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 66
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

	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
42	pi_AB_stack	`pi_AB_stack`	stack of both sets of intensives	state		[]	67
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	${t^o}_N := \text{Instantiate}(t_N, \#)$	starting time	root
2	${t^e}_N := \text{Instantiate}(t_N, \#)$	end time	root
7	${\pi^{A,\alpha}}_N := M^{A,\alpha} \,.\, x_N$	effort a	System
8	${\pi^{A,\beta}}_N := M^{A,\beta} \,.\, x_N$	effort b	System
12	${x^o}_N := \text{Instantiate}(x_N, \#)$	initial condition	System
14	${\pi^{A,\alpha}}_N := \text{Instantiate}({\pi^{A,\alpha}}_N, \#)$	effort a	System
15	${\pi^{A,\beta}}_N := \text{Instantiate}({\pi^{A,\beta}}_N, \#)$	effort b	System
16	$0 := \text{Instantiate}(\#, \#)$	numerical value 0	root
17	$1 := \text{Instantiate}(\#, \#)$	numerical value 1	root
18	$\dot{x}_N := \text{Instantiate}(\dot{x}_N, 0)$	differential state	System
19	${\underline{\pi}^A}_N := \text{Stack}\left({\pi^{A,\alpha}}_N, {\pi^{A,\beta}}_N\right)$	the stack of intensive variables	System
22	${K^{B,\gamma}}_N := \text{Instantiate}((t_N)^{-1}, \#)$	frequency B alpha	System
23	${\pi^{B,\gamma}}_N := M^{B,\gamma} \,.\, y_N$	transport of B mechanism gamma	System
26	${y^o}_N := \text{Instantiate}(y_N, \#)$	initial condition for token B	System
30	${K^{B,\delta}}_N := \text{Instantiate}((t_N)^{-1}, \#)$	var doc : frequency B delta	System
32	${\pi^{B,\delta}}_N := M^{B,\delta} \,.\, y_N$	effort B mechansim delta	System

Continued on next page

no	equation	documentation	layer
36	$\dot{y}_N := \text{Instantiate}(\dot{y}_N, \#)$	differential state for token B	System
40	${K^{A,\alpha}}_N := \text{Instantiate}((t_N)^{-1}, \#)$	frequency token A	System
41	${K^{A,\beta}}_N := \text{Instantiate}((t_N)^{-1}, \#)$	frequency token B	System
42	$M^{A,\alpha} := \text{Instantiate}(\#, \#)$	norming factor token A mechanism alpha	System
43	$M^{A,\beta} := \text{Instantiate}(\#, \#)$	norming factor token A mechanism beta	System
44	$\underline{\pi}^B{}_N := \text{Stack}\left({\pi^{B,\gamma}}_N, {\pi^{B,\delta}}_N\right)$	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	${\hat{y}^{B,\delta}}_N := \text{Instantiate}({\hat{y}^{B,\delta}}_N, \#)$	netflow of token B due to mechanism delta	System
55	${\hat{x}^{A,\alpha}}_N := \text{Instantiate}({\hat{x}^{A,\alpha}}_N, \#)$	netflow of token A due to mechanism alpha	System
57	${\hat{y}^{B,\gamma}}_N := \text{Instantiate}({\hat{y}^{B,\gamma}}_N, \#)$	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

Continued on next page

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	$xy_stack := \text{MixedStack}\,(x_N, y_N)$	mixed stack of both states	System
66	$\hat{x}^{A,\beta}{}_N := \text{Instantiate}(\hat{x}^{A,\alpha}{}_N, \#)$	netflow of token A due to mechanism beta	System
67	$pi_A B_s tack := \text{MixedStack}\left(\underline{\pi}^A{}_N, \underline{\pi}^B{}_N\right)$	stack of both sets of intensives	System