Model Documentation of the 'Automobile Gas Turbine'

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:

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

System Equations:

$$\dot{x}(t) = Ax(t) + B_1 w(t) + Bu(t) \tag{1a}$$

$$z(t) = C_1 x(t) + D_{11} w(t) + D_{12} u(t)$$
(1b)

$$y(t) = Cx(t) + D21w(t) \tag{1c}$$

Outputs: z



2.1 Exemplary parameter values

Symbol	Value											
	0	1.0	0	0	0	0	0	0	0	0	0	
	-0.202	-1.15	0	0	0	0	0	0	0	0	0	
	0	0 0	$0 \\ 0$	$\frac{1.0}{0}$	$0 \\ 1.0$	$0 \\ 0$	$0 \\ 0$	0	$0 \\ 0$	$0 \\ 0$	$0 \\ 0$	
	0	0	-2.36	-13.6	-12.8	0	0	0	0	0	0	
	0	0	0	0	0	0	1.0	0	0	0	0	
A	0	0	0	0	0	0	0	1.0	0	0	0	
	0	0	0	0	0	-1.62	-9.4	-9.15	0	0	0	
	0	0	0	0	0	0	0	0	0	1.0	0	
	0	0	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	0	0	0	0	-188.0	-111.6	-116.4	
	1.0439	4.1486										
	0	0										
	0	0										
	-1.794	2.6775										
B	0	0										
D	0	0										
	1.0439	4.1486										
	0	0										
	0	0										
	-1.794	2.6775										
	0	0										
	1.0439	4.1486										
	0	0										
	$\begin{vmatrix} 0 \\ -1.794 \end{vmatrix}$	$\begin{bmatrix} 0 \\ 2.6775 \end{bmatrix}$										
_	0	0										
B_1	0	0										
	1.0439	4.1486										
	0	0										
	0	0										
	$\begin{bmatrix} 0 \\ -1.794 \end{bmatrix}$	0										
	$\begin{bmatrix} -1.794 \\ 1.0 \end{bmatrix}$	0	0 0	0	0 0	0 0	0	0]				
	0 1.0		0 0		0 0	0 0	0	$\stackrel{\circ}{0}$				
	0 0		0 0		0 0	0 0	0	0				
	0 0		1.0 0		0 0	0 0	0	0				
	0 0		0 1.0		0 0	0 0	0	0				
C_1	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$		0 0		0 0	0 0	0	0				
	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$		$\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$		$\begin{array}{ccc} .0 & 0 \\ 0 & 1.0 \end{array}$	$\begin{array}{ccc} 0 & 0 \\ 0 & 0 \end{array}$	$0 \\ 0$	$\begin{bmatrix} 0 \\ 0 \end{bmatrix}$				
	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$		$\begin{array}{ccc} 0 & 0 \\ 0 & 0 \end{array}$		0 0	1.0 0	0	0				
	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$		0 0		0 0	0 1.0		$\overset{\circ}{0}$				
	0 0		0 0		0 0	0 0	1.0	0				
	$\begin{bmatrix} 0 & 0 \end{bmatrix}$		0 0		0 0	0 0	0	1.0		_		
C				15.0 0		0 0	0	0	0 0			
		0		3 0 0		$1.12 ext{ } 1.95$	9.35	25.8	7.14 0]		
	$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$		0 0 0		$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$							
	0 0 0		0 0 0		0 0							
	0 0 0		0 0 0		0 0							
	0 0 0		0 0 0		0 0							
D_{11}	0 0 0		0 0 0		0 0							
211	0 0 0	0 0	0 0 0	0 0	0 0							

3 Derivation and Explanation

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

The original description was:

AGS Automobile Gas Turbine Y. S. Hung and A. G. J. MacFarlane, "Multi-variable feedback A quasi-classical approach", Springer-Verlag, "Lecture Notes in Control and Information Sciences", 1982 p. 27/163

4 Simulation

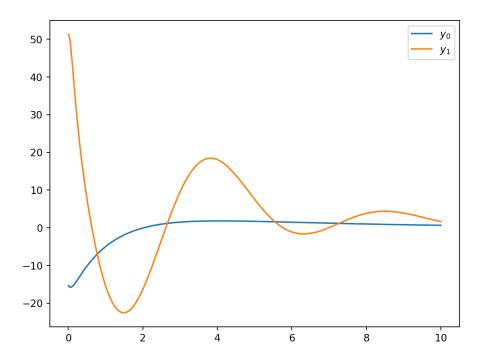


Figure 1: Simulation of the Automobile Gas Turbine.

References

[1]. S. Hung and A. G. J. MacFarlane, "Multivariable feedback A quasi-classical approach", Springer-Verlag, "Lecture Notes in Control and Information Sciences", 1982 p. 27/163