Model Documentation of the 'Space backpack model'

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:

$$x \in \mathbb{R}^3 u \qquad \in \mathbb{R}^2 w \in \mathbb{R}^1 z \qquad \in \mathbb{R}^4 y \in \mathbb{R}^2$$

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	$\begin{bmatrix} 0 & 1.0 & 0 \\ -79.285 & -0.113 & 0 \\ 28.564 & 0.041 & 0 \end{bmatrix}$
B	$\begin{bmatrix} 0 & 0 \\ 0.041 & -0.0047 \\ -0.03 & -0.0016 \end{bmatrix}$
B_1	$\begin{bmatrix} 0 & 0 \\ 0.041 & -0.0047 \\ -0.03 & -0.0016 \end{bmatrix}$
C_1	$\begin{bmatrix} 0 & 0 & 1.0 \\ 1.0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$
C	$\begin{bmatrix} 0 & 0 & 1.0 \\ 1.0 & 0 & 0 \end{bmatrix}$
D_{11}	$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$
D_{12}	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0.1 & 0 \\ 0 & 0.1 \end{bmatrix}$
D_{21}	$\begin{bmatrix} 0 \\ 0 \end{bmatrix}$

3 Derivation and Explanation

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

The original description was:

NN15 Space backpack model P. L. D. Peres and J. C. Geromel, "An Alternate Numerical Solution to the Linear Quadratic Problem", TOAC, Vol. 39, Nr. 1, pp. 198-202, 1994
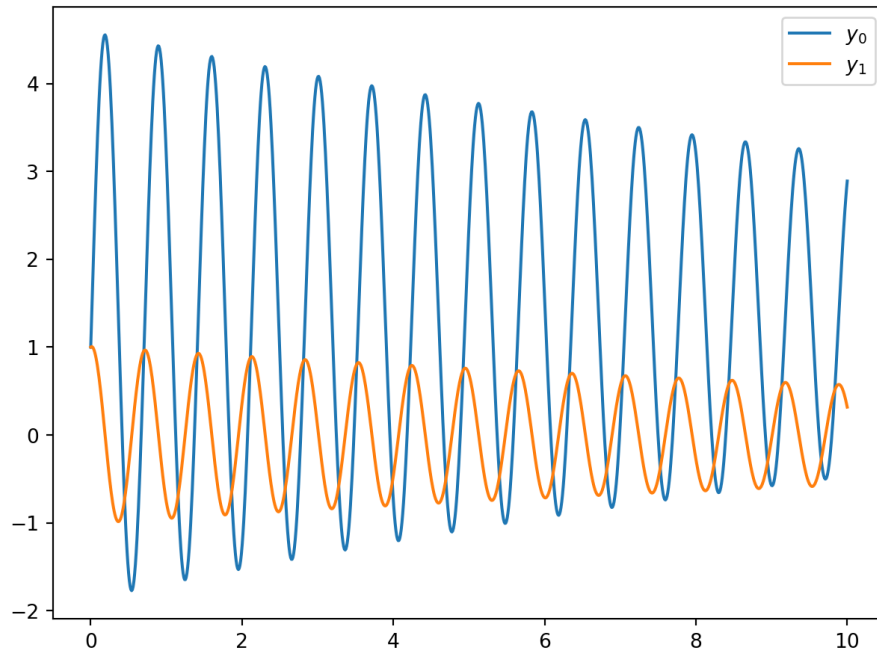
4 Simulation

Figure 1: Simulation of the Space backpack model.

References

[1] . L. D. Peres and J. C. Geromel, "An Alternate Numerical Solution to the Linear Quadratic Problem", TOAC, Vol. 39, Nr. 1, pp. 198-202, 1994