

1 Variables

2 root

	var	symbol	documentation	type	units	tokens	eqs
13	$F_{N,A}$	F	directed graph incidence matrix	network		[]	
1	t_N	t	time	frame	s	[]	
3	t^o_N	to	starting time	frame	s	[]	1
4	t^e_N	te	end time	frame	s	[]	2
2	#	value	numerical value	constant		[]	
18	0	null	numerical value 0	constant		[]	16
19	1	one	numerical value 1	constant		[]	17

3 System

	var	symbol	documentation	type	units	tokens	eqs
14	$\hat{x}^{A,\alpha}_N$	fx_A_alpha	flow of A mechanism alpha	transport	ms^{-1}	[]	9 20
15	$\hat{x}^{A,\beta}_N$	fx_A_beta	flow of A mechanism beta	transport	ms^{-1}	[]	10 21
25	$\hat{y}^{B,\gamma}_N$	fy_B_gamma	flow of B mechanism gamma	transport	s^{-1}	[]	24
5	x_N	x	state - length	state	m	[]	13
11	$\pi^{A,\alpha}_N$	pi_A_alpha	effort A mechanism alpha	state	m	[]	7 14
12	$\pi^{A,\beta}_N$	pi_A_beta	effort A mechanism beta	state	m	[]	8 15
16	\dot{x}_N	dx	differential state for token A	state	ms^{-1}	[]	11 18
17	x^o_N	xo	initial condition for token A	state	m	[]	12
20	$\underline{\pi}^A_N$	pi_A_stack	the stack of intensive variables	state	m	[]	19
21	y_N	y	state b	state		[]	27

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	var	symbol	documentation	type	units	tokens	eqs
24	$\pi^{B,\gamma}_N$	pi_B_gamma	effort B mechanism gamma	state		[]	23
26	dy_N	dy	differential state for token B	state	s^{-1}	[]	25
27	yo_N	yo	initial condition for token B	state		[]	26
7	$K^{A,\alpha}_N$	K_A_alpha	frequency A alpha	constant	s^{-1}	[]	3
8	$K^{A,\beta}_N$	K_A_beta	frequency A beta	constant	s^{-1}	[]	4
9	$M^{A,\alpha}$	M_A_alpha	gain a	constant		[]	5
10	$M^{A,\beta}$	M_A_beta	gain b	constant		[]	6
22	$M^{B,\gamma}$	M_B_gamma	gain B	constant		[]	
23	$K^{B,\gamma}_N$	K_B_gamma	frequency B gamma	constant	s^{-1}	[]	22

4 Properties

	var	symbol	documentation	type	units	tokens	eqs
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5 Control

	var	symbol	documentation	type	units	tokens	eqs
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6 System–Properties

	var	symbol	documentation	type	units	tokens	eqs
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7 Properties–System

	var	symbol	documentation	type	units	tokens	eqs
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8 System–Control

	var	symbol	documentation	type	units	tokens	eqs
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9 Control–System

	var	symbol	documentation	type	units	tokens	eqs
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10 Properties–Control

	var	symbol	documentation	type	units	tokens	eqs
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11 Control–Properties

	var	symbol	documentation	type	units	tokens	eqs
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12 Equations

12.1 Model equations

no	equation	documentation	layer
1	$t_N^o := Set(t_N, \#)$	starting time	root
2	$t_N^e := Set(t_N, \#)$	end time	root
3	$K^{A,\alpha}_N := Set((t_N)^{-1}, \#)$	frequency a	System
4	$K^{A,\beta}_N := Set((t_N)^{-1}, \#)$	frequency b	System
5	$M^{A,\alpha} := Set(\#, \#)$	gain a	System
6	$M^{A,\beta} := Set(\#, \#)$	gain b	System
7	$\pi^{A,\alpha}_N := M^{A,\alpha} \cdot x_N$	effort a	System
8	$\pi^{A,\beta}_N := M^{A,\beta} \cdot x_N$	effort b	System
9	$\hat{x}^{A,\alpha}_N := F_{N,A} \star^A \left(K^{A,\alpha}_N \cdot F_{N,A} \star^N \pi^{A,\alpha}_N \right)$	flow of x mechanism a	System
10	$\hat{x}^{A,\beta}_N := F_{N,A} \star^A \left(K^{A,\beta}_N \cdot F_{N,A} \star^N \pi^{A,\beta}_N \right)$	flow of x mechanism b	System
11	$\dot{x}_N := \hat{x}^{A,\alpha}_N + \hat{x}^{A,\beta}_N$	differential state	System
12	$x_N^o := Set(x_N, \#)$	initial condition	System
13	$x_N := \int_{t_N^o}^{t_N^e} \dot{x}_N \, dt_N + x_N^o$	state - length	System
14	$\pi^{A,\alpha}_N := Set(\pi^{A,\alpha}_N, \#)$	effort a	System
15	$\pi^{A,\beta}_N := Set(\pi^{A,\beta}_N, \#)$	effort b	System
16	$0 := Set(\#, \#)$	numerical value 0	root

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no	equation	documentation	layer
17	$1 := Set(\#, \#)$	numerical value 1	root
18	$\dot{x}_N := Set(\dot{x}_N, 0)$	differential state	System
19	$\underline{\pi}^A_N := Stack(\pi^{A,\alpha}_N, \pi^{A,\beta}_N)$	the stack of intensive variables	System
20	$\hat{x}^{A,\alpha}_N := Set(\hat{x}^{A,\alpha}_N, \#)$	flow of x mechanism a	System
21	$\hat{x}^{A,\beta}_N := Set(\hat{x}^{A,\beta}_N, \#)$	flow of x mechanism b	System
22	$K^{B,\gamma}_N := Set((t_N)^{-1}, \#)$	frequency B alpha	System
23	$\pi^{B,\gamma}_N := M^{B,\gamma} . y_N$	transport of B mechanism gamma	System
24	$\hat{y}^{B,\gamma}_N := F_{N,A} \overset{A}{\star} \left(K^{B,\gamma}_N . F_{N,A} \overset{N}{\star} \pi^{B,\gamma}_N \right)$	flow of B mechanism gamma	System
25	$dy_N := 1 . \hat{y}^{B,\gamma}_N$	differential state for token B	System
26	$yo_N := Set(y_N, \#)$	initial condition for token B	System
27	$y_N := \int_{t^o_N}^{t^e_N} dy_N \ dt_N + yo_N$	state b	System