. Baltimore, 1995