MGTP/N(Prolog) の性能

MGTP グループ

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MGTP/N(Prolog) の性能を Condensed Detachment 問題 112 題を用いて計測した．計測に当たっては，次の項目を考慮に入れた．重みによる足切り及び useless 検査は行なわなかった．

1. 連言照合の順序: Otter 順 ($\Delta \times \Delta$, $M \times \Delta$, $\Delta \times M$ 順で，M の順序は，新 → 古)，MGTP 順 ($\Delta \times M$, $M \times \Delta$, $\Delta \times \Delta$ 順で，M の順序は，古 → 新)

2. 包摂検査: 前向き (F)，後向き (B)

3. $D \to M$ の取り出し順序: 生成順 (N)，重み順 (S)

4. 部分計算 $(p(X), p(i(X,Y)) \to p(Y)$ + $p(A) \to \Rightarrow p(X), p(i(X,A)) \to)$ 有り (デフォルト)/ 無し (u).

以下，McCune 論文に従って，性能を列挙する．単位は sec．MGTP は，Sicstus Prolog 上のもので fastcode でコンパイルされている (SS 10/30)．参考までに，OTTER の処理時間 (deletion 戦略を用いないもの) も付記する．OTTER は SPARCstation 1+ 上での計測．

1 Two-Valued Sentential Calculi

1.1 CN

問題	OTTER(sec) Basic	Ratio	OFBN sec/ M+D	OFN sec/ M+D	OFNu sec/ M+D	OFBS sec/ M+D	OFS sec/ M+D	OFSu sec/ M+D	MFBN sec/ M+D
1	-	246	35 99+761	22 107+784	- 806+33015	- 478+14668	- 616+18458	- 719+20468	23 92+592
2	3	5	<1 5+23	<1 5+23	1 28+236	1 21+46	<1 21+46	13 66+550	<1 5+19
3	-	-	750 94+2256	516 99+2300	- 411+31567	- 309+12982	- 334+15542	- 413+22986	2167 129+4216
4	<1	9	<1 5+20	<1 5+20	1 25+185	<1 8+16	<1 8+16	<1 12+22	<1 5+22
5	14	10	<1 12+52	<1 12+55	16 67+1008	1 24+54	1 24+54	116 148+2014	<1 12+43
6	7366	1534	5 27+209	3 27+213	3144 240+15315	3799 216+6582	2395 216+6586	- 413+22973	4 24+169

問題	OTTER(sec)		OFBN sec/ M+D	OFN sec/ M+D	OFNu sec/ M+D	OFBS sec/ M+D	OFS sec/ M+D	OFSu sec/ M+D	MFBN sec/ M+D
	Basic	Ratio							
7	<1	<1	<1 3+6	<1 3+6	<1 9+25	<1 5+6	<1 5+6	<1 6+10	<1 3+6
8	60	7	- 284+12804	- 378+17441	- 452+28403	6502 245+6967	4978 268+7550	1756 270+7647	- 304+13113
9	60	7	- 268+11908	- 361+15702	- 451+28347	6664 244+7010	5109 268+7595	1818 271+7705	- 294+12056
10	89	147	- 284+12778	- 375+17353	- 451+28390	- 301+10384	13227 346+13294	5534 355+13953	- 303+13053
11	104	148	- 266+11829	- 361+15658	- 451+28345	- 299+10301	- 352+13653	7901 386+17286	- 293+11994
12	105	589	- 268+11898	- 361+15658	- 451+28323	- 298+10261	- 350+13544	7866 386+17233	- 293+12050
13	105	71	- 276+12326	- 362+16012	- 452+28402	- 303+10509	- 356+14010	7970 389+17418	- 300+12484
14	109	71	- 269+11997	- 361+15764	- 451+28353	- 301+10371	- 354+13816	8328 396+18199	- 297+12195
15	FAIL		- 263+11719	- 357+15479	- 452+28404	- 298+10245	- 350+13535	- 459+25182	- 291+11797
16	105	33	- 267+11870	- 361+15658	- 451+28335	- 300+10328	- 353+13739	7978 389+17463	- 293+11973
17	104	31	- 284+12836	- 376+17387	- 449+28306	- 302+10488	13038 347+13342	7867 386+17206	- 304+13143
18	106	32	- 284+12869	- 380+17543	- 451+28383	- 303+10498	- 356+14005	8091 392+17721	- 305+13198
19	1021	1262	- 270+12009	- 361+15753	- 451+28345	- 299+10294	- 351+13585	- 459+25169	- 297+12204
20	260	73	- 270+12044	- 361+15764	- 451+28390	- 301+10386	13278 346+13294	- 459+25161	- 296+12179
21	1195	1608	- 266+11846	- 361+15624	- 451+28345	- 299+10307	- 352+13708	- 459+25183	- 293+11978
22	FAIL		- 263+11719	- 357+15460	- 451+28387	- 298+10174	- 348+13424	- 459+25174	- 291+11785
23	FAIL		- 261+11557	- 353+15237	- 449+28305	- 298+10024	- 346+13294	- 459+25182	- 287+11605
24	FAIL		- 259+11453	- 353+15257	- 451+28363	- 298+10164	- 347+13357	- 459+25183	- 286+11542

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問題	OTTER(sec) Basic	Ratio	OFBN sec / M+D	OFN sec / M+D	OFNu sec / M+D	OFBS sec / M+D	OFS sec / M+D	OFSu sec / M+D	MFBN sec / M+D
25	-	1083	12 / 41+292	6 / 45+301	2364 / 346+11581	- / 392+13881	- / 481+17040	- / 554+21957	16 / 46+350
26	4	3	9 / 41+269	4 / 45+277	1505 / 322+9099	11 / 52+246	7 / 56+248	17 / 88+700	73 / 71+809
27	3	1	9 / 40+261	4 / 44+268	1333 / 312+8595	16 / 57+332	9 / 61+336	8 / 70+430	72 / 70+792
28	6038	303	224 / 206+1564	459 / 329+2300	- / 1125+18236	- / 665+12583	- / 694+17835	- / 731+23898	74 / 142+791
29	622	359	- / 723+15764	- / 1046+15527	- / 1124+18204	- / 665+12908	- / 700+18415	- / 730+23830	- / 663+14781
30	161	12	2 / 33+102	3 / 52+195	159 / 247+1425	531 / 264+2051	313 / 266+2065	2878 / 648+7833	2 / 33+115
31	5611	515	3323 / 410+6057	8796 / 799+11162	- / 1037+16107	- / 740+11609	- / 774+16664	- / 794+21575	790 / 272+2917
32	753	546	- / 647+12769	- / 960+14516	- / 1037+16046	- / 742+11936	- / 780+17363	- / 794+21752	- / 759+13964
33	239	224	3 / 30+172	24 / 32+219	265 / 251+2453	558 / 245+2094	291 / 247+2114	5739 / 751+11162	4 / 38+168
34	FAIL		- / 467+5295	- / 613+6950	- / 635+7166	- / 404+11645	- / 458+14007	- / 540+17874	- / 472+6611
35	FAIL		- / 474+5365	- / 621+7028	- / 635+7166	- / 407+12052	- / 466+14606	- / 539+17843	- / 486+6882
36	6	10	- / 468+5305	- / 617+6989	- / 635+7166	2 / 24+81	1 / 26+93	31 / 79+744	4935 / 327+3997

1.2 C0

問題	OTTER(sec) Basic	OTTER(sec) Ratio	OFBN sec/ M+D	OFN sec/ M+D	OFNu sec/ M+D	OFBS sec/ M+D	OFS sec/ M+D	OFSu sec/ M+D	MFBN sec/ M+D
37	419	72	25 55+462	15 62+492	9058 554+23455	- 355+9765	- 466+11711	- 604+19416	29 56+496
38	337	103	- 359+11719	- 486+15985	- 630+29911	- 372+10368	- 505+12835	- 603+19392	- 362+11735
39	<1	<1	<1 6+8	<1 6+8	<1 14+36	<1 13+5	<1 13+5	<1 28+41	<1 5+9
40	FAIL		- 345+10995	- 453+14305	- 630+29900	- 346+9478	- 446+11259	- 604+19445	- 344+10827
41	38	7	19 42+361	8 43+368	- 402+27514	13 54+257	8 54+257	468 215+3444	25 45+416
42	1251	953	86 54+774	41 55+789	- 402+27409	- 312+9110	- 325+11197	- 380+23196	141 62+981
43	FAIL		- 259+9389	- 314+12702	- 402+27379	- 311+8925	- 323+10974	- 380+23196	- 243+9716
44	FAIL		- 573+6242	- 1187+2625	- 1201+2657	- 364+9409	- 416+11256	- 614+19863	- 621+5553
45	<1	<1	1 15+19	1 23+27	2 50+44	<1 7+9	<1 10+10	<1 11+10	<1 7+16
46	13	24	- 577+6287	- 1192+2637	- 1198+2650	205 110+1184	139 125+1292	76 128+1341	- 623+5582
47	<1	<1	<1 7+13	<1 7+14	<1 21+26	<1 6+9	<1 6+10	<1 7+11	<1 7+7
48	5	9	51 114+259	1089 489+857	- 1199+2652	7 46+152	6 59+205	12 78+462	32 108+268
49	FAIL		- 572+6236	- 1190+2632	- 1199+2653	- 364+9402	- 415+11231	- 614+19839	- 620+5552

1.3 AN

問題	OTTER(sec) Basic	OTTER(sec) Ratio	OFBN sec/ M+D	OFN sec/ M+D	OFNu sec/ M+D	OFBS sec/ M+D	OFS sec/ M+D	OFSu sec/ M+D	MFBN sec/ M+D
50	FAIL		- 416+13138	- 511+19914	- 613+24790	- 438+16002	- 490+20633	- 529+26213	- 358+14305
51	-	-	- 600+5122	- 1259+5784	- 1262+5826	- 548+12156	- 673+13634	- 729+14581	- 480+6387
52	3472	-	- 598+5112	- 1259+5784	- 1262+5826	- 548+12235	- 676+13633	- 728+14578	- 480+6387
53	34	58	- 595+5093	- 1259+5784	- 1261+5816	336 48+667	1319 160+4277	1136 163+4375	- 481+6401
54	11447	-	- 595+5079	- 1259+5784	- 1261+5816	- 548+12274	- 686+13643	- 727+14558	- 481+6389

2 The Many-Valued Sentential Calculus

2.1 MV

問題	OTTER(sec) Basic	Ratio	OFBN sec/ M+D	OFN sec/ M+D	OFNu sec/ M+D	OFBS sec/ M+D	OFS sec/ M+D	OFSu sec/ M+D	MFBN sec/ M+D
55	FAIL		- / 265+11112	- / 340+16542	- / 429+27195	- / 314+13189	- / 375+16070	- / 486+21717	- / 278+11119
56	3	2	2 / 21+134	1 / 21+135	461 / 156+5119	1 / 23+81	1 / 24+81	8 / 63+376	3 / 24+152
57	4475	8	<1 / 9+23	<1 / 9+23	2 / 32+301	3 / 24+116	2 / 25+116	- / 486+21676	<1 / 10+30
58	3	2	41 / 55+637	18 / 57+646	- / 432+27364	22 / 61+372	15 / 63+376	9 / 64+404	87 / 70+917
59	-	2036	2414 / 151+4873	999 / 155+5072	- / 431+27344	- / 313+13169	- / 377+16125	- / 487+21754	- / 278+11221
60	-	2035	- / 266+11265	- / 341+16856	- / 430+27296	- / 313+13173	- / 374+15997	- / 488+21800	- / 278+11177
61	7	17	2341 / 152+4928	902 / 156+5137	- / 429+27264	28 / 63+464	18 / 65+470	66 / 109+1565	7852 / 255+8513
62	-	2041	- / 266+11325	- / 342+17128	- / 429+27213	- / 312+13143	- / 375+16064	- / 488+21807	- / 279+11295

3 The Implicational Propositional Calculus

問題	OTTER(sec) Basic	Ratio	OFBN sec/ M+D	OFN sec/ M+D	OFNu sec/ M+D	OFBS sec/ M+D	OFS sec/ M+D	OFSu sec/ M+D	MFBN sec/ M+D
63	50	101	18 / 38+300	10 / 39+310	6917 / 349+17679	2254 / 154+3594	1352 / 155+3621	1735 / 189+8113	25 / 43+379
64	8	<1	1 / 18+32	1 / 28+50	8 / 78+86	12 / 31+56	19 / 89+331	18 / 90+333	<1 / 11+27
65	8	<1	1 / 14+32	1 / 28+52	9 / 80+86	13 / 31+63	22 / 93+339	19 / 94+339	<1 / 12+26
66	32	47	- / 633+5123	- / 1117+4728	- / 1126+5164	25 / 78+126	81 / 193+462	76 / 194+472	- / 706+4253
67	7933	13985	- / 623+5032	- / 1107+4535	- / 1128+5176	- / 887+6473	- / 1034+6803	- / 1121+7809	- / 691+4188
68	2172	3753	- / 627+5053	- / 1112+4551	- / 1126+5168	- / 900+6628	- / 1049+6984	- / 1119+7809	- / 698+4215

4 The Equivalential Calculus

4.1 EC

問題	OTTER(sec) Basic	Ratio	OFBN sec/ M+D	OFN sec/ M+D	OFNu sec/ M+D	OFBS sec/ M+D	OFS sec/ M+D	OFSu sec/ M+D	MFBN sec/ M+D
69	244	366	<1 6+28	<1 6+28	11 34+843	- 162+10339	13542 203+14827	- 245+21656	8 20+243
70	<1	<1	<1 4+9	<1 4+9	<1 2+5	<1 4+7	<1 4+7	<1 2+3	<1 3+3
71	<1	<1	<1 9+38	<1 9+38	58 47+1742	<1 5+7	<1 6+8	<1 7+9	<1 7+37
72	32	2	1 10+54	<1 10+54	158 64+2953	<1 11+34	<1 14+36	1240 134+6090	8 17+202
73	2	5	<1 6+21	<1 6+21	5 27+450	<1 10+39	<1 10+39	8 38+469	7 20+213
74	34	54	6 19+179	3 19+179	12882 198+26804	29 33+419	18 33+419	1890 162+7562	14 23+286
75	558	1074	- 172+7260	- 198+10481	- 291+24651	- 177+10145	- 196+12213	- 259+20343	- 105+6518
76	<1	<1	<1 1+1	<1 1+1	<1 2+2	<1 1+1	<1 1+1	<1 2+2	<1 1+1
77	98	164	- 127+7930	- 161+12618	- 216+27223	- 165+9601	- 195+13647	- 233+21277	- 127+8044
78	326	474	- 142+6848	- 179+10143	- 248+22306	- 149+9338	- 175+13275	- 239+22514	- 141+6626
79	188	250	- 141+6290	- 162+8180	- 350+21754	- 161+8953	- 189+11357	- 246+21944	- 154+6130
80	281	592	- 146+7145	- 207+16114	- 241+21239	- 165+10955	- 224+18889	- 257+25321	- 120+7305
81	245	449	- 156+4989	- 169+5950	- 373+22437	- 140+7458	- 165+9178	- 255+24030	- 155+5128
82	-	-	- 172+7402	- 245+14647	- 288+21864	- 169+10696	- 214+17092	- 235+20872	- 169+7262
83	-	-	- 194+7270	- 325+13509	- 412+20659	- 316+9489	- 356+14085	- 400+20084	- 189+7181
84	750	1690	- 153+5405	- 178+7278	- 317+21217	- 157+7745	- 191+11031	- 321+24085	- 130+5010

4.2 R

問題	OTTER(sec) Basic	Ratio	OFBN sec/ M+D	OFN sec/ M+D	OFNu sec/ M+D	OFBS sec/ M+D	OFS sec/ M+D	OFSu sec/ M+D	MFBN sec/ M+D
85	<1	<1	<1 2+2	<1 2+2	<1 4+7	<1 2+2	<1 2+2	<1 3+3	<1 2+2
86	21	11	1 9+55	<1 9+57	72 66+1655	<1 5+16	<1 5+16	688 116+4831	1 10+76
87	-	-	- 160+6626	- 196+9351	- 320+23288	- 191+10540	- 237+16039	- 275+21462	- 131+6181
88	41	42	89 55+729	23 55+729	- 476+24538	851 97+2694	340 97+2694	2754 167+9321	36 50+471

4.3 LG

問題	OTTER(sec)		OFBN sec/ M+D	OFN sec/ M+D	OFNu sec/ M+D	OFBS sec/ M+D	OFS sec/ M+D	OFSu sec/ M+D	MFBN sec/ M+D
	Basic	Ratio							
89	115	115	<1 / 7+25	<1 / 7+25	12 / 32+735	3119 / 132+5151	1378 / 132+5151	- / 274+21093	<1 / 8+31
90	222	6	<1 / 6+21	<1 / 6+21	5 / 27+427	<1 / 8+25	<1 / 9+25	- / 275+21109	<1 / 7+19
91	109	8	<1 / 4+13	<1 / 4+13	1 / 17+195	<1 / 4+10	<1 / 4+10	- / 150+20558	<1 / 3+5
92	-	-	- / 127+9478	- / 165+17128	- / 198+25565	- / 177+11024	- / 238+15958	- / 275+21107	- / 167+9588
93	-	-	- / 112+8979	- / 161+17881	- / 191+24690	- / 173+11011	- / 224+17770	- / 247+21583	- / 131+7541
94	<1	<1	3 / 30+88	2 / 32+92	77 / 124+1470	<1 / 9+21	<1 / 10+22	<1 / 16+53	1 / 18+50
95	16	30	168 / 51+1025	45 / 51+1025	- / 311+24740	3 / 20+131	2 / 21+132	258 / 95+2827	59 / 41+591
96	211	295	- / 119+8768	7332 / 134+11071	- / 193+24620	- / 212+10400	9851 / 224+11819	- / 284+20588	- / 119+9010
97	<1	<1	4 / 23+123	1 / 23+123	712 / 146+5014	<1 / 10+34	<1 / 10+33	<1 / 18+79	5 / 26+138
98	10905	-	- / 159+9374	- / 231+19715	- / 254+26162	- / 195+10708	- / 246+15231	- / 283+19576	- / 171+9231
99	<1	<1	<1 / 6+15	<1 / 6+15	1 / 21+140	<1 / 5+12	<1 / 5+12	<1 / 6+17	<1 / 7+22
100	<1	<1	<1 / 5+8	<1 / 5+8	<1 / 13+48	1 / 12+39	1 / 12+39	<1 / 17+77	<1 / 5+8
101	<1	2	<1 / 7+16	<1 / 7+16	1 / 23+112	<1 / 6+11	<1 / 6+11	<1 / 8+14	<1 / 9+23

4.4 RG

問題	OTTER(sec) Basic	OTTER(sec) Ratio	OFBN sec / M+D	OFN sec / M+D	OFNu sec / M+D	OFBS sec / M+D	OFS sec / M+D	OFSu sec / M+D	MFBN sec / M+D
102	130	133	- / 268+8653	- / 413+15849	- / 464+19730	3112 / 151+4512	1602 / 154+4517	- / 282+19850	- / 295+8118
103	-	-	- / 268+8607	- / 412+15724	- / 464+19717	- / 223+9700	- / 248+12319	- / 282+19841	- / 294+8098
104	-	889	84 / 57+610	33 / 57+613	- / 464+19718	- / 222+9489	11726 / 239+11185	- / 282+19850	5445 / 228+4888
105	-	-	- / 264+8440	- / 393+14947	- / 464+19703	- / 222+9436	- / 243+11800	- / 282+19855	- / 290+8015
106	9606	-	- / 312+8297	- / 446+14324	- / 526+21451	- / 213+8852	- / 250+11161	- / 315+19504	- / 312+8258
107	<1	<1	<1 / 4+9	<1 / 4+9	<1 / 13+75	<1 / 3+5	<1 / 3+5	<1 / 8+25	<1 / 4+7
108	757	1495	- / 144+8586	- / 207+17133	- / 240+23103	3378 / 124+4860	1776 / 129+4888	- / 293+20494	- / 120+8861
109	91	142	- / 291+7451	- / 426+12770	- / 559+20202	14 / 26+254	8 / 28+258	8749 / 252+15769	- / 313+7395
110	5837	-	- / 182+8637	- / 230+12325	- / 335+26237	- / 205+8604	- / 230+10955	- / 285+21280	- / 160+7753
111	<1	<1	<1 / 6+12	<1 / 6+12	1 / 18+99	<1 / 7+16	<1 / 8+17	1 / 18+85	<1 / 4+5
112	120	143	1060 / 91+2705	353 / 95+2763	- / 279+22367	- / 212+9758	13479 / 243+12349	- / 294+20173	2757 / 115+4365

5 まとめ

5.1 証明できた問題数

分野 (問題数)	OTTER		OFBN	OFN	OFNu	OFBS	OFS	OFSu	MFBN
	Basic	Ratio							
CN(36)	27 75.0 %	29 80.6 %	14 38.9 %	14 38.9 %	10 27.8 %	12 33.3 %	15 41.7 %	19 52.8 %	16 44.4 %
C0(13)	9 69.2 %	9 69.2 %	7 53.8 %	7 53.8 %	4 30.8 %	6 46.2 %	6 46.2 %	6 46.2 %	7 53.8 %
AN(5)	3 60.0 %	1 20.0 %	0 0.0 %	0 0.0 %	0 0.0 %	1 20.0 %	1 20.0 %	1 20.0 %	0 0.0 %
MV(8)	4 50.0 %	7 87.5 %	5 62.5 %	5 62.5 %	2 25.0 %	4 50.0 %	4 50.0 %	3 37.5 %	4 50.0 %
IPC(6)	6 100.0 %	6 100.0 %	3 50.0 %	3 50.0 %	3 50.0 %	4 66.7 %	4 66.7 %	4 66.7 %	3 50.0 %
EC(16)	14 87.5 %	14 87.5 %	7 43.8 %	7 43.8 %	7 43.8 %	5 31.3 %	7 43.8 %	6 37.5 %	7 43.8 %
R(4)	3 75.0 %	3 75.0 %	3 75.0 %	3 75.0 %	2 50.0 %	3 75.0 %	3 75.0 %	3 75.0 %	3 75.0 %
LG(13)	11 84.6 %	10 76.9 %	9 69.2 %	10 76.9 %	8 61.5 %	9 69.2 %	10 76.9 %	6 46.2 %	9 69.2 %
RG(11)	8 72.7 %	7 63.6 %	4 36.4 %	4 36.4 %	2 18.2 %	5 45.5 %	7 63.6 %	3 27.3 %	4 36.4 %
(112)	85 75.9 %	86 76.8 %	52 46.4 %	53 47.3 %	38 33.9 %	49 43.8 %	57 50.1 %	51 45.5 %	53 47.3 %