

Model Documentation of the '2-degree-of-freedom 2DOF tuned-mass damper TMD'

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:

$$x \in \mathbb{R}^6 \quad u \in \mathbb{R}^2 \quad w \in \mathbb{R}^1 \quad z \in \mathbb{R}^3 \quad y \in \mathbb{R}^4$$

System Equations:

$$\dot{x}(t) = Ax(t) + B_1w(t) + Bu(t) \tag{1a}$$

$$z(t) = C_1x(t) + D_{11}w(t) + D_{12}u(t) \tag{1b}$$

$$y(t) = Cx(t) + D_{21}w(t) \tag{1c}$$

Outputs: z

2.1 Exemplary parameter values

Symbol	Value
A	$\begin{bmatrix} 0 & 0 & 0 & 1.0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1.0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1.0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -0.6 & 0 & 0 & -0.01 \end{bmatrix}$
B	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ -1.625 & 0.625 \\ 0.625 & -1.625 \\ 0.2 & 0.2 \end{bmatrix}$
B_1	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ -1.625 & 0.625 \\ 0.625 & -1.625 \\ 0.2 & 0.2 \end{bmatrix}$
C_1	$\begin{bmatrix} 0 & 0 & 1.0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
C	$\begin{bmatrix} 1.0 & 0 & -1.0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1.0 & 0 & -1.0 \\ 0 & 1.0 & -1.0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1.0 & -1.0 \end{bmatrix}$
D_{11}	$\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$
D_{12}	$\begin{bmatrix} 0 & 0 \\ 1.0 & 0 \\ 0 & 1.0 \end{bmatrix}$
D_{21}	$\begin{bmatrix} 0 \\ -0.01 \\ 0 \\ -0.01 \end{bmatrix}$

3 Derivation and Explanation

This model is part of the "COMpleib" - library and was automatically imported into ACKREP.

The original description was:

TMD 2-degree-of-freedom 2DOF tuned-mass damper TMD L. Zuo and S. A. Nayfeh, "The Multi-Degree-of-Freedom Tuned- Mass-Damper for Suppression of Single-Mode Vibration Under Random and Harmonic Excitation", Dept. of Mech. Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139, Draft for 2003 ASME Design Engineering Technical Conferences",

4 Simulation

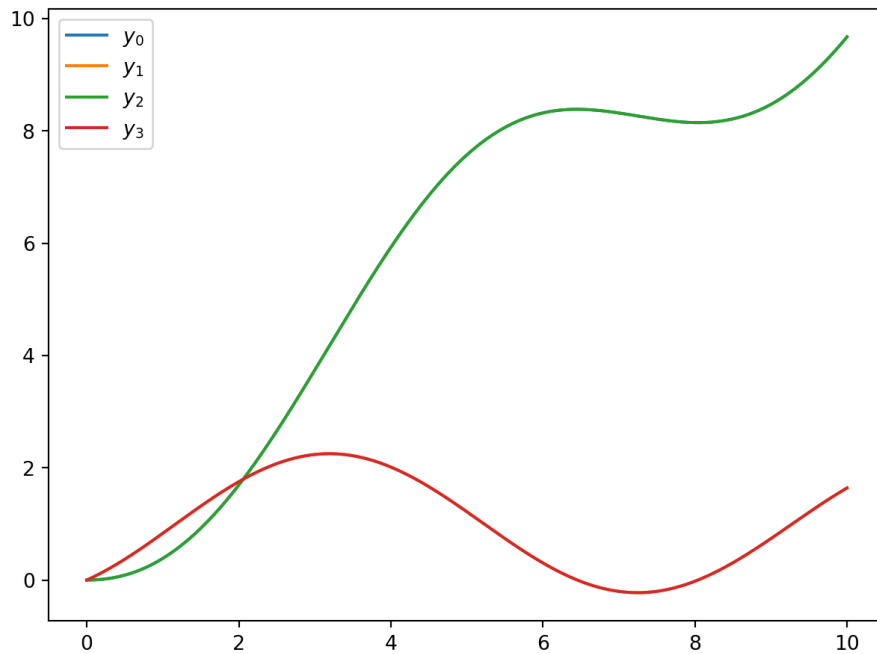


Figure 1: Simulation of the 2-degree-of-freedom 2DOF tuned-mass damper TMD.

References

- [1] . Zuo and S. A. Nayfeh, "The Multi-Degree-of-Freedom Tuned- Mass-Damper for Suppression of Single-Mode Vibration Under Random and Harmonic Excitation", Dept. of Mech. Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139, Draft for 2003 ASME Design Engineering Technical Conferences",