a Dummy PHSCore

The PyPHS* development team[1]

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1 System dimensions

$\dim(\mathbf{x}) = n_{\mathbf{x}} = 2$;
$\dim(\mathbf{w}) = n_{\mathbf{w}} = 0$;
$\dim(\mathbf{y}) = n_{\mathbf{y}} = 1$;
$\dim(\mathbf{p}) = n_{\mathbf{p}} = 0$;

2 System variables

State variable $\mathbf{x} = \begin{pmatrix} x_{\mathrm{L}} \\ x_{\mathrm{C}} \end{pmatrix}$;
Input $\mathbf{u} = \begin{pmatrix} u_{\mathrm{out}} \end{pmatrix}$;
Output $\mathbf{y} = \begin{pmatrix} y_{\mathrm{out}} \end{pmatrix}$;

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*https://afalaize.github.io/pyphs/

†https://www.ircam.fr/recherche/equipes-recherche/systemes-et-signaux-sonores-audioacoustique-instruments-s

3 Constitutive relations

Hamiltonian $\mathtt{H}(\mathbf{x}) = \frac{x_{\mathrm{L}}^2}{2\cdot L} + \frac{x_{\mathrm{C}}^2}{C} \cdot \left(\frac{Cnl}{4} \cdot x_{\mathrm{C}}^2 + 0.5\right)$;

Hamiltonian gradient $\nabla\mathtt{H}(\mathbf{x}) = \begin{pmatrix} \frac{x_{\mathrm{L}}}{L} \\ \frac{Cnl \cdot x_{\mathrm{C}}^3}{2\cdot C} + \frac{2}{C} \cdot x_{\mathrm{C}} \cdot \left(\frac{Cnl}{4} \cdot x_{\mathrm{C}}^2 + 0.5\right) \end{pmatrix}$;

4 System parameters

4.1 Constant

parameter	value (SI)
Cnl :	100000000.0
Rnl :	100.0
C :	5.06605918212e-06
L :	0.5

5 System structure

$$\mathbf{M} = \begin{pmatrix} -1.0 \cdot Rnl \cdot \left(x_{\mathrm{L}}^2 + 1\right) & -1.0 & -1.0 \\ 1.0 & gxC & 0 \\ 1.0 & 0 & 0 \end{pmatrix};$$

$$\mathbf{M_{xx}} = \begin{pmatrix} -1.0 \cdot Rnl \cdot \left(x_{\mathrm{L}}^2 + 1\right) & -1.0 \\ 1.0 & gxC \end{pmatrix};$$

$$\mathbf{M_{xy}} = \begin{pmatrix} -1.0 \\ 0 \end{pmatrix};$$

$$\mathbf{M_{yx}} = \begin{pmatrix} 1.0 & 0 \end{pmatrix};$$

$$\mathbf{M_{yy}} = \begin{pmatrix} 0 \end{pmatrix};$$

$$\mathbf{J} = \begin{pmatrix} 0 & -1.0 & -1.0 \\ 1.0 & 0 & 0 \\ 1.0 & 0 & 0 \end{pmatrix};$$

$$\mathbf{J_{xx}} = \begin{pmatrix} 0 & -1.0 \\ 1.0 & 0 \end{pmatrix};$$

$$\mathbf{J_{xy}} = \begin{pmatrix} -1.0 \\ 0 \end{pmatrix};$$

$$\mathbf{J_{yy}} = \begin{pmatrix} 0 \end{pmatrix};$$

$$\mathbf{R} = \begin{pmatrix} 1.0 \cdot Rnl \cdot \left(x_{\mathrm{L}}^{2} + 1\right) & 0 & 0 \\ 0 & -1.0 \cdot gxC & 0 \\ 0 & 0 & 0 \end{pmatrix};$$

$$\mathbf{R_{xx}} = \begin{pmatrix} 1.0 \cdot Rnl \cdot \left(x_{\mathrm{L}}^{2} + 1\right) & 0 \\ 0 & -1.0 \cdot gxC \end{pmatrix};$$

$$\mathbf{R_{xy}} = \begin{pmatrix} 0 \\ 0 \end{pmatrix};$$

$$\mathbf{R_{yy}} = \begin{pmatrix} 0 \end{pmatrix};$$