

Detailed tables for our experiments

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		empty		non-empty		total	
		class.	dec.	class.	dec.	class.	dec.
anderson.4	SE	100	100	100	100	200	200
	ELL	100	100	100	100	200	200
	Cou	100	100	100	100	200	200
	OWCTY	100	100	100	100	200	200
at.4	SE	85	100	100	100	185	200
	ELL	85	100	100	100	185	200
	Cou	85	100	100	100	185	200
	OWCTY	99	100	93	100	192	200
bakery.4	SE	100	100	100	100	200	200
	ELL	100	100	100	100	200	200
	Cou	100	100	100	100	200	200
	OWCTY	100	100	97	100	197	200
bopdp.3	SE	100	100	100	100	200	200
	ELL	99	100	100	100	199	200
	Cou	100	100	100	100	200	200
	OWCTY	100	100	99	100	199	200
brp2.3	SE	100	100	100	100	200	200
	ELL	100	100	100	100	200	200
	Cou	100	100	100	100	200	200
	OWCTY	100	99	100	100	200	199
elevator2.3	SE	73	97	100	100	173	197
	ELL	66	97	100	100	166	197
	Cou	72	99	100	100	172	199
	OWCTY	100	100	100	100	200	200
elevator.4	SE	100	100	100	100	200	200
	ELL	100	100	100	100	200	200
	Cou	100	100	100	100	200	200
	OWCTY	94	100	91	96	185	196
gear.2	SE	100	100	100	100	200	200
	ELL	100	100	100	100	200	200
	Cou	100	100	100	100	200	200
	OWCTY	100	100	100	100	200	200
leader-election.3	SE	100	100	100	100	200	200
	ELL	100	100	100	100	200	200
	Cou	100	100	100	100	200	200
	OWCTY	100	100	100	100	200	200
lifts.4	SE	94	94	106	106	200	200
	ELL	94	94	106	106	200	200
	Cou	94	94	106	106	200	200
	OWCTY	94	94	106	105	200	199
prodcell.3	SE	100	100	100	100	200	200
	ELL	100	100	100	100	200	200
	Cou	100	100	100	100	200	200
	OWCTY	100	100	99	98	199	198
sorter.2	SE	100	100	100	100	200	200
	ELL	100	100	100	100	200	200
	Cou	100	100	100	100	200	200
	OWCTY	100	100	100	100	200	200
telephony.2	SE	100	100	100	100	200	200
	ELL	100	100	100	100	200	200
	Cou	100	100	100	100	200	200
	OWCTY	100	100	100	100	200	200
Total	SE	1252	1291	1306	1306	2558	2597
	ELL	1244	1291	1306	1306	2550	2597
	Cou	1251	1293	1306	1306	2557	2599
	OWCTY	1287	1293	1285	1299	2572	2592

Table 1: Number of formulas processed by the classical (class.) and decomposition (dec.) approach, using different emptiness checks, out of a total of 2600 formulas.

		classical				decomposition			
model	algorithm	states	transitions	time	mem	states	transitions	time	mem
anderson.4 100 cases	SE	83137	474824	0.77	797	41799	154148	0.36	732
	ELL	83137	447288	0.79	809	41950	154031	0.36	726
	Cou	76949	378195	0.61	742	40616	133692	0.31	715
	OWCTY			85.40	2864			47.13	2538
at.4 84 cases	SE	11778840	55765492	112.21	3034	7620732	30150665	63.35	2691
	ELL	11778840	55748407	117.22	3050	7620732	30150665	63.07	2688
	Cou	11692421	54326243	95.95	2913	7542343	28859760	58.88	2657
	OWCTY			149.91	3227			75.68	2841
bakery.4 100 cases	SE	230748	1110911	1.76	850	97920	277830	0.62	793
	ELL	230748	998912	1.70	846	98050	278080	0.63	789
	Cou	212290	826157	1.31	829	96433	245003	0.55	777
	OWCTY			101.74	2330			63.37	2143
bopdp.3 99 cases	SE	2672100	14245549	20.59	1790	1430033	5249648	9.65	1460
	ELL	2672100	13637796	21.27	1811	1440798	5250679	9.51	1443
	Cou	2515568	10389823	17.93	1717	1414104	4037319	7.96	1362
	OWCTY			241.26	3313			166.98	3151
brp2.3 99 cases	SE	136267	426982	0.84	833	57136	101834	0.32	788
	ELL	136267	416898	0.89	813	57076	101788	0.32	788
	Cou	128729	375319	0.74	796	56419	90718	0.29	790
	OWCTY			148.40	3190			72.65	2983
elevator2.3 64 cases	SE	17583328	208607370	273.95	3622	12709300	106105555	161.48	3418
	ELL	17583328	200251800	287.67	3639	12709300	106105555	161.02	3419
	Cou	17144611	171043227	186.22	3464	12479194	99666774	141.25	3348
	OWCTY			14.59	1607			6.48	1534
elevator.4 94 cases	SE	2928295	15794777	26.73	1969	1543723	4728263	10.58	1505
	ELL	2928295	14908666	26.65	1984	1543723	4728263	10.54	1498
	Cou	2849219	12734156	20.14	1831	1547016	4430731	9.70	1463
	OWCTY			638.29	3812			245.55	3718
gear.2 100 cases	SE	51677	136714	0.30	787	23442	36745	0.12	787
	ELL	51677	129751	0.31	766	23442	36745	0.12	785
	Cou	48539	112455	0.23	775	23168	32772	0.10	789
	OWCTY			83.17	3039			50.19	2700
leader-election.3 100 cases	SE	333853	4127079	5.33	1181	153458	988245	1.93	1019
	ELL	333853	3875483	5.15	1182	152979	986428	1.88	1015
	Cou	286568	2339034	3.07	1080	150616	693728	1.38	989
	OWCTY			199.85	3538			139.41	3449
lifts.4 94 cases	SE	371235	1714419	2.67	1107	166521	408141	0.94	1013
	ELL	371235	1559895	2.61	1106	165314	405194	0.92	994
	Cou	337156	1239361	2.31	1110	162463	371390	0.85	999
	OWCTY			255.57	3626			169.82	3567
prodcell.3 100 cases	SE	3488725	25182172	34.28	1952	1358518	5065228	9.64	1400
	ELL	3488725	23975933	35.11	1954	1358849	5065967	9.58	1397
	Cou	3194579	19584772	26.40	1797	1323029	4391328	8.38	1357
	OWCTY			145.60	3003			50.04	2731
sorter.2 100 cases	SE	25514	93158	0.17	738	10459	18177	0.06	760
	ELL	25514	91407	0.19	739	10409	18089	0.06	758
	Cou	22938	62908	0.16	749	10329	15985	0.05	761
	OWCTY			2.89	905			1.77	815
telephony.2 100 cases	SE	151324	1205379	1.37	900	61016	249379	0.41	901
	ELL	151324	1168941	1.43	908	61062	249184	0.40	898
	Cou	144267	1062029	1.13	921	60542	229946	0.38	899
	OWCTY			59.55	2393			30.32	2023

Table 2: Evaluation of the decomposition technique when model-checking different models in four possible setups. All values are averaged over all cases considered for one model. Time is in seconds, memory is in MB. **Empty products.**

		classical				decomposition			
model	algorithm	states	transitions	time	mem	states	transitions	time	mem
anderson.4 100 cases	SE	5497	34802	0.06	737	223	450	0.00	697
	ELL	5484	29505	0.06	729	227	454	0.00	703
	Cou	4845	20660	0.04	700	222	449	0.00	697
	OWCTY			144.72	3073			40.86	2010
at.4 93 cases	SE	362202	2384803	4.61	842	138	181	0.00	795
	ELL	362202	2100874	4.38	861	146	186	0.00	798
	Cou	362196	2095924	3.63	837	172	217	0.00	799
	OWCTY			343.86	3501			80.95	2623
bakery.4 97 cases	SE	710	1561	0.00	704	123	174	0.00	708
	ELL	700	1534	0.00	714	113	149	0.00	704
	Cou	707	1430	0.00	710	113	146	0.00	707
	OWCTY			369.74	3400			84.11	2471
bopdp.3 99 cases	SE	32131	90859	0.19	765	1145	2333	0.01	803
	ELL	31989	90668	0.20	762	1134	2310	0.01	802
	Cou	32120	80027	0.17	780	1152	2331	0.01	800
	OWCTY			292.19	3275			69.46	2594
brp2.3 100 cases	SE	5427	20163	0.05	722	526	729	0.00	747
	ELL	5329	16651	0.04	749	527	731	0.00	748
	Cou	4991	11741	0.03	713	523	710	0.00	755
	OWCTY			162.07	3271			56.45	2459
elevator2.3 100 cases	SE	998871	14729965	15.29	1023	7967	50455	0.07	721
	ELL	998725	13980443	16.54	1031	7978	50466	0.07	720
	Cou	984226	9916942	10.29	986	7975	50464	0.07	720
	OWCTY			30.53	2079			6.68	1172
elevator.4 87 cases	SE	37389	141012	0.28	745	54	58	0.00	719
	ELL	37336	137843	0.29	751	44	47	0.00	718
	Cou	37386	118119	0.21	732	41	43	0.00	723
	OWCTY			491.27	3747			174.15	3087
gear.2 100 cases	SE	2871	6074	0.02	741	531	557	0.00	746
	ELL	2564	4633	0.01	767	543	571	0.00	744
	Cou	2123	3206	0.01	743	562	587	0.00	751
	OWCTY			110.99	3118			42.43	2325
leader-election.3 100 cases	SE	70994	1137612	1.13	887	2923	13803	0.03	872
	ELL	70904	1111900	1.17	888	2922	13801	0.03	872
	Cou	67552	950706	0.89	896	2923	13802	0.03	871
	OWCTY			241.33	3601			72.48	2724
lifts.4 105 cases	SE	12411	68061	0.10	908	1479	3099	0.01	937
	ELL	12397	61982	0.10	908	1484	3104	0.01	943
	Cou	10248	39778	0.07	935	1480	3100	0.01	939
	OWCTY			341.80	3677			156.84	2955
prodcell.3 97 cases	SE	52458	313946	0.46	753	497	876	0.00	758
	ELL	52375	271454	0.44	779	495	862	0.00	759
	Cou	48589	199349	0.32	744	491	857	0.00	757
	OWCTY			196.47	3209			57.83	2469
sorter.2 100 cases	SE	1706	2969	0.01	720	79	93	0.00	741
	ELL	1679	2940	0.01	719	155	199	0.00	740
	Cou	1706	2936	0.01	724	154	198	0.00	741
	OWCTY			2.54	874			1.01	742
telephony.2 100 cases	SE	600	2793	0.00	786	111	313	0.00	806
	ELL	600	2792	0.00	792	117	327	0.00	815
	Cou	518	2599	0.00	813	111	307	0.00	817
	OWCTY			101.96	2757			24.52	1856

Table 3: Evaluation of the decomposition technique when model-checking different models in four possible setups. All values are averaged over all cases considered for one model. Time is in seconds, memory is in MB. **Non-empty products.**

Formulas		Deciding decomposition		
Empty	# form.	$K \otimes A_S$	$K \otimes A_W$	$K \otimes A_T$
Cou99				
Verified	1251	345 (28%)	613 (49%)	293 (23%)
Violated	1306	1176 (90%)	71 (5%)	59 (5%)
SE05				
Verified	1252	432 (35%)	553 (44%)	267 (21%)
Violated	1306	1171 (90%)	75 (6%)	60 (5%)
OWCTY				
Verified	1291	566 (44%)	277 (21%)	448 (35%)
Violated	1301	481 (37%)	609 (47%)	211 (16%)

Table 4: Dispatching of the “deciding” emptiness check (the shortest execution for violated properties, the longest one for verified ones).