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
37	$\hat{x}^{A,\alpha}{}_N$	fx_A_alpha	netflow of token A due to mechanism alpha	transport	ms^{-1}	[]	50 55
38	$\hat{x}^{A,\beta}{}_N$	fx_A_beta	netflow of token A due to mechanism beta	transport	ms^{-1}	[]	51 65
39	$\hat{y}^{B,\gamma}{}_N$	fy_B_gamma	netflow of token B due to mechanism gammma	transport	s^{-1}	[]	52 57
40	$\hat{y}^{B,\delta}{}_N$	fy_B_delta	netflow of token B due to mechanism delta	transport	s^{-1}	[]	53 54
5	x_N	x	state token A	state	m	[]	62
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	state	ms^{-1}	[]	18 58
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 token A	state	m	[]	19

Continued on next page

1

		var	symbol	documentation	type	units	tokens	eqs
21		y_N	y	state token B	state		[]	63
24		$\pi^{B,\gamma}{}_N$	pi_B_gamma	effort B mechanism gamma	state		[]	23
26		$\dot{y}_N$	dy	differential state for token B	state	s^{-1}	[]	36 59
27		$y^o{}_N$	yo	initial condition for token B	state		[]	26
33		$\pi^{B,\delta}{}_N$	pi_B_delta	effort B mechansim delta	state		[]	32
36		$\underline{\pi}^B{}_N$	pi_B_stack	the stack of intensive variables token B	state		[]	44
41		xy_stack	xy_stack	mixed stack of both states	state		[]	64
7		$K^{A,\alpha}{}_N$	K_A_alpha	frequency token A	constant	s^{-1}	[]	40
8		$K^{A,\beta}{}_N$	K_A_beta	frequency token B	constant	s^{-1}	[]	41
9		$M^{A,\alpha}$	M_A_alpha	norming factor token A mechanism alpha	constant		[]	42
10		$M^{A,\beta}$	M_A_beta	norming factor token A mechanism beta	constant		[]	43
22		$M^{B,\gamma}$	M_B_gamma	norming factor token B mechanism gamma	constant		[]	
23		$K^{B,\gamma}{}_N$	K_B_gamma	norming factor token A mechanism d	constant	s^{-1}	[]	22
30		$K^{B,\delta}{}_N$	K_B_delta	frequency B delta	constant	s^{-1}	[]	30
31		$M^{B,\delta}$	M_B_delta	norming factor token B mechanism delta	constant		[]	

4   Properties

		var	symbol	documentation	type	units	tokens	eqs

5   Control

		var	symbol	documentation	type	units	tokens	eqs

6   System–Properties

	var	symbol	documentation	type	units	tokens	eqs

7 Properties–System

	var	symbol	documentation	type	units	tokens	eqs

8 System–Control

	var	symbol	documentation	type	units	tokens	eqs

9 Control–System

	var	symbol	documentation	type	units	tokens	eqs

10 Properties–Control

	var	symbol	documentation	type	units	tokens	eqs

11 Control–Properties

	var	symbol	documentation	type	units	tokens	eqs

12 Equations

12.1 Model equations

no	equation	documentation	layer
1	$t^o{}_N := \mathrm{Instantiate}(t_N, \#)$	starting time	root
2	$t^e{}_N := \mathrm{Instantiate}(t_N, \#)$	end time	root
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
12	$x^o{}_N := \mathrm{Instantiate}(x_N, \#)$	initial condition	System
14	$\pi^{A,\alpha}{}_N := \mathrm{Instantiate}(\pi^{A,\alpha}{}_N, \#)$	effort a	System
15	$\pi^{A,\beta}{}_N := \mathrm{Instantiate}(\pi^{A,\beta}{}_N, \#)$	effort b	System
16	$0 := \mathrm{Instantiate}(\#, \#)$	numerical value 0	root
17	$1 := \mathrm{Instantiate}(\#, \#)$	numerical value 1	root
18	$\dot{x}_N := \mathrm{Instantiate}(\dot{x}_N, 0)$	differential state	System
19	$\underline{\pi}^A{}_N := \mathrm{Stack}\left(\pi^{A,\alpha}{}_N, \pi^{A,\beta}{}_N\right)$	the stack of intensive variables	System
22	$K^{B,\gamma}{}_N := \mathrm{Instantiate}((t_N)^{-1}, \#)$	frequency B alpha	System
23	$\pi^{B,\gamma}{}_N := M^{B,\gamma} \cdot y_N$	transport of B mechanism gamma	System
26	$y^o{}_N := \mathrm{Instantiate}(y_N, \#)$	initial condition for token B	System
30	$K^{B,\delta}{}_N := \mathrm{Instantiate}((t_N)^{-1}, \#)$	var doc : frequency B delta	System
32	$\pi^{B,\delta}{}_N := M^{B,\delta} \cdot y_N$	effort B mechansim delta	System

no	equation	documentation	layer
36	$\dot{y}_N := \mathrm{Instantiate}(\dot{y}_N, \#)$	differential state for token B	System
40	$K^{A,\alpha}{}_N := \mathrm{Instantiate}((t_N)^{-1}, \#)$	frequency token A	System
41	$K^{A,\beta}{}_N := \mathrm{Instantiate}((t_N)^{-1}, \#)$	frequency token B	System
42	$M^{A,\alpha} := \mathrm{Instantiate}(\#, \#)$	norming factor token A mechanism alpha	System
43	$M^{A,\beta} := \mathrm{Instantiate}(\#, \#)$	norming factor token A mechanism beta	System
44	$\underline{\pi}^B{}_N := \mathrm{Stack}\left(\pi^{B,\gamma}{}_N, \pi^{B,\delta}{}_N\right)$	the stack of intensive variables token B	System
50	$\hat{x}^{A,\alpha}{}_N := F_{N,A} \overset{A}{\star} \left(K^{A,\alpha}{}_N . F_{N,A} \overset{N}{\star} \pi^{A,\alpha}{}_N\right)$	netflow of token A due to mechanism alpha	System
51	$\hat{x}^{A,\beta}{}_N := F_{N,A} \overset{A}{\star} \left(K^{A,\beta}{}_N . F_{N,A} \overset{N}{\star} \pi^{A,\beta}{}_N\right)$	netflow of token A due to mechanism beta	System
52	$\hat{y}^{B,\gamma}{}_N := F_{N,A} \overset{A}{\star} \left(K^{B,\gamma}{}_N . F_{N,A} \overset{N}{\star} \pi^{B,\gamma}{}_N\right)$	netflow of token B due to mechanism gammma	System
53	$\hat{y}^{B,\delta}{}_N := F_{N,A} \overset{A}{\star} \left(K^{B,\delta}{}_N . F_{N,A} \overset{N}{\star} \pi^{B,\delta}{}_N\right)$	netflow of token B due to mechanism delta	System
54	$\hat{y}^{B,\delta}{}_N := \mathrm{Instantiate}(\hat{y}^{B,\delta}{}_N, \#)$	netflow of token B due to mechanism delta	System
55	$\hat{x}^{A,\alpha}{}_N := \mathrm{Instantiate}(\hat{x}^{A,\alpha}{}_N, \#)$	netflow of token A due to mechanism alpha	System
57	$\hat{y}^{B,\gamma}{}_N := \mathrm{Instantiate}(\hat{y}^{B,\gamma}{}_N, \#)$	netflow of token B due to mechanism gammma	System
58	$\dot{x}_N := \hat{x}^{A,\alpha}{}_N + \hat{x}^{A,\beta}{}_N$	differential state	System

no	equation	documentation	layer
59	$\dot{y}_N := \hat{y}^{B,\gamma}{}_N + \hat{y}^{B,\delta}{}_N$	differential state for token B	System
62	$x_N := \int_{t^o{}_N}^{t^e{}_N} \dot{x}_N \ d\,t_N + x^o{}_N$	state token A	System
63	$y_N := \int_{t^o{}_N}^{t^e{}_N} \dot{y}_N \ d\,t_N + y^o{}_N$	state token B	System
64	$xy_s tack := \text{MixedStack}\,(x_N, y_N)$	mixed stack of both states	System
65	$\hat{x}^{A,\beta}{}_N := \text{Instantiate}(\hat{x}^{A,\beta}{}_N, \#)$	netflow of token A due to mechanism beta	System