Model Documentation of the 'Perturbetd linear cable mass problem of order 20'

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:

$$x \in \mathbb{R}^2 0u \qquad \in \mathbb{R}^1 w \in \mathbb{R}^1 z \qquad \in \mathbb{R}^3 y \in \mathbb{R}^2$$

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	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \\ 0 & 0 & 0 & 0 & 0 & \\ 0 & 0 & 0 & 0 & 0 & \\ 0 & 0 & 0 & 0 & 0 & \\ 0 & 0 & 0 & 0 & 0 & \\ 0 & 0 & 0 & 0 & 0 & \\ 0 & 0 & 0 & 0 & 0 & \\ 0 & 0 & 0 & 0 & 0 & \\ 0 & 0 & 0 & 0 & 0 & \\ 0 & 0 & 0 & 0 & 0 & \\ -91.1542732 & 64.6170927 & -17.3140977 & 4.63929794 & -1.2430941 & 0.33 \\ 64.6170927 & -108.468371 & 69.2563907 & -18.5571918 & 4.97237639 & -1.3 \\ -17.3140977 & 69.2563907 & -109.711465 & 69.5894691 & -18.6464115 & 4.9 \\ 4.63929794 & -18.5571918 & 69.5894691 & -109.800685 & 69.6132695 & -18 \\ -1.2430941 & 4.97237639 & -18.6464115 & 69.6132695 & -109.806667 & 69. \\ 0.333078454 & -1.33231381 & 4.9961768 & -18.6523934 & 69.6133968 & -10 \\ -0.0892197157 & 0.356878863 & -1.33829574 & 4.99630408 & -18.6469206 & 69. \\ 0.0238004092 & -0.0952016367 & 0.357006138 & -1.33282291 & 4.97428552 & -18 \\ -0.00598192102 & 0.0239276841 & -0.0897288153 & 0.334987577 & -1.25022149 & 4.6 \\ 0.000127274915 & -0.000509099661 & 0.00190912373 & -0.00712739526 & 0.0266004573 & -0.0 \end{bmatrix}$
B	$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ -6.36374577 \cdot 10^{-6} \\ 2.54549831 \cdot 10^{-5} \\ -9.54561865 \cdot 10^{-5} \\ 0.000356369763 \\ -0.00133002287 \\ 0.0049637217 \\ -0.0185248639 \\ 0.069135734 \\ -0.258018072 \\ 0.962936555 \end{bmatrix}$
B_1	$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ -6.36374577 \cdot 10^{-6} \\ 2.54549831 \cdot 10^{-5} \\ -9.54561865 \cdot 10^{-5} \\ 0.000356369763 \\ -0.00133002287 \\ 0.0049637217 \\ -0.0185248639 \end{bmatrix}$

3 Derivation and Explanation

This model is part of the "'COMPleib"' - library and wasautomatically imported into ACKREP.
The original description was:
CM1_IS Perturbetd linear cable mass problem of order 20 J. A. Burns and B.B. King, "A reduced bases approach to the design of low order feedback controllers for nonlinear continuous systems", ICAM Virginia Polytechnic Institute and State University, Blacksburg Note CM1_IS instable version of CM1, i.e. A of CM1 is redefined by A=A+dA, where dA=[0 — 0 0 — ds*eye0.5*nx] such that the system matrix A=A+dA is not Hurwitz! Max. real part of eigA > 0, sd=9.5825e-003

4 Simulation

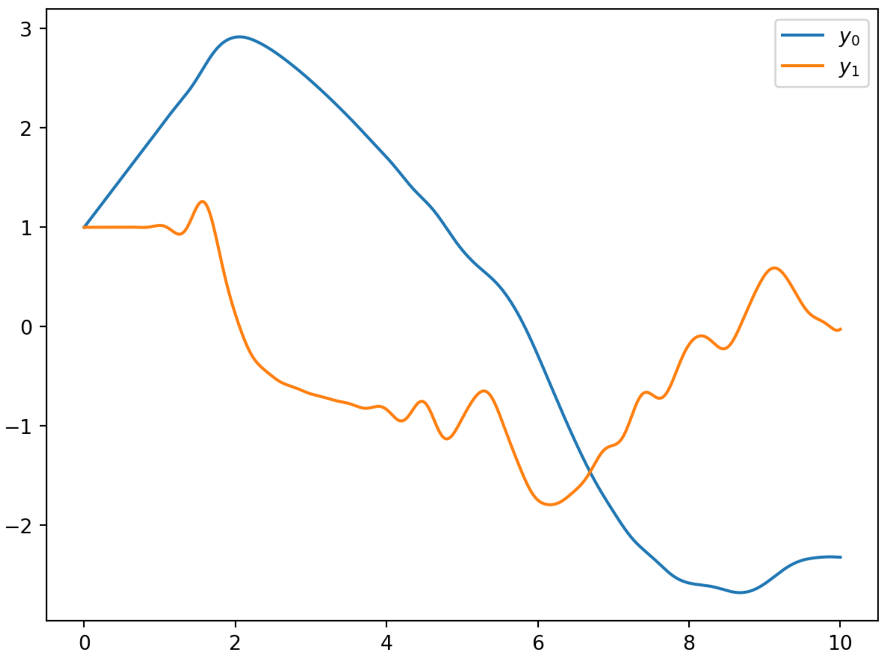

Figure 1: Simulation of the Perturbetd linear cable mass problem of order 20.

References

[1] . A. Burns and B.B. King, "A reduced bases approach to the design of low order feedback controllers for nonlinear continuous systems", ICAM Virginia Polytechnic Institute and State University, Blacksburg