Model Documentation of the 'Power system 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:

$$x \in \mathbb{R}^7 u \qquad \in \mathbb{R}^2 w \in \mathbb{R}^2 z \qquad \in \mathbb{R}^5 y \in \mathbb{R}^3$$

System Equations:

$$\dot{x}(t) = Ax(t) + B_1 w(t) + Bu(t) \tag{1a}$$
$$z(t) = C_1 x(t) + D_{11} w(t) + D12u(t) \tag{1b}$$
$$y(t) = Cx(t) + D21w(t) \tag{1c}$$

Outputs: z

2.1 Exemplary parameter values

Symbol	Value
A	$\begin{bmatrix} -0.04165 & 0 & 4.92 & -4.92 & 0 & 0 & 0 \\ -5.21 & -12.5 & 0 & 0 & 0 & 0 & 0 \\ 0 & 3.33 & -3.33 & 0 & 0 & 0 & 0 \\ 0.545 & 0 & 0 & 0 & -0.545 & 0 & 0 \\ 0 & 0 & 0 & 4.92 & -0.04165 & 0 & 4.92 \\ 0 & 0 & 0 & 0 & -5.21 & -12.5 & 0 \\ 0 & 0 & 0 & 0 & 0 & 3.33 & -3.33 \end{bmatrix}$
B	$\begin{bmatrix} -4.92 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & -4.92 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$
B_1	$\begin{bmatrix} -4.92 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & -4.92 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$
C_1	$\begin{bmatrix} 1.0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1.0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1.0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
C	$\begin{bmatrix} 1.0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1.0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1.0 & 0 & 0 \end{bmatrix}$
D_{11}	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$
D_{12}	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 1.0 & 0 \\ 0 & 1.0 \end{bmatrix}$
D_{21}	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$

3 Derivation and Explanation

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

The original description was:
PSM Power system model A. Varga, "Model Reduction Routines for SLICOT", NICONET Report 1999-8, p. 32 and C. E. Fosha and O. I. Elgerd,"The megawatt-frequency control problem a new approach via optimal control theory", IEEE Trans. on Power Apparatus and Systems,Vol.89,pp.563-571,1970

4 Simulation

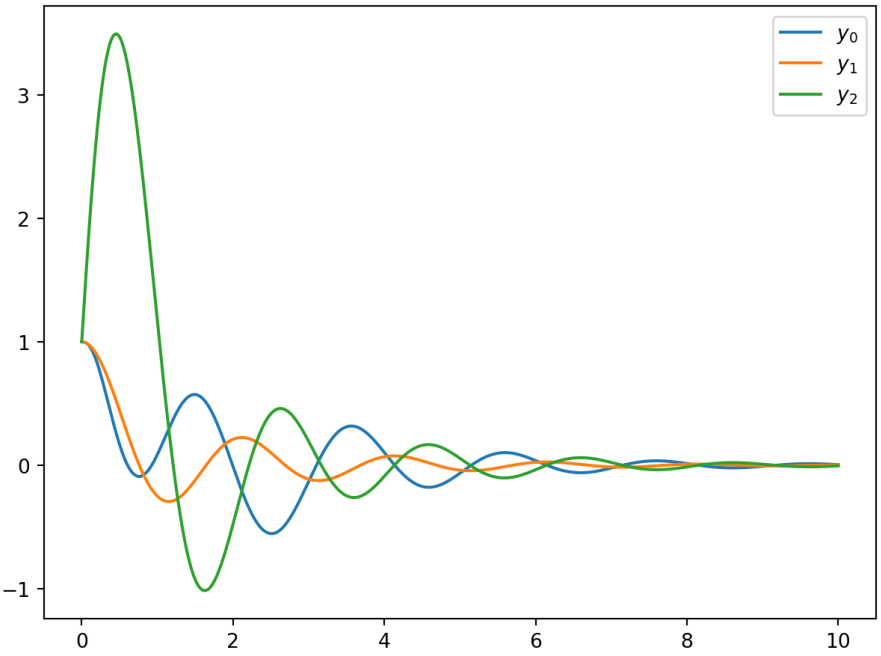

Figure 1: Simulation of the Power system model.

References

[1] . Varga, "Model Reduction Routines for SLICOT", NICONET Report 1999-8, p. 32 and C. E. Fosha and O. I. Elgerd,"The megawatt-frequency control problem a new approach via optimal control theory", IEEE Trans. on Power Apparatus and Systems,Vol.89,pp.563-571,1970