1 Variables

2 root

	var	symbol	documentation	type	units	tokens	eqs
8	$F_{N,A}$	F	directed graph indicence matrix	network		[]	
1	t	t	time	frame	s	[]	
6	t_o	to	starting time	frame	s	[]	3
7	t_e	te	end time	frame	s	[]	4
3	#	value	numerical value	constant		[]	
4	1	one	numerical value 1	constant		[]	1
5	0	null	numerical value 0	constant		[]	2

3 System

	var	symbol	documentation	type	units	tokens	eqs
25	${\hat{x}^{A,\alpha}}_N$	fx_A_alpha	netflow of token A due to mechanism alpha	transport	ms^{-1}	[]	11
26	${\hat{x}^{A,\beta}}_N$	fx_A_beta	net flow of token A due to mechanism beta	transport	ms^{-1}	[]	12
27	${\hat{y}^{B,\gamma}}_N$	fy_B_gamma	netflow of token B due to mechanism gamma	transport	s^{-1}	[]	14
28	${\hat{y}^{B,\delta}}_N$	fy_B_delta	netflow of token B due to mechansim beta	transport	s^{-1}	[]	15
36	$D_{N,A}$	D	difference operator	differenceOperator		[]	
9	x_N	x	state token A	state	m	[]	20
10	y_N	y	state token B	state		[]	21
11	${x^o}_N$	xo	initial condition for state x	state	m	[]	5
12	${y^o}_N$	yo	initial condition for state y	state		[]	6
34	s	s	mixed state	state		[]	31

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	var	symbol	documentation	type	units	tokens	eqs
13	$K^{A,\alpha}{}_A$	K_A_alpha	conductivity token A mechanism alpha	constant	s^{-1}	[]	
14	$K^{A,\beta}{}_A$	K_A_beta	conductivity token A mechanism beta	constant	s^{-1}	[]	
15	$K^{B,\gamma}{}_A$	K_B_gamma	conductivity token B mechanism gamma	constant	s^{-1}	[]	
16	$K^{B,\delta}{}_A$	K_B_delta	conductivity token B mechanism delta	constant	s^{-1}	[]	
17	$M^{A,\alpha}{}_N$	M_A_alpha	norming factor token A mechanism alpha	constant		[]	
18	$M^{A,\beta}{}_N$	M_A_beta	norming factor token A mechanism beta	constant		[]	
19	$M^{B,\gamma}{}_N$	M_B_gamma	norming factor token B mechanism gamma	constant		[]	
20	$M^{B,\delta}{}_N$	M_B_delta	norming factor token B mechanism delta	constant		[]	
21	$\pi^{A,\alpha}{}_N$	pi_A_alpha	effort for A mechanism alpha	secondaryState	m	[]	7 27
22	$\pi^{A,\beta}{}_N$	pi_A_beta	effort for A mechanism beta	secondaryState	m	[]	8 28
23	$\pi^{B,\gamma}{}_N$	pi_B_gamma	effort for B mechanism gamma	secondaryState		[]	9 29
24	$\pi^{B,\delta}{}_N$	pi_B_delta	effort for B mechanism delta	secondaryState		[]	10 30
31	$\underline{\pi}^{A}{}_N$	pi_A_stack	effort for token A stack	secondaryState	m	[]	24
32	$\underline{\pi}^{B}{}_N$	pi_B_stack	effort for token B stack	secondaryState		[]	25
33	$\underline{\pi}^{A,B}$	pi_stack	effort for token A, B stack	secondaryState		[]	26
29	$\dot{x}_N$	dx	diferential balance for token A	differentialState	ms^{-1}	[]	16 32
30	$\dot{y}_N$	dy	differential balance for token B	differentialState	s^{-1}	[]	17 33
35	dxy	dxy	mixed stack of the two accumulation terms	differentialState		[]	34

4 Properties

	var	symbol	documentation	type	units	tokens	eqs
37	$K_{Aa}lpha_A$	K_A_alpha	conductivity token A mechanism alpha	constant	s^{-1}	[]	
38	$K_{Ab}eta_A$	K_A_beta	conductivity token A mechanism beta	constant	s^{-1}	[]	
39	$K_{Bg}amma_A$	K_B_gamma	conductivity token B mechanism gamma	constant	s^{-1}	[]	

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	var	symbol	documentation	type	units	tokens	eqs
40	$K_{Bd}elta_A$	`K_B_delta`	conductivity token B mechanism delta	constant	s^{-1}	[]	
42	K_A	`K`	stack of conductivities	constant	s^{-1}	[]	36

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
41	$k_{Aa}lpha_A$	`k_A_alpha`	link	transform	s^{-1}	[]	35
43	$k_{Ab}eta_A$	`k_A_beta`	link	transform	s^{-1}	[]	37
44	$k_{Bd}elta_A$	`k_B_delta`	link	transform	s^{-1}	[]	38
45	$k_{Bg}amma_A$	`k_B_gamma`	link	transform	s^{-1}	[]	39

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	$1 := \text{Instantiate}(\#, \#)$	numerical value 1	root
2	$0 := \text{Instantiate}(\#, \#)$	numerical value 0	root
3	$t_o := \text{Instantiate}(t, \#)$	starting time	root
4	$t_e := \text{Instantiate}(t, \#)$	end time	root
5	$x^o{}_N := \text{Instantiate}(x_N, \#)$	initial condition for state x	System
6	$y^o{}_N := \text{Instantiate}(y_N, \#)$	initial condition for state y	System
7	$\pi^{A,\alpha}{}_N := M^{A,\alpha}{}_N \,.\, x_N$	effort for B mechanism alpha	System
8	$\pi^{A,\beta}{}_N := M^{A,\beta}{}_N \,.\, x_N$	effort for A mechanism beta	System
9	$\pi^{B,\gamma}{}_N := M^{B,\gamma}{}_N \,.\, y_N$	effort for B mechanism gamma	System
10	$\pi^{B,\delta}{}_N := M^{B,\delta}{}_N \,.\, y_N$	effort for B mechanism delta	System
11	$\hat{x}^{A,\alpha}{}_N := F_{N,A} \overset{A}{\star} \left(k_{A}alpha_A \,.\, D_{N,A} \overset{N}{\star} \pi^{A,\alpha}{}_N \right)$	netflow of token A due to mechanism alpha	System
12	$\hat{x}^{A,\beta}{}_N := F_{N,A} \overset{A}{\star} \left(k_{A}eta_A \,.\, D_{N,A} \overset{N}{\star} \pi^{A,\beta}{}_N \right)$	net flow of token A due to mechanism beta	System
14	$\hat{y}^{B,\gamma}{}_N := F_{N,A} \overset{A}{\star} \left(k_{B}amma_A \,.\, D_{N,A} \overset{N}{\star} \pi^{B,\gamma}{}_N \right)$	netflow of token B due to mechanism gamma	System
15	$\hat{y}^{B,\delta}{}_N := F_{N,A} \overset{A}{\star} \left(k_{B}elta_A \,.\, D_{N,A} \overset{N}{\star} \pi^{B,\delta}{}_N \right)$	netflow of token B due to mechansim beta	System

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no	equation	documentation	layer
16	$\dot{x}_N := \hat{x}^{A,\alpha}{}_N + \hat{x}^{A,\beta}{}_N$	diferential balance for token A	System
17	$\dot{y}_N := \hat{y}^{B,\gamma}{}_N + \hat{y}^{B,\delta}{}_N$	differential balance for token B	System
20	$x_N := \int_{t_o}^{t_e} \dot{x}_N \ dt + x^o{}_N$	state token A	System
21	$y_N := \int_{t_o}^{t_e} \dot{y}_N \ dt + y^o{}_N$	state token B	System
24	$\underline{\pi}^A{}_N := \text{Stack}\left(\pi^{A,\alpha}{}_N, \pi^{A,\beta}{}_N\right)$	effort for token A stack	System
25	$\underline{\pi}^B{}_N := \text{Stack}\left(\pi^{B,\gamma}{}_N, \pi^{B,\delta}{}_N\right)$	effort for token B stack	System
26	$\underline{\pi}^{A,B} := \text{MixedStack}\left(\underline{\pi}^A{}_N, \underline{\pi}^B{}_N\right)$	effort for token A, B stack	System
27	$\pi^{A,\alpha}{}_N := \text{Instantiate}(\pi^{A,\alpha}{}_N, \#)$	effort for B mechanism alpha	System
28	$\pi^{A,\beta}{}_N := \text{Instantiate}(\pi^{A,\beta}{}_N, \#)$	effort for A mechanism beta	System
29	$\pi^{B,\gamma}{}_N := \text{Instantiate}(\pi^{B,\gamma}{}_N, \#)$	effort for B mechanism gamma	System
30	$\pi^{B,\delta}{}_N := \text{Instantiate}(\pi^{B,\delta}{}_N, \#)$	effort for B mechanism delta	System
31	$s := \text{MixedStack}\left(x_N, y_N\right)$	mixed state	System
32	$\dot{x}_N := \text{Instantiate}(\dot{x}_N, 0)$	diferential balance for token A	System
33	$\dot{y}_N := \text{Instantiate}(\dot{y}_N, 0)$	differential balance for token B	System
34	$dxy := \text{MixedStack}\left(\dot{x}_N, \dot{y}_N\right)$	mixed stack of the two accumulation terms	System
35	$k_{Aa}lpha_A := K_{Aa}lpha_A$	var doc : link	Properties »> System
36	$K_A := \text{Stack}\left(K_{Aa}lpha_A, K_{Ab}eta_A, K_{Bg}amma_A, K_{Bd}elta_A\right)$	stack of conductivities	Properties

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no	equation	documentation	layer
37	$k_{Ab}eta_A := K_{Ab}eta_A$	link	Properties »> System
38	$k_{Bd}elta_A := K_{Bd}elta_A$	link	Properties »> System
39	$k_{Bg}amma_A := K_{Bg}amma_A$	link	Properties »> System