

A new general-purpose algorithm for mixed-integer bilevel linear programs

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June 29, 2016

Abstract

This appendix contains detailed computational results for all the instances in the testbed of the paper *A new general-purpose algorithm for mixed-integer bilevel linear programs*. A technical report of this paper is available at <http://homepage.univie.ac.at/markus.sinnl/program-codes/bilevel/>.

Instance Set DENEGRÉ

The instances are available at <http://coral.ise.lehigh.edu/data-sets/bilevel-instances/detailed-bilevel-instances-mips-random/>

Table 1: Results for instance set DENEGRÉ.

instance	BestSol	LB	%gap	time [s]
miblp-20-15-50-0110-10-10	-206	-206.0000	0.00	0.32
miblp-20-15-50-0110-10-1	-388	-388.0000	0.00	0.91
miblp-20-15-50-0110-10-2	-398	-398.0000	0.00	7.83
miblp-20-15-50-0110-10-3	-42	-42.0000	0.00	2.41
miblp-20-15-50-0110-10-4	-729	-729.0000	0.00	0.55
miblp-20-15-50-0110-10-5	-281	-281.0000	0.00	0.45
miblp-20-15-50-0110-10-6	-246	-246.0000	0.00	15.91
miblp-20-15-50-0110-10-7	-260	-260.0000	0.00	0.44
miblp-20-15-50-0110-10-8	-293	-293.0000	0.00	0.39
miblp-20-15-50-0110-10-9	-635	-635.0000	0.00	0.50
miblp-20-20-50-0110-10-10	-441	-441.0000	0.00	2927.10
miblp-20-20-50-0110-10-1	-359	-359.0000	0.00	1.70
miblp-20-20-50-0110-10-2	-659	-659.0000	0.00	0.70
miblp-20-20-50-0110-10-3	-618	-618.0000	0.00	0.27
miblp-20-20-50-0110-10-4	-604	-604.0000	0.00	0.50
miblp-20-20-50-0110-10-5	-1003	-1003.0000	0.00	0.22
miblp-20-20-50-0110-10-6	-731	-731.0000	0.00	9.91
miblp-20-20-50-0110-10-7	-683	-683.0000	0.00	0.29
miblp-20-20-50-0110-10-8	-667	-667.0000	0.00	15.11
miblp-20-20-50-0110-10-9	-256	-256.0000	0.00	0.47
miblp-20-20-50-0110-15-10	-251	-251.0000	0.00	0.44

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Table 1 – continued from previous page

instance	BestSol	LB	%gap	time [s]
miblp-20-20-50-0110-15-1	-450	-450.0000	0.00	0.34
miblp-20-20-50-0110-15-2	-645	-645.0000	0.00	0.29
miblp-20-20-50-0110-15-3	-593	-593.0000	0.00	3.15
miblp-20-20-50-0110-15-4	-441	-441.0000	0.00	5.06
miblp-20-20-50-0110-15-5	-379	-379.0000	0.00	1392.23
miblp-20-20-50-0110-15-6	-596	-596.0000	0.00	49.85
miblp-20-20-50-0110-15-7	-471	-471.0000	0.00	0.34
miblp-20-20-50-0110-15-8	-370	-370.0000	0.00	0.27
miblp-20-20-50-0110-15-9	-584	-584.0000	0.00	0.22
miblp-20-20-50-0110-5-10	-340	-340.0000	0.00	0.49
miblp-20-20-50-0110-5-11	-426	-426.0000	0.00	0.30
miblp-20-20-50-0110-5-12	-854	-854.0000	0.00	0.05
miblp-20-20-50-0110-5-13	-519	-519.0000	0.00	0.02
miblp-20-20-50-0110-5-14	-923	-923.0000	0.00	0.16
miblp-20-20-50-0110-5-15	-617	-617.0000	0.00	0.54
miblp-20-20-50-0110-5-16	-833	-833.0000	0.00	0.30
miblp-20-20-50-0110-5-17	-944	-944.0000	0.00	0.10
miblp-20-20-50-0110-5-18	-386	-386.0000	0.00	0.11
miblp-20-20-50-0110-5-19	-431	-431.0000	0.00	0.13
miblp-20-20-50-0110-5-1	-548	-548.0000	0.00	0.14
miblp-20-20-50-0110-5-20	-438	-438.0000	0.00	0.03
miblp-20-20-50-0110-5-2	-591	-591.0000	0.00	0.03
miblp-20-20-50-0110-5-3	-477	-477.0000	0.00	0.03
miblp-20-20-50-0110-5-4	-753	-753.0000	0.00	0.07
miblp-20-20-50-0110-5-5	-392	-392.0000	0.00	0.30
miblp-20-20-50-0110-5-6	-1061	-1061.0000	0.00	0.32
miblp-20-20-50-0110-5-7	-547	-547.0000	0.00	0.37
miblp-20-20-50-0110-5-8	-936	-936.0000	0.00	0.36
miblp-20-20-50-0110-5-9	-877	-877.0000	0.00	0.35

Instance Set MIPLIB

The instances are available at <http://homepage.univie.ac.at/markus.sinnl/program-codes/bilevel/>.

Table 2: Results for instance set MIPLIB.

instance	BestSol	LB	%gap	time [s]
air03-0.1	379800	344940.6202	9.18	3600.00
air03-0.5	512698	360653.0000	29.66	3600.00
air03-0.9	770100	358130.7506	53.50	3600.00
air04-0.1	56399	56291.5472	0.19	3600.00
air04-0.5	60076	56224.6292	6.41	3600.00
air04-0.9	73759	56035.8472	24.03	3600.00
air05-0.1	26577	26577.0000	0.00	401.27
air05-0.5	31290	26469.7692	15.41	3600.00
air05-0.9	40558	26350.2340	35.03	3600.00
cap6000-0.1	-1967015	-1967015.0000	0.00	586.98
cap6000-0.5	-	-2400881.8508	-	3600.00
cap6000-0.9	-	-2372513.7387	-	3600.00
enigma-0.1	0	0.0000	0.00	0.28
enigma-0.5	0	0.0000	0.00	6.20
enigma-0.9	0	0.0000	0.00	185.65
fast0507-0.1	12484	12484.0000	0.00	1.86
fast0507-0.5	61439	61439.0000	0.00	1.74
fast0507-0.9	109916	109916.0000	0.00	1.49
l152lav-0.1	4722	4722.0000	0.00	2.21
l152lav-0.5	4868	4758.5000	2.25	3600.00
l152lav-0.9	5072	4785.3277	5.65	3600.00
lseu-0.1	1120	1120.0000	0.00	0.07
lseu-0.5	2313	2036.3864	11.96	3600.00
lseu-0.9	5838	5838.0000	0.00	64.85
mitre-0.1	122235	115310.6145	5.66	3600.00
mitre-0.5	-	115492.2852	-	3600.00
mitre-0.9	-	115493.3824	-	3600.00
mod010-0.1	6554	6554.0000	0.00	4.20
mod010-0.5	6618	6573.4891	0.67	3600.00
mod010-0.9	7355	6565.6667	10.73	3600.00
nw04-0.1	17066	17066.0000	0.00	1139.69
nw04-0.5	24100	16689.4706	30.75	3600.00
nw04-0.9	52290	18241.2202	65.12	3600.00
p0033-0.1	3089	3089.0000	0.00	0.03
p0033-0.5	3095	3095.0000	0.00	0.02
p0033-0.9	4679	4679.0000	0.00	0.13
p0201-0.1	12555	9724.8337	22.54	3600.00
p0201-0.5	13635	13635.0000	0.00	1113.28
p0201-0.9	15025	15025.0000	0.00	0.98
p0282-0.1	260781	260781.0000	0.00	3.87
p0282-0.5	272659	267014.5318	2.07	3600.00
p0282-0.9	616034	398553.0624	35.30	3600.00
p0548-0.1	11051	9115.1458	17.52	3600.00
p0548-0.5	-	11358.4606	-	3600.00
p0548-0.9	49509	19026.7330	61.57	3600.00
p2756-0.1	12862	3338.0000	74.05	3600.00
p2756-0.5	25384	4077.6628	83.94	3600.00
p2756-0.9	33623	4685.3819	86.06	3600.00
seymour-0.1	476	469.9485	1.27	3600.00
seymour-0.5	807	807.0000	0.00	2.11
seymour-0.9	1251	1251.0000	0.00	0.54
stein27-0.1	18	18.0000	0.00	0.25
stein27-0.5	19	19.0000	0.00	0.02
stein27-0.9	24	24.0000	0.00	0.01
stein45-0.1	30	30.0000	0.00	2.59
stein45-0.5	32	32.0000	0.00	0.10
stein45-0.9	40	40.0000	0.00	0.01

Instance Set XUWANG

The instances are available at <http://lzwang.public.iastate.edu/bmilplib.html>.

Table 3: Results for instance set XUWANG.

instance	BestSol	LB	%gap	time [s]
bmilplib-10-10b1	-449	-449.0000	0.00	0.02
bmilplib-10-1b1	-352	-351.8333	0.00	0.01
bmilplib-10-2b1	-229	-229.0000	0.00	0.02
bmilplib-10-3b1	-460	-460.0000	0.00	0.03
bmilplib-10-4b1	-250	-250.0000	0.00	0.04
bmilplib-10-5b1	-329	-328.6000	0.00	0.04
bmilplib-10-6b1	-223	-223.0000	0.00	0.04
bmilplib-10-7b1	-307	-307.0000	0.00	0.02
bmilplib-10-8b1	-76	-76.5000	0.00	0.04
bmilplib-10-9b1	-79	-79.0000	0.00	0.02
bmilplib-110-10b1	-188	-187.5556	0.00	9.47
bmilplib-110-1b1	-184	-184.1333	0.00	0.31
bmilplib-110-2b1	-111	-110.6667	0.00	0.41
bmilplib-110-3b1	-236	-236.0000	0.00	0.11
bmilplib-110-4b1	-197	-197.2860	0.00	0.18
bmilplib-110-5b1	-195	-194.7377	0.00	0.12
bmilplib-110-6b1	-148	-148.2500	0.00	0.73
bmilplib-110-7b1	-161	-160.8643	0.00	0.27
bmilplib-110-8b1	-155	-155.0000	0.00	0.69
bmilplib-110-9b1	-193	-192.9213	0.00	0.25
bmilplib-160-10b1	-190	-189.8182	0.00	1.55
bmilplib-160-1b1	-165	-165.0000	0.00	0.53
bmilplib-160-2b1	-178	-178.2355	0.00	1.10
bmilplib-160-3b1	-175	-174.9448	0.00	2.62
bmilplib-160-4b1	-136	-135.9469	0.00	1.49
bmilplib-160-5b1	-141	-140.7778	0.00	2.08
bmilplib-160-6b1	-111	-111.0000	0.00	0.61
bmilplib-160-7b1	-96	-96.0000	0.00	2.71
bmilplib-160-8b1	-181	-181.4000	0.00	0.44
bmilplib-160-9b1	-208	-207.5000	0.00	0.32
bmilplib-210-10b1	-131	-130.5847	0.00	2.37
bmilplib-210-1b1	-137	-136.8000	0.00	0.90
bmilplib-210-2b1	-118	-117.8000	0.00	1.71
bmilplib-210-3b1	-131	-130.8000	0.00	1.09
bmilplib-210-4b1	-162	-162.1985	0.00	0.81
bmilplib-210-5b1	-134	-134.0000	0.00	2.40
bmilplib-210-6b1	-125	-125.4286	0.00	2.51
bmilplib-210-7b1	-170	-169.7258	0.00	3.39
bmilplib-210-8b1	-101	-101.4571	0.00	1.31
bmilplib-210-9b1	-184	-184.0000	0.00	4.95
bmilplib-260-10b1	-155	-155.0000	0.00	7.64
bmilplib-260-1b1	-139	-139.0000	0.00	2.21
bmilplib-260-2b1	-83	-82.6250	0.00	4.14
bmilplib-260-3b1	-144	-144.2500	0.00	2.17
bmilplib-260-4b1	-117	-117.3333	0.00	5.98
bmilplib-260-5b1	-121	-121.0000	0.00	2.99
bmilplib-260-6b1	-124	-124.0000	0.00	4.64
bmilplib-260-7b1	-138	-137.8000	0.00	6.49
bmilplib-260-8b1	-120	-119.8889	0.00	2.32
bmilplib-260-9b1	-160	-160.0000	0.00	3.74
bmilplib-310-10b1	-142	-141.8595	0.00	2.63
bmilplib-310-1b1	-117	-117.0000	0.00	2.76
bmilplib-310-2b1	-105	-105.0000	0.00	7.83
bmilplib-310-3b1	-128	-127.5231	0.00	8.91
bmilplib-310-4b1	-148	-147.7826	0.00	13.11
bmilplib-310-5b1	-161	-161.4500	0.00	3.09
bmilplib-310-6b1	-141	-141.1798	0.00	14.63
bmilplib-310-7b1	-142	-142.0000	0.00	14.41
bmilplib-310-8b1	-115	-115.3431	0.00	5.88
bmilplib-310-9b1	-116	-115.6491	0.00	3.76
bmilplib-360-10b1	-109	-108.5926	0.00	12.05
bmilplib-360-1b1	-133	-133.0000	0.00	15.15
bmilplib-360-2b1	-138	-138.4349	0.00	27.84
bmilplib-360-3b1	-131	-131.0000	0.00	9.78
bmilplib-360-4b1	-119	-119.0000	0.00	11.76
bmilplib-360-5b1	-167	-167.0000	0.00	6.89
bmilplib-360-6b1	-110	-110.1242	0.00	13.04

Table 3 – continued from previous page

instance	BestSol	LB	%gap	time [s]
bmilplib-360-7b1	-105	-105.0000	0.00	6.35
bmilplib-360-8b1	-98	-98.2500	0.00	16.46
bmilplib-360-9b1	-127	-127.2222	0.00	7.31
bmilplib-410-10b1	-153	-153.3671	0.00	42.14
bmilplib-410-1b1	-104	-103.5043	0.00	18.45
bmilplib-410-2b1	-109	-108.5953	0.00	9.64
bmilplib-410-3b1	-96	-96.2377	0.00	29.22
bmilplib-410-4b1	-120	-119.5000	0.00	6.77
bmilplib-410-5b1	-119	-119.2188	0.00	20.04
bmilplib-410-6b1	-151	-151.3077	0.00	8.36
bmilplib-410-7b1	-123	-123.0000	0.00	7.87
bmilplib-410-8b1	-126	-125.7837	0.00	10.55
bmilplib-410-9b1	-101	-100.7683	0.00	21.57
bmilplib-460-10b1	-103	-102.5143	0.00	22.01
bmilplib-460-1b1	-98	-97.5882	0.00	21.61
bmilplib-460-2b1	-139	-139.0000	0.00	8.96
bmilplib-460-3b1	-87	-86.5021	0.00	23.13
bmilplib-460-4b1	-107	-107.0305	0.00	35.65
bmilplib-460-5b1	-100	-100.4955	0.00	21.76
bmilplib-460-6b1	-107	-107.0000	0.00	21.71
bmilplib-460-7b1	-84	-83.7500	0.00	34.72
bmilplib-460-8b1	-115	-115.3878	0.00	23.87
bmilplib-460-9b1	-129	-128.7011	0.00	19.58
bmilplib-60-10b1	-186	-186.2051	0.00	0.23
bmilplib-60-1b1	-154	-153.5633	0.00	1.09
bmilplib-60-2b1	-145	-144.6667	0.00	0.11
bmilplib-60-3b1	-251	-251.4429	0.00	0.10
bmilplib-60-4b1	-234	-234.0000	0.00	0.08
bmilplib-60-5b1	-116	-116.4000	0.00	0.42
bmilplib-60-6b1	-189	-189.2927	0.00	0.08
bmilplib-60-7b1	-182	-181.7200	0.00	0.07
bmilplib-60-8b1	-232	-232.1212	0.00	0.22
bmilplib-60-9b1	-136	-136.5000	0.00	1.25
bmilplib-10-10b2	-463	-463.0000	0.00	0.16
bmilplib-10-1b2	-332	-332.1667	0.00	0.07
bmilplib-10-2b2	-301	-300.5714	0.00	0.02
bmilplib-10-3b2	-484	-484.0000	0.00	0.57
bmilplib-10-4b2	-304	-304.0000	0.00	0.02
bmilplib-10-5b2	-337	-336.6000	0.00	0.06
bmilplib-10-6b2	39	39.0000	0.00	2.66
bmilplib-10-7b2	-238	-238.0000	0.00	0.10
bmilplib-10-8b2	-88	-88.3571	0.00	0.08
bmilplib-10-9b2	-130	-129.8182	0.00	0.03
bmilplib-110-10b2	-251	-251.0000	0.00	122.50
bmilplib-110-1b2	-231	-231.3333	0.00	15.89
bmilplib-110-2b2	-206	-206.0000	0.00	1.66
bmilplib-110-3b2	-288	-287.9412	0.00	1.89
bmilplib-110-4b2	-258	-258.0000	0.00	8.18
bmilplib-110-5b2	-301	-300.7385	0.00	1.31
bmilplib-110-6b2	-239	-239.3246	0.00	25.47
bmilplib-110-7b2	-237	-237.0000	0.00	14.53
bmilplib-110-8b2	-250	-250.3364	0.00	4.74
bmilplib-110-9b2	-280	-280.0204	0.00	1.26
bmilplib-160-10b2	-255	-255.0729	0.00	123.31
bmilplib-160-1b2	-252	-251.8606	0.00	7.69
bmilplib-160-2b2	-268	-267.5918	0.00	38.47
bmilplib-160-3b2	-260	-260.2500	0.00	20.56
bmilplib-160-4b2	-222	-222.0000	0.00	90.87
bmilplib-160-5b2	-241	-240.9444	0.00	34.08
bmilplib-160-6b2	-230	-230.0606	0.00	3.78
bmilplib-160-7b2	-208	-207.7575	0.00	40.23
bmilplib-160-8b2	-266	-266.0000	0.00	2.75
bmilplib-160-9b2	-290	-289.6000	0.00	12.44
bmilplib-210-10b2	-230	-230.0000	0.00	106.99
bmilplib-210-1b2	-235	-234.7209	0.00	1.37
bmilplib-210-2b2	-218	-217.7500	0.00	73.68
bmilplib-210-3b2	-224	-223.6522	0.00	27.74
bmilplib-210-4b2	-245	-245.4167	0.00	40.98
bmilplib-210-5b2	-233	-233.2500	0.00	121.06
bmilplib-210-6b2	-214	-213.8182	0.00	76.41
bmilplib-210-7b2	-260	-259.5106	0.00	37.21
bmilplib-210-8b2	-197	-196.7472	0.00	13.44
bmilplib-210-9b2	-292	-292.3627	0.00	69.86
bmilplib-260-10b2	-229	-229.2000	0.00	768.71

Table 3 – continued from previous page

instance	BestSol	LB	%gap	time [s]
bmilplib-260-1b2	-242	-241.5000	0.00	18.74
bmilplib-260-2b2	-192	-191.8750	0.00	37.27
bmilplib-260-3b2	-227	-227.4356	0.00	128.85
bmilplib-260-4b2	-225	-225.0000	0.00	152.17
bmilplib-260-5b2	-218	-218.0000	0.00	80.74
bmilplib-260-6b2	-207	-207.0000	0.00	487.92
bmilplib-260-7b2	-227	-227.0000	0.00	282.02
bmilplib-260-8b2	-217	-217.0000	0.00	133.31
bmilplib-260-9b2	-230	-229.6667	0.00	1149.97
bmilplib-310-10b2	-222	-221.7910	0.00	374.59
bmilplib-310-1b2	-212	-212.0000	0.00	142.11
bmilplib-310-2b2	-213	-212.5714	0.00	93.31
bmilplib-310-3b2	-234	-233.8114	0.00	192.91
bmilplib-310-4b2	-258	-258.2688	0.00	104.78
bmilplib-310-5b2	-254	-254.1811	0.00	337.83
bmilplib-310-6b2	-224	-224.3333	0.00	1135.21
bmilplib-310-7b2	-235	-234.7043	0.00	710.06
bmilplib-310-8b2	-218	-217.9601	0.00	50.42
bmilplib-310-9b2	-206	-205.9665	0.00	317.47
bmilplib-360-10b2	-208	-208.3491	0.00	261.25
bmilplib-360-1b2	-215	-215.0000	0.00	2564.55
bmilplib-360-2b2	-227	-227.3768	0.00	2668.17
bmilplib-360-3b2	-229	-229.0000	0.00	512.91
bmilplib-360-4b2	-224	-224.0000	0.00	270.74
bmilplib-360-5b2	-253	-253.0000	0.00	896.66
bmilplib-360-6b2	-232	-232.4400	0.00	21.91
bmilplib-360-7b2	-223	-222.7143	0.00	407.97
bmilplib-360-8b2	-207	-206.8000	0.00	99.58
bmilplib-360-9b2	-227	-227.0000	0.00	286.52
bmilplib-410-10b2	-241	-250.3735	3.89	3600.00
bmilplib-410-1b2	-202	-201.5000	0.00	299.19
bmilplib-410-2b2	-230	-230.0000	0.00	33.30
bmilplib-410-3b2	-196	-195.9776	0.00	714.75
bmilplib-410-4b2	-232	-232.0033	0.00	156.61
bmilplib-410-5b2	-210	-209.5000	0.00	796.23
bmilplib-410-6b2	-244	-244.0000	0.00	349.61
bmilplib-410-7b2	-218	-218.2857	0.00	568.76
bmilplib-410-8b2	-237	-236.8333	0.00	227.73
bmilplib-410-9b2	-208	-207.6923	0.00	647.59
bmilplib-460-10b2	-209	-209.0345	0.00	1047.34
bmilplib-460-1b2	-202	-202.0000	0.00	1553.11
bmilplib-460-2b2	-224	-224.0000	0.00	750.37
bmilplib-460-2	-139	-139.0000	0.00	9.58
bmilplib-460-3b2	-184	-184.0000	0.00	650.88
bmilplib-460-3	-87	-86.5021	0.00	23.56
bmilplib-460-4b2	-212	-211.8235	0.00	2261.18
bmilplib-460-5b2	-215	-215.4462	0.00	484.51
bmilplib-460-6b2	-203	-203.2333	0.00	1190.47
bmilplib-460-7b2	-187	-187.3979	0.00	501.34
bmilplib-460-8b2	-207	-207.0000	0.00	2144.19
bmilplib-460-9b2	-225	-225.0000	0.00	2684.42
bmilplib-60-10b2	-285	-285.0363	0.00	0.72
bmilplib-60-1b2	-218	-218.2640	0.00	11.08
bmilplib-60-2b2	-218	-218.0000	0.00	2.64
bmilplib-60-3b2	-300	-300.0429	0.00	0.17
bmilplib-60-4b2	-305	-305.2500	0.00	0.15
bmilplib-60-5b2	-188	-188.2000	0.00	11.15
bmilplib-60-6b2	-272	-272.2714	0.00	0.37
bmilplib-60-7b2	-252	-252.0000	0.00	0.19
bmilplib-60-8b2	-311	-311.3333	0.00	1.72
bmilplib-60-9b2	-216	-216.4286	0.00	12.61
bmilplib-10-10	-444	-444.3333	0.00	2.95
bmilplib-10-1	-352	-351.8333	0.00	2.90
bmilplib-10-2	-229	-229.0000	0.00	2.64
bmilplib-10-3	-437	-437.0000	0.00	2.93
bmilplib-10-4	-250	-250.0000	0.00	2.83
bmilplib-10-5	-264	-263.6000	0.00	2.35
bmilplib-10-6	-67	-67.0000	0.00	3.05
bmilplib-10-7	-224	-224.0000	0.00	1.99
bmilplib-10-8	-66	-66.5000	0.00	2.63
bmilplib-10-9	-79	-79.0000	0.00	1.86
bmilplib-110-10	-178	-177.6667	0.00	12.08
bmilplib-110-1	-182	-181.6667	0.00	1.78
bmilplib-110-2	-111	-110.6667	0.00	1.32

Table 3 – continued from previous page

instance	BestSol	LB	%gap	time [s]
bmilplib-110-3	-215	-215.1600	0.00	1.69
bmilplib-110-4	-197	-197.2860	0.00	1.80
bmilplib-110-5	-195	-194.7377	0.00	1.28
bmilplib-110-6	-148	-148.2500	0.00	2.29
bmilplib-110-7	-161	-160.8643	0.00	1.37
bmilplib-110-8	-155	-155.0000	0.00	2.08
bmilplib-110-9	-193	-192.9213	0.00	2.07
bmilplib-160-10	-190	-189.8182	0.00	2.68
bmilplib-160-1	-165	-165.0000	0.00	1.93
bmilplib-160-2	-178	-178.2355	0.00	1.63
bmilplib-160-3	-175	-174.9448	0.00	3.00
bmilplib-160-4	-136	-135.8333	0.00	2.42
bmilplib-160-5	-141	-140.7778	0.00	2.75
bmilplib-160-6	-111	-111.0000	0.00	1.12
bmilplib-160-7	-96	-96.0000	0.00	3.51
bmilplib-160-8	-181	-181.4000	0.00	1.20
bmilplib-160-9	-208	-207.5000	0.00	1.18
bmilplib-210-10	-131	-130.5847	0.00	3.00
bmilplib-210-1	-137	-136.8000	0.00	1.66
bmilplib-210-2	-118	-117.8000	0.00	2.58
bmilplib-210-3	-131	-130.8000	0.00	1.30
bmilplib-210-4	-162	-162.1985	0.00	1.16
bmilplib-210-5	-134	-134.0000	0.00	2.51
bmilplib-210-6	-125	-125.4286	0.00	2.94
bmilplib-210-7	-170	-169.7258	0.00	3.43
bmilplib-210-8	-101	-101.4571	0.00	1.74
bmilplib-210-9	-184	-184.0000	0.00	5.21
bmilplib-260-10	-152	-151.7310	0.00	10.91
bmilplib-260-1	-139	-139.0000	0.00	2.93
bmilplib-260-2	-83	-82.6250	0.00	4.35
bmilplib-260-3	-144	-144.2500	0.00	2.89
bmilplib-260-4	-117	-117.3333	0.00	5.98
bmilplib-260-5	-121	-121.0000	0.00	3.21
bmilplib-260-6	-124	-124.0000	0.00	4.82
bmilplib-260-7	-138	-137.8000	0.00	5.55
bmilplib-260-8	-120	-119.8889	0.00	2.50
bmilplib-260-9	-160	-160.0000	0.00	6.57
bmilplib-310-10	-142	-141.8595	0.00	3.01
bmilplib-310-1	-117	-117.0000	0.00	4.64
bmilplib-310-2	-105	-105.0000	0.00	9.74
bmilplib-310-3	-128	-127.5231	0.00	11.07
bmilplib-310-4	-148	-147.7826	0.00	13.77
bmilplib-310-5	-161	-161.4500	0.00	7.20
bmilplib-310-6	-141	-141.1798	0.00	16.29
bmilplib-310-7	-142	-142.0000	0.00	15.23
bmilplib-310-8	-115	-115.3431	0.00	7.99
bmilplib-310-9	-116	-115.6491	0.00	4.70
bmilplib-360-10	-109	-108.5926	0.00	14.02
bmilplib-360-1	-133	-133.0000	0.00	16.69
bmilplib-360-2	-138	-138.4349	0.00	28.24
bmilplib-360-3	-131	-131.0000	0.00	11.17
bmilplib-360-4	-119	-119.0000	0.00	13.06
bmilplib-360-5	-164	-164.2566	0.00	11.00
bmilplib-360-6	-110	-110.1242	0.00	15.08
bmilplib-360-7	-105	-105.0000	0.00	7.12
bmilplib-360-8	-98	-98.2500	0.00	18.51
bmilplib-360-9	-127	-127.2222	0.00	8.98
bmilplib-410-10	-153	-153.3671	0.00	41.62
bmilplib-410-1	-104	-103.5043	0.00	19.31
bmilplib-410-2	-109	-108.5953	0.00	10.48
bmilplib-410-3	-96	-96.2377	0.00	29.41
bmilplib-410-4	-120	-119.5000	0.00	8.25
bmilplib-410-5	-119	-119.2188	0.00	20.97
bmilplib-410-6	-151	-151.3077	0.00	9.99
bmilplib-410-7	-123	-123.0000	0.00	8.77
bmilplib-410-8	-126	-125.7837	0.00	14.86
bmilplib-410-9	-101	-100.7683	0.00	23.37
bmilplib-460-10	-103	-102.5143	0.00	22.50
bmilplib-460-1	-98	-97.5882	0.00	21.72
bmilplib-460-2	-139	-139.0000	0.00	9.70
bmilplib-460-3	-87	-86.5021	0.00	22.22
bmilplib-460-4	-107	-107.0305	0.00	34.94
bmilplib-460-5	-100	-100.4955	0.00	21.39
bmilplib-460-6	-107	-107.0000	0.00	20.99

Table 3 – continued from previous page

instance	BestSol	LB	%gap	time [s]
bmilplib-460-7	-84	-83.7500	0.00	32.20
bmilplib-460-8	-115	-115.3878	0.00	22.08
bmilplib-460-9	-129	-128.7011	0.00	23.42
bmilplib-60-10	-186	-186.2051	0.00	1.61
bmilplib-60-1	-153	-153.1966	0.00	1.61
bmilplib-60-2	-145	-144.6667	0.00	0.45
bmilplib-60-3	-251	-251.4429	0.00	0.48
bmilplib-60-4	-221	-221.2500	0.00	0.68
bmilplib-60-5	-116	-116.4000	0.00	0.53
bmilplib-60-6	-187	-187.3077	0.00	0.66
bmilplib-60-7	-182	-181.7200	0.00	0.65
bmilplib-60-8	-232	-232.1212	0.00	0.80
bmilplib-60-9	-136	-136.5000	0.00	1.73

Instance Set INTER-KP

The instances are available at <http://coral.ise.lehigh.edu/data-sets/bilevel-instances/detailed-bilevel-instances-mcdm/>.

Table 4: Results for instance set INTER-KP.

instance	BestSol	LB	%gap	time [s]
K5010W01	1401	1401.0000	0.00	0.43
K5010W02	1060	1060.0000	0.00	0.40
K5010W03	526	526.0000	0.00	0.31
K5010W04	1533	1533.0000	0.00	0.34
K5010W05	2114	2114.0000	0.00	0.34
K5010W06	1100	1100.0000	0.00	0.44
K5010W07	1135	1135.0000	0.00	0.37
K5010W08	1707	1707.0000	0.00	0.37
K5010W09	271	271.0000	0.00	0.36
K5010W10	509	509.0000	0.00	0.40
K5010W11	1759	1759.0000	0.00	0.42
K5010W12	1223	1223.0000	0.00	0.39
K5010W13	700	700.0000	0.00	0.32
K5010W14	644	644.0000	0.00	0.34
K5010W15	1723	1723.0000	0.00	0.36
K5010W16	1098	1098.0000	0.00	0.35
K5010W17	1465	1465.0000	0.00	0.31
K5010W18	1580	1580.0000	0.00	0.35
K5010W19	2055	2055.0000	0.00	0.43
K5010W20	1998	1998.0000	0.00	0.25
K5020W01	2379	2379.0000	0.00	2.55
K5020W02	2785	2785.0000	0.00	2.70
K5020W03	1550	1550.0000	0.00	0.64
K5020W04	2131	2131.0000	0.00	1.98
K5020W05	3212	3212.0000	0.00	4.90
K5020W06	1245	1245.0000	0.00	0.90
K5020W07	1432	1432.0000	0.00	0.84
K5020W08	3117	3117.0000	0.00	8.82
K5020W09	1177	1177.0000	0.00	0.91
K5020W10	2098	2098.0000	0.00	1.67
K5020W11	1804	1804.0000	0.00	2.42
K5020W12	2086	2086.0000	0.00	0.76
K5020W13	2194	2194.0000	0.00	1.17
K5020W14	1999	1999.0000	0.00	1.65
K5020W15	1793	1793.0000	0.00	0.91
K5020W16	1776	1776.0000	0.00	1.31
K5020W17	2767	2767.0000	0.00	1.87
K5020W18	2021	2021.0000	0.00	1.38
K5020W19	4124	4124.0000	0.00	11.71
K5020W20	1949	1949.0000	0.00	0.67
K5030W01	2956	2956.0000	0.00	39.88
K5030W02	3529	3529.0000	0.00	86.77
K5030W03	2706	2706.0000	0.00	43.01
K5030W04	3201	3201.0000	0.00	73.32
K5030W05	4861	4861.0000	0.00	569.09
K5030W06	1997	1997.0000	0.00	12.12
K5030W07	2270	2270.0000	0.00	18.99
K5030W08	4902	4902.0000	0.00	1077.40
K5030W09	2201	2201.0000	0.00	14.06
K5030W10	2668	2668.0000	0.00	19.00
K5030W11	2013	2013.0000	0.00	28.67
K5030W12	2534	2534.0000	0.00	11.42
K5030W13	3152	3152.0000	0.00	21.57
K5030W14	2184	2184.0000	0.00	23.05
K5030W15	2841	2841.0000	0.00	53.60
K5030W16	2102	2102.0000	0.00	12.57
K5030W17	3553	3553.0000	0.00	98.74
K5030W18	2602	2602.0000	0.00	19.66
K5030W19	5015	5015.0000	0.00	710.57
K5030W20	2496	2496.0000	0.00	11.95
K5040W01	4254	3204.0000	24.68	3600.00
K5040W02	4423	4423.0000	0.00	2533.36
K5040W03	3440	3440.0000	0.00	1578.91
K5040W04	3574	3574.0000	0.00	1158.20
K5040W05	4646	3363.6302	27.60	3600.00
K5040W06	2606	2606.0000	0.00	233.58

Table 4 – continued from previous page

instance	BestSol	LB	%gap	time [s]
K5040W07	3244	3244.0000	0.00	600.63
K5040W08	6345	2870.0000	54.77	3600.00
K5040W09	3154	3154.0000	0.00	410.00
K5040W10	4382	4382.0000	0.00	3099.20
K5040W11	3389	3389.0000	0.00	1120.76
K5040W12	3817	3817.0000	0.00	593.61
K5040W13	4174	4174.0000	0.00	1126.49
K5040W14	3374	3374.0000	0.00	1090.91
K5040W15	3925	3164.8373	19.37	3600.00
K5040W16	2605	2605.0000	0.00	194.39
K5040W17	3996	3996.0000	0.00	2645.77
K5040W18	3342	3342.0000	0.00	918.78
K5040W19	5299	3167.0000	40.23	3600.00
K5040W20	2875	2875.0000	0.00	267.87
K5050W01	4244	2610.2294	38.50	3600.00
K5050W02	5280	2559.0000	51.53	3600.00
K5050W03	5483	2530.0283	53.86	3600.00
K5050W04	3999	2401.0000	39.96	3600.00
K5050W05	5109	2408.0000	52.87	3600.00
K5050W06	3558	2691.9300	24.34	3600.00
K5050W07	4521	2355.0000	47.91	3600.00
K5050W08	8215	2706.5175	67.05	3600.00
K5050W09	4775	2521.0000	47.20	3600.00
K5050W10	5575	2682.1036	51.89	3600.00
K5050W11	3855	2287.0000	40.67	3600.00
K5050W12	4885	2738.0731	43.95	3600.00
K5050W13	4926	2816.0000	42.83	3600.00
K5050W14	5055	2249.0000	55.51	3600.00
K5050W15	4757	2240.7014	52.90	3600.00
K5050W16	4039	2222.0000	44.99	3600.00
K5050W17	5666	2672.0930	52.84	3600.00
K5050W18	4591	2858.0000	37.75	3600.00
K5050W19	6022	2717.5260	54.87	3600.00
K5050W20	4303	2247.0000	47.78	3600.00
nK5010W01	977	977.0000	0.00	0.15
nK5010W02	2260	2260.0000	0.00	0.10
nK5010W03	1231	1231.0000	0.00	0.06
nK5010W04	1590	1590.0000	0.00	0.10
nK5010W05	1476	1476.0000	0.00	0.11
nK5010W06	936	936.0000	0.00	0.11
nK5010W07	1668	1668.0000	0.00	0.13
nK5010W08	1771	1771.0000	0.00	0.14
nK5010W09	820	820.0000	0.00	0.06
nK5010W10	1065	1065.0000	0.00	0.09
nK5010W11	425	425.0000	0.00	0.08
nK5010W12	773	773.0000	0.00	0.10
nK5010W13	760	760.0000	0.00	0.14
nK5010W14	1260	1260.0000	0.00	0.10
nK5010W15	730	730.0000	0.00	0.09
nK5010W16	1712	1712.0000	0.00	0.10
nK5010W17	1761	1761.0000	0.00	0.07
nK5010W18	905	905.0000	0.00	0.13
nK5010W19	1568	1568.0000	0.00	0.10
nK5010W20	939	939.0000	0.00	0.10
nK5011W01	1007	1007.0000	0.00	0.14
nK5011W02	2198	2198.0000	0.00	0.10
nK5011W03	1762	1762.0000	0.00	0.11
nK5011W04	1475	1475.0000	0.00	0.08
nK5011W05	795	795.0000	0.00	0.13
nK5011W06	678	678.0000	0.00	0.10
nK5011W07	1403	1403.0000	0.00	0.14
nK5011W08	1803	1803.0000	0.00	0.13
nK5011W09	926	926.0000	0.00	0.08
nK5011W10	1855	1855.0000	0.00	0.12
nK5011W11	1161	1161.0000	0.00	0.11
nK5011W12	973	973.0000	0.00	0.12
nK5011W13	893	893.0000	0.00	0.06
nK5011W14	1492	1492.0000	0.00	0.10
nK5011W15	1060	1060.0000	0.00	0.13
nK5011W16	2182	2182.0000	0.00	0.13
nK5011W17	633	633.0000	0.00	0.09
nK5011W18	1220	1220.0000	0.00	0.12
nK5011W19	2575	2575.0000	0.00	0.15
nK5011W20	1325	1325.0000	0.00	0.14

Table 4 – continued from previous page

instance	BestSol	LB	%gap	time [s]
nK5012W01	2317	2317.0000	0.00	0.16
nK5012W02	1169	1169.0000	0.00	0.18
nK5012W03	1506	1506.0000	0.00	0.13
nK5012W04	935	935.0000	0.00	0.20
nK5012W05	1421	1421.0000	0.00	0.17
nK5012W06	628	628.0000	0.00	0.08
nK5012W07	1601	1601.0000	0.00	0.17
nK5012W08	1850	1850.0000	0.00	0.18
nK5012W09	1236	1236.0000	0.00	0.17
nK5012W10	1224	1224.0000	0.00	0.07
nK5012W11	602	602.0000	0.00	0.07
nK5012W12	1743	1743.0000	0.00	0.16
nK5012W13	1847	1847.0000	0.00	0.19
nK5012W14	2188	2188.0000	0.00	0.17
nK5012W15	812	812.0000	0.00	0.12
nK5012W16	2197	2197.0000	0.00	0.16
nK5012W17	2275	2275.0000	0.00	0.14
nK5012W18	1097	1097.0000	0.00	0.08
nK5012W19	753	753.0000	0.00	0.15
nK5012W20	1412	1412.0000	0.00	0.12

Instance Set INTER-KP2

The instances are available at http://people.clemson.edu/7Ejcsmith/Test_Instances_files/BKPIns.zip.

Table 5: Results for instance set INTER-KP2.

instance	BestSol	LB	%gap	time [s]
BKPIns-15-12-10	24	24.0000	0.00	0.05
BKPIns-15-12-1	5	5.0000	0.00	0.04
BKPIns-15-12-2	23	23.0000	0.00	0.04
BKPIns-15-12-3	17	17.0000	0.00	0.05
BKPIns-15-12-4	44	44.0000	0.00	0.04
BKPIns-15-12-5	30	30.0000	0.00	0.06
BKPIns-15-12-6	8	8.0000	0.00	0.07
BKPIns-15-12-7	12	12.0000	0.00	0.07
BKPIns-15-12-8	31	31.0000	0.00	0.04
BKPIns-15-12-9	17	17.0000	0.00	0.06
BKPIns-15-4-10	270	270.0000	0.00	0.56
BKPIns-15-4-1	194	194.0000	0.00	0.58
BKPIns-15-4-2	217	217.0000	0.00	0.52
BKPIns-15-4-3	184	184.0000	0.00	0.66
BKPIns-15-4-4	344	344.0000	0.00	1.04
BKPIns-15-4-5	291	291.0000	0.00	0.82
BKPIns-15-4-6	301	301.0000	0.00	0.82
BKPIns-15-4-7	247	247.0000	0.00	0.65
BKPIns-15-4-8	348	348.0000	0.00	0.72
BKPIns-15-4-9	248	248.0000	0.00	0.61
BKPIns-15-8-10	97	97.0000	0.00	0.26
BKPIns-15-8-1	71	71.0000	0.00	0.22
BKPIns-15-8-2	84	84.0000	0.00	0.30
BKPIns-15-8-3	66	66.0000	0.00	0.27
BKPIns-15-8-4	150	150.0000	0.00	0.35
BKPIns-15-8-5	117	117.0000	0.00	0.27
BKPIns-15-8-6	89	89.0000	0.00	0.26
BKPIns-15-8-7	95	95.0000	0.00	0.23
BKPIns-15-8-8	149	149.0000	0.00	0.39
BKPIns-15-8-9	100	-100.0000	0.00	0.32
BKPIns-18-14-10	22	22.0000	0.00	0.08
BKPIns-18-14-1	24	24.0000	0.00	0.13
BKPIns-18-14-2	19	19.0000	0.00	0.12
BKPIns-18-14-3	41	41.0000	0.00	0.08
BKPIns-18-14-4	38	38.0000	0.00	0.06
BKPIns-18-14-5	33	33.0000	0.00	0.12
BKPIns-18-14-6	50	50.0000	0.00	0.08
BKPIns-18-14-7	7	7.0000	0.00	0.08
BKPIns-18-14-8	30	30.0000	0.00	0.12
BKPIns-18-14-9	46	46.0000	0.00	0.10
BKPIns-18-5-10	305	305.0000	0.00	1.51
BKPIns-18-5-14	272	272.0000	0.00	2.12
BKPIns-18-5-1	272	272.0000	0.00	2.08
BKPIns-18-5-2	283	283.0000	0.00	1.05
BKPIns-18-5-3	211	211.0000	0.00	2.72
BKPIns-18-5-4	380	380.0000	0.00	3.28
BKPIns-18-5-5	299	299.0000	0.00	2.34
BKPIns-18-5-6	337	337.0000	0.00	2.00
BKPIns-18-5-7	265	265.0000	0.00	1.46
BKPIns-18-5-8	345	345.0000	0.00	1.50
BKPIns-18-5-9	338	338.0000	0.00	2.03
BKPIns-18-9-10	142	142.0000	0.00	0.77
BKPIns-18-9-1	107	107.0000	0.00	0.64
BKPIns-18-9-2	93	93.0000	0.00	0.51
BKPIns-18-9-3	116	116.0000	0.00	1.19
BKPIns-18-9-4	209	209.0000	0.00	1.29
BKPIns-18-9-5	160	160.0000	0.00	1.05
BKPIns-18-9-6	128	128.0000	0.00	0.70
BKPIns-18-9-7	128	128.0000	0.00	0.71
BKPIns-18-9-8	186	186.0000	0.00	1.00
BKPIns-18-9-9	165	165.0000	0.00	1.23
BKPIns-20-10-10	172	172.0000	0.00	1.67
BKPIns-20-10-1	168	168.0000	0.00	4.35
BKPIns-20-10-2	137	137.0000	0.00	0.87
BKPIns-20-10-3	131	131.0000	0.00	1.40
BKPIns-20-10-4	187	187.0000	0.00	1.09

Table 5 – continued from previous page

instance	BestSol	LB	%gap	time [s]
BKPIIns-20-10-5	217	217.0000	0.00	3.04
BKPIIns-20-10-6	131	131.0000	0.00	0.86
BKPIIns-20-10-7	115	115.0000	0.00	0.66
BKPIIns-20-10-8	209	209.0000	0.00	1.38
BKPIIns-20-10-9	170	170.0000	0.00	1.89
BKPIIns-20-15-10	43	43.0000	0.00	0.27
BKPIIns-20-15-1	42	42.0000	0.00	0.38
BKPIIns-20-15-2	23	23.0000	0.00	0.20
BKPIIns-20-15-3	24	24.0000	0.00	0.14
BKPIIns-20-15-4	32	32.0000	0.00	0.18
BKPIIns-20-15-5	57	57.0000	0.00	0.12
BKPIIns-20-15-6	26	26.0000	0.00	0.17
BKPIIns-20-15-7	7	7.0000	0.00	0.10
BKPIIns-20-15-8	30	30.0000	0.00	0.11
BKPIIns-20-15-9	30	30.0000	0.00	0.18
BKPIIns-20-5-10	384	384.0000	0.00	5.02
BKPIIns-20-5-1	323	323.0000	0.00	7.92
BKPIIns-20-5-2	347	347.0000	0.00	2.69
BKPIIns-20-5-3	336	336.0000	0.00	6.26
BKPIIns-20-5-4	474	474.0000	0.00	5.23
BKPIIns-20-5-5	434	434.0000	0.00	8.60
BKPIIns-20-5-6	363	363.0000	0.00	3.52
BKPIIns-20-5-7	335	335.0000	0.00	2.50
BKPIIns-20-5-8	477	477.0000	0.00	7.20
BKPIIns-20-5-9	412	412.0000	0.00	4.82
BKPIIns-22-11-10	160	160.0000	0.00	2.03
BKPIIns-22-11-1	160	160.0000	0.00	2.35
BKPIIns-22-11-2	144	144.0000	0.00	0.86
BKPIIns-22-11-3	122	122.0000	0.00	1.78
BKPIIns-22-11-4	211	211.0000	0.00	3.09
BKPIIns-22-11-5	219	219.0000	0.00	6.07
BKPIIns-22-11-6	114	114.0000	0.00	1.73
BKPIIns-22-11-7	143	143.0000	0.00	1.56
BKPIIns-22-11-8	217	217.0000	0.00	2.44
BKPIIns-22-11-9	120	120.0000	0.00	0.87
BKPIIns-22-17-10	34	34.0000	0.00	0.20
BKPIIns-22-17-1	23	23.0000	0.00	0.19
BKPIIns-22-17-2	18	18.0000	0.00	0.09
BKPIIns-22-17-3	28	28.0000	0.00	0.15
BKPIIns-22-17-4	32	32.0000	0.00	0.14
BKPIIns-22-17-5	59	59.0000	0.00	0.18
BKPIIns-22-17-6	29	29.0000	0.00	0.21
BKPIIns-22-17-7	12	12.0000	0.00	0.15
BKPIIns-22-17-8	41	41.0000	0.00	0.10
BKPIIns-22-17-9	16	16.0000	0.00	0.13
BKPIIns-22-6-10	360	360.0000	0.00	6.43
BKPIIns-22-6-1	345	345.0000	0.00	14.43
BKPIIns-22-6-2	390	390.0000	0.00	4.59
BKPIIns-22-6-3	278	278.0000	0.00	5.97
BKPIIns-22-6-4	486	486.0000	0.00	15.91
BKPIIns-22-6-5	443	443.0000	0.00	23.73
BKPIIns-22-6-6	337	337.0000	0.00	6.26
BKPIIns-22-6-7	314	314.0000	0.00	4.03
BKPIIns-22-6-8	503	503.0000	0.00	16.39
BKPIIns-22-6-9	371	371.0000	0.00	5.04
BKPIIns-25-13-10	257	257.0000	0.00	15.95
BKPIIns-25-13-1	183	183.0000	0.00	17.27
BKPIIns-25-13-2	146	146.0000	0.00	1.72
BKPIIns-25-13-3	119	119.0000	0.00	3.18
BKPIIns-25-13-4	227	227.0000	0.00	8.17
BKPIIns-25-13-5	257	257.0000	0.00	16.35
BKPIIns-25-13-6	133	133.0000	0.00	2.40
BKPIIns-25-13-7	190	190.0000	0.00	6.07
BKPIIns-25-13-8	229	229.0000	0.00	5.72
BKPIIns-25-13-9	174	174.0000	0.00	3.57
BKPIIns-25-19-10	63	63.0000	0.00	0.51
BKPIIns-25-19-1	45	45.0000	0.00	0.35
BKPIIns-25-19-2	23	23.0000	0.00	0.23
BKPIIns-25-19-3	27	27.0000	0.00	0.62
BKPIIns-25-19-4	59	59.0000	0.00	0.59
BKPIIns-25-19-5	65	65.0000	0.00	0.27
BKPIIns-25-19-6	27	27.0000	0.00	0.26
BKPIIns-25-19-7	17	17.0000	0.00	0.29
BKPIIns-25-19-8	56	56.0000	0.00	0.32

Table 5 – continued from previous page

instance	BestSol	LB	%gap	time [s]
BKPIIns-25-19-9	36	36.0000	0.00	0.36
BKPIIns-25-7-10	524	524.0000	0.00	56.68
BKPIIns-25-7-1	351	351.0000	0.00	40.74
BKPIIns-25-7-2	449	449.0000	0.00	21.63
BKPIIns-25-7-3	321	321.0000	0.00	25.53
BKPIIns-25-7-4	458	458.0000	0.00	29.49
BKPIIns-25-7-5	521	521.0000	0.00	49.51
BKPIIns-25-7-6	356	356.0000	0.00	19.05
BKPIIns-25-7-7	418	418.0000	0.00	27.44
BKPIIns-25-7-8	510	510.0000	0.00	38.21
BKPIIns-25-7-9	454	454.0000	0.00	27.89
BKPIIns-28-14-10	260	260.0000	0.00	32.37
BKPIIns-28-14-1	188	188.0000	0.00	24.17
BKPIIns-28-14-2	196	196.0000	0.00	6.31
BKPIIns-28-14-3	182	182.0000	0.00	22.30
BKPIIns-28-14-4	259	259.0000	0.00	28.71
BKPIIns-28-14-5	285	285.0000	0.00	35.80
BKPIIns-28-14-6	156	156.0000	0.00	4.63
BKPIIns-28-14-7	204	204.0000	0.00	13.89
BKPIIns-28-14-8	310	310.0000	0.00	48.80
BKPIIns-28-14-9	194	194.0000	0.00	9.34
BKPIIns-28-21-10	50	50.0000	0.00	0.43
BKPIIns-28-21-1	37	37.0000	0.00	0.36
BKPIIns-28-21-2	44	44.0000	0.00	0.41
BKPIIns-28-21-3	35	35.0000	0.00	0.53
BKPIIns-28-21-4	74	74.0000	0.00	0.61
BKPIIns-28-21-5	58	58.0000	0.00	0.62
BKPIIns-28-21-6	35	35.0000	0.00	0.42
BKPIIns-28-21-7	26	26.0000	0.00	0.32
BKPIIns-28-21-8	54	54.0000	0.00	0.43
BKPIIns-28-21-9	49	49.0000	0.00	0.94
BKPIIns-28-7-10	573	573.0000	0.00	111.74
BKPIIns-28-7-1	378	378.0000	0.00	55.99
BKPIIns-28-7-2	549	549.0000	0.00	87.24
BKPIIns-28-7-3	388	388.0000	0.00	67.84
BKPIIns-28-7-4	566	566.0000	0.00	81.88
BKPIIns-28-7-5	603	603.0000	0.00	144.08
BKPIIns-28-7-6	439	439.0000	0.00	32.39
BKPIIns-28-7-7	509	509.0000	0.00	88.08
BKPIIns-28-7-8	647	647.0000	0.00	223.88
BKPIIns-28-7-9	509	509.0000	0.00	86.29
BKPIIns-30-15-10	249	249.0000	0.00	39.14
BKPIIns-30-15-1	210	210.0000	0.00	45.48
BKPIIns-30-15-2	207	207.0000	0.00	17.48
BKPIIns-30-15-3	190	190.0000	0.00	28.55
BKPIIns-30-15-4	310	310.0000	0.00	70.63
BKPIIns-30-15-5	277	277.0000	0.00	50.61
BKPIIns-30-15-6	201	201.0000	0.00	16.68
BKPIIns-30-15-7	206	206.0000	0.00	13.90
BKPIIns-30-15-8	263	263.0000	0.00	22.02
BKPIIns-30-15-9	187	187.0000	0.00	13.51
BKPIIns-30-23-10	64	64.0000	0.00	0.74
BKPIIns-30-23-1	41	41.0000	0.00	0.65
BKPIIns-30-23-2	40	40.0000	0.00	0.44
BKPIIns-30-23-3	44	44.0000	0.00	0.70
BKPIIns-30-23-4	62	62.0000	0.00	0.60
BKPIIns-30-23-5	66	66.0000	0.00	0.92
BKPIIns-30-23-6	35	35.0000	0.00	0.55
BKPIIns-30-23-7	25	25.0000	0.00	0.50
BKPIIns-30-23-8	67	67.0000	0.00	0.58
BKPIIns-30-23-9	31	31.0000	0.00	0.49
BKPIIns-30-8-10	554	554.0000	0.00	362.38
BKPIIns-30-8-1	445	445.0000	0.00	239.81
BKPIIns-30-8-2	565	565.0000	0.00	225.23
BKPIIns-30-8-3	428	428.0000	0.00	180.97
BKPIIns-30-8-4	641	641.0000	0.00	542.76
BKPIIns-30-8-5	566	566.0000	0.00	291.65
BKPIIns-30-8-6	463	463.0000	0.00	138.78
BKPIIns-30-8-7	575	575.0000	0.00	520.10
BKPIIns-30-8-8	616	616.0000	0.00	306.84
BKPIIns-30-8-9	510	510.0000	0.00	221.28

Instance Set INTER-ASSIG

The instances are available at <http://coral.ise.lehigh.edu/data-sets/bilevel-instances/detailed-bilevel-instances-assignment/>.

Table 6: Results for instance set INTER-ASSIG.

instance	BestSol	LB	%gap	time [s]
2AP05-10	-46	-46.0000	0.00	0.89
2AP05-11	-36	-36.0000	0.00	0.78
2AP05-12	-49	-49.0000	0.00	0.83
2AP05-13	-44	-44.0000	0.00	0.92
2AP05-14	-48	-48.0000	0.00	0.62
2AP05-15	-48	-48.0000	0.00	0.78
2AP05-16	-34	-34.0000	0.00	0.80
2AP05-17	-66	-66.0000	0.00	0.89
2AP05-18	-35	-35.0000	0.00	0.89
2AP05-19	-39	-39.0000	0.00	0.88
2AP05-1	-36	-36.0000	0.00	0.74
2AP05-20	-42	-42.0000	0.00	0.75
2AP05-21	-47	-47.0000	0.00	0.60
2AP05-22	-50	-50.0000	0.00	0.73
2AP05-23	-41	-41.0000	0.00	0.83
2AP05-24	-43	-43.0000	0.00	0.51
2AP05-25	-45	-45.0000	0.00	0.69
2AP05-2	-46	-46.0000	0.00	0.73
2AP05-3	-46	-46.0000	0.00	0.78
2AP05-4	-25	-25.0000	0.00	0.78
2AP05-5	-38	-38.0000	0.00	0.73
2AP05-6	-32	-32.0000	0.00	0.37
2AP05-7	-49	-49.0000	0.00	0.43
2AP05-8	-41	-41.0000	0.00	0.40
2AP05-9	-54	-54.0000	0.00	0.56

Instance Set INTER-RANDOM

The instances are available at <http://coral.ise.lehigh.edu/data-sets/bilevel-instances/detailed-bilevel-instances-mips-symmetric-vs-nonsymmetric/>.

Table 7: Results for instance set INTER-RANDOM.

instance	BestSol	LB	%gap	time [s]
amiblp-10-10-50-0110-0-10	0	0.0000	0.00	0.01
amiblp-10-10-50-0110-0-1	11	11.0000	0.00	0.02
amiblp-10-10-50-0110-0-2	121	121.0000	0.00	0.10
amiblp-10-10-50-0110-0-3	47	47.0000	0.00	0.04
amiblp-10-10-50-0110-0-4	45	45.0000	0.00	0.08
amiblp-10-10-50-0110-0-5	47	47.0000	0.00	0.05
amiblp-10-10-50-0110-0-6	33	33.0000	0.00	0.03
amiblp-10-10-50-0110-0-7	0	0.0000	0.00	0.01
amiblp-10-10-50-0110-0-8	23	23.0000	0.00	0.06
amiblp-10-10-50-0110-0-9	5	5.0000	0.00	0.01
amiblp-15-10-50-0110-0-10	1	1.0000	0.00	0.01
amiblp-15-10-50-0110-0-1	28	28.0000	0.00	0.02
amiblp-15-10-50-0110-0-2	0	0.0000	0.00	0.01
amiblp-15-10-50-0110-0-3	47	47.0000	0.00	0.09
amiblp-15-10-50-0110-0-4	10	10.0000	0.00	0.01
amiblp-15-10-50-0110-0-5	108	108.0000	0.00	0.09
amiblp-15-10-50-0110-0-6	3	3.0000	0.00	0.02
amiblp-15-10-50-0110-0-7	51	51.0000	0.00	0.08
amiblp-15-10-50-0110-0-8	25	25.0000	0.00	0.01
amiblp-15-10-50-0110-0-9	0	0.0000	0.00	0.01
amiblp-20-20-50-0110-0-10	183	183.0000	0.00	0.22
amiblp-20-20-50-0110-0-1	168	168.0000	0.00	0.42
amiblp-20-20-50-0110-0-2	68	68.0000	0.00	0.09
amiblp-20-20-50-0110-0-3	119	119.0000	0.00	0.46
amiblp-20-20-50-0110-0-4	116	116.0000	0.00	0.16
amiblp-20-20-50-0110-0-5	122	122.0000	0.00	0.27
amiblp-20-20-50-0110-0-6	15	15.0000	0.00	0.02
amiblp-20-20-50-0110-0-7	57	57.0000	0.00	0.12
amiblp-20-20-50-0110-0-8	222	222.0000	0.00	0.55
amiblp-20-20-50-0110-0-9	57	57.0000	0.00	0.16
amiblp-25-20-50-0110-0-10	94	94.0000	0.00	0.15
amiblp-25-20-50-0110-0-1	172	172.0000	0.00	0.29
amiblp-25-20-50-0110-0-2	33	33.0000	0.00	0.03
amiblp-25-20-50-0110-0-3	64	64.0000	0.00	0.08
amiblp-25-20-50-0110-0-4	142	142.0000	0.00	0.16
amiblp-25-20-50-0110-0-5	63	63.0000	0.00	0.08
amiblp-25-20-50-0110-0-6	224	224.0000	0.00	0.56
amiblp-25-20-50-0110-0-7	50	50.0000	0.00	0.20
amiblp-25-20-50-0110-0-8	0	0.0000	0.00	0.01
amiblp-25-20-50-0110-0-9	183	183.0000	0.00	0.44
smiblp-10-10-50-0110-0-10	0	0.0000	0.00	0.01
smiblp-10-10-50-0110-0-1	0	0.0000	0.00	0.01
smiblp-10-10-50-0110-0-2	152	152.0000	0.00	0.14
smiblp-10-10-50-0110-0-3	17	17.0000	0.00	0.02
smiblp-10-10-50-0110-0-4	37	37.0000	0.00	0.05
smiblp-10-10-50-0110-0-5	18	18.0000	0.00	0.02
smiblp-10-10-50-0110-0-6	33	33.0000	0.00	0.03
smiblp-10-10-50-0110-0-7	0	0.0000	0.00	0.01
smiblp-10-10-50-0110-0-8	23	23.0000	0.00	0.03
smiblp-10-10-50-0110-0-9	5	5.0000	0.00	0.01
smiblp-15-10-50-0110-0-10	1	1.0000	0.00	0.01
smiblp-15-10-50-0110-0-1	13	13.0000	0.00	0.01
smiblp-15-10-50-0110-0-2	0	0.0000	0.00	0.01
smiblp-15-10-50-0110-0-3	44	44.0000	0.00	0.04
smiblp-15-10-50-0110-0-4	10	10.0000	0.00	0.01
smiblp-15-10-50-0110-0-5	104	104.0000	0.00	0.06
smiblp-15-10-50-0110-0-6	3	3.0000	0.00	0.02
smiblp-15-10-50-0110-0-7	43	43.0000	0.00	0.09
smiblp-15-10-50-0110-0-8	25	25.0000	0.00	0.01
smiblp-15-10-50-0110-0-9	0	0.0000	0.00	0.01
smiblp-20-20-50-0110-0-10	174	174.0000	0.00	0.26
smiblp-20-20-50-0110-0-1	210	210.0000	0.00	0.62
smiblp-20-20-50-0110-0-2	86	86.0000	0.00	0.15
smiblp-20-20-50-0110-0-3	122	122.0000	0.00	0.58
smiblp-20-20-50-0110-0-4	135	135.0000	0.00	0.26
smiblp-20-20-50-0110-0-5	118	118.0000	0.00	0.30

Table 7 – continued from previous page

instance	BestSol	LB	%gap	time [s]	
smiblp-20-20-50-0110-0-6		25	25.0000	0.00	0.02
smiblp-20-20-50-0110-0-7		76	76.0000	0.00	0.20
smiblp-20-20-50-0110-0-8		247	247.0000	0.00	1.08
smiblp-20-20-50-0110-0-9		80	80.0000	0.00	0.30
smiblp-25-20-50-0110-0-10		61	61.0000	0.00	0.25
smiblp-25-20-50-0110-0-1		138	138.0000	0.00	0.36
smiblp-25-20-50-0110-0-2		43	43.0000	0.00	0.04
smiblp-25-20-50-0110-0-3		64	64.0000	0.00	0.09
smiblp-25-20-50-0110-0-4		158	158.0000	0.00	0.23
smiblp-25-20-50-0110-0-5		62	62.0000	0.00	0.10
smiblp-25-20-50-0110-0-6		227	227.0000	0.00	0.89
smiblp-25-20-50-0110-0-7		87	87.0000	0.00	0.18
smiblp-25-20-50-0110-0-8		11	11.0000	0.00	0.02
smiblp-25-20-50-0110-0-9		193	193.0000	0.00	0.44

Instance Set INTER-CLIQUE

The instances are available at http://people.clemson.edu/7Ejcsmith/Test_Instances_files/BCPIns.zip.

Table 8: Results for instance set INTER-CLIQUE.

instance	BestSol	LB	%gap	time [s]
BCPIns-10-7-10	3	3.0000	0.00	0.36
BCPIns-10-7-1	3	3.0000	0.00	0.40
BCPIns-10-7-2	3	3.0000	0.00	0.30
BCPIns-10-7-3	3	3.0000	0.00	0.26
BCPIns-10-7-4	3	3.0000	0.00	0.34
BCPIns-10-7-5	3	3.0000	0.00	0.30
BCPIns-10-7-6	3	3.0000	0.00	0.21
BCPIns-10-7-7	2	2.0000	0.00	0.22
BCPIns-10-7-8	3	3.0000	0.00	0.23
BCPIns-10-7-9	3	3.0000	0.00	0.26
BCPIns-10-9-10	3	3.0000	0.00	0.54
BCPIns-10-9-1	3	3.0000	0.00	0.62
BCPIns-10-9-2	3	3.0000	0.00	0.65
BCPIns-10-9-3	3	3.0000	0.00	0.96
BCPIns-10-9-4	3	3.0000	0.00	0.97
BCPIns-10-9-5	3	3.0000	0.00	0.72
BCPIns-10-9-6	3	3.0000	0.00	0.67
BCPIns-10-9-7	3	3.0000	0.00	0.68
BCPIns-10-9-8	3	3.0000	0.00	0.65
BCPIns-10-9-9	3	3.0000	0.00	0.84
BCPIns-12-7-10	3	3.0000	0.00	0.87
BCPIns-12-7-1	3	3.0000	0.00	0.74
BCPIns-12-7-2	3	3.0000	0.00	0.92
BCPIns-12-7-3	3	3.0000	0.00	0.79
BCPIns-12-7-4	3	3.0000	0.00	0.88
BCPIns-12-7-5	3	3.0000	0.00	0.74
BCPIns-12-7-6	3	3.0000	0.00	0.76
BCPIns-12-7-7	3	3.0000	0.00	0.80
BCPIns-12-7-8	3	3.0000	0.00	0.80
BCPIns-12-7-9	3	3.0000	0.00	0.76
BCPIns-12-9-10	3	3.0000	0.00	1.22
BCPIns-12-9-1	3	3.0000	0.00	2.12
BCPIns-12-9-2	3	3.0000	0.00	1.34
BCPIns-12-9-3	3	3.0000	0.00	1.65
BCPIns-12-9-4	3	3.0000	0.00	2.37
BCPIns-12-9-5	3	3.0000	0.00	2.39
BCPIns-12-9-6	3	3.0000	0.00	1.96
BCPIns-12-9-7	3	3.0000	0.00	1.74
BCPIns-12-9-8	3	3.0000	0.00	1.83
BCPIns-12-9-9	3	3.0000	0.00	2.50
BCPIns-15-7-10	3	3.0000	0.00	2.28
BCPIns-15-7-1	3	3.0000	0.00	2.02
BCPIns-15-7-2	3	3.0000	0.00	2.05
BCPIns-15-7-3	3	3.0000	0.00	1.82
BCPIns-15-7-4	3	3.0000	0.00	1.74
BCPIns-15-7-5	3	3.0000	0.00	2.23
BCPIns-15-7-6	3	3.0000	0.00	2.19
BCPIns-15-7-7	3	3.0000	0.00	2.45
BCPIns-15-7-8	3	3.0000	0.00	2.53
BCPIns-15-7-9	3	3.0000	0.00	2.31
BCPIns-15-9-10	3	3.0000	0.00	33.69
BCPIns-15-9-1	3	3.0000	0.00	6.42
BCPIns-15-9-2	3	3.0000	0.00	8.91
BCPIns-15-9-3	3	3.0000	0.00	12.04
BCPIns-15-9-4	3	3.0000	0.00	3.35
BCPIns-15-9-5	3	3.0000	0.00	5.02
BCPIns-15-9-6	3	3.0000	0.00	20.34
BCPIns-15-9-7	3	3.0000	0.00	11.60
BCPIns-15-9-8	3	3.0000	0.00	10.41
BCPIns-15-9-9	3	3.0000	0.00	13.75
BCPIns-8-7-10	2	2.0000	0.00	0.08
BCPIns-8-7-1	2	2.0000	0.00	0.15
BCPIns-8-7-2	2	2.0000	0.00	0.13
BCPIns-8-7-3	2	2.0000	0.00	0.11
BCPIns-8-7-4	3	3.0000	0.00	0.12
BCPIns-8-7-5	2	2.0000	0.00	0.10

Table 8 – continued from previous page

instance	BestSol	LB	%gap	time [s]
BCPIns-8-7-6	2	2.0000	0.00	0.14
BCPIns-8-7-7	3	3.0000	0.00	0.12
BCPIns-8-7-8	2	2.0000	0.00	0.08
BCPIns-8-7-9	2	2.0000	0.00	0.09
BCPIns-8-9-10	3	3.0000	0.00	0.25
BCPIns-8-9-1	3	3.0000	0.00	0.23
BCPIns-8-9-2	3	3.0000	0.00	0.15
BCPIns-8-9-3	3	3.0000	0.00	0.17
BCPIns-8-9-4	3	3.0000	0.00	0.21
BCPIns-8-9-5	3	3.0000	0.00	0.17
BCPIns-8-9-6	3	3.0000	0.00	0.21
BCPIns-8-9-7	3	3.0000	0.00	0.26
BCPIns-8-9-8	3	3.0000	0.00	0.17
BCPIns-8-9-9	3	3.0000	0.00	0.31

Instance Set INTER-FIRE

The instances of this set are available at request from A. Baggio.

Table 9: Results for instance set INTER-FIRE.

instance	BestSol	LB	%gap	time [s]
rndgraph-25-1-3-3-002	15	15.0000	0.00	5.64
rndgraph-25-1-3-3-003	17	17.0000	0.00	8.18
rndgraph-25-1-3-3-005	8	8.0000	0.00	2.24
rndgraph-25-1-3-3-015	6	6.0000	0.00	1.44
rndgraph-25-2-2-2-004	7	7.0000	0.00	0.61
rndgraph-25-2-2-2-007	16	16.0000	0.00	1.54
rndgraph-25-2-2-2-014	18	18.0000	0.00	1.50
rndgraph-25-2-2-2-015	19	19.0000	0.00	1.48
rndgraph-25-3-3-3-001	15	15.0000	0.00	4.84
rndgraph-25-3-3-3-004	13	13.0000	0.00	3.72
rndgraph-25-3-3-3-005	13	13.0000	0.00	3.75
rndgraph-25-3-3-3-014	9	9.0000	0.00	1.33
rndgraph-50-1-3-3-002	7	7.0000	0.00	11.05
rndgraph-50-1-3-3-004	5	5.0000	0.00	7.70
rndgraph-50-1-3-3-007	11	11.0000	0.00	18.07
rndgraph-50-1-3-3-012	7	7.0000	0.00	6.64
rndgraph-50-1-5-3-001	3	3.0000	0.00	4.58
rndgraph-50-1-5-3-003	7	7.0000	0.00	31.05
rndgraph-50-1-5-3-011	11	11.0000	0.00	198.61
rndgraph-50-1-5-3-015	4	4.0000	0.00	16.49
rndgraph-50-3-5-5-002	6	6.0000	0.00	8.29
rndgraph-50-3-5-5-004	9	9.0000	0.00	56.35
rndgraph-50-3-5-5-008	9	9.0000	0.00	33.94
rndgraph-50-3-5-5-010	9	9.0000	0.00	27.40
rndgraph-80-1-3-3-001	3	3.0000	0.00	5.41
rndgraph-80-1-3-3-003	4	4.0000	0.00	9.57
rndgraph-80-1-3-3-007	3	3.0000	0.00	12.32
rndgraph-80-1-3-3-012	3	3.0000	0.00	10.95
rndgraph-80-2-2-2-002	2	2.0000	0.00	0.84
rndgraph-80-2-2-2-006	6	6.0000	0.00	4.36
rndgraph-80-2-2-2-009	2	2.0000	0.00	0.88
rndgraph-80-2-2-2-014	2	2.0000	0.00	1.02
rndgraph-80-3-3-3-001	4	4.0000	0.00	11.76
rndgraph-80-3-3-3-002	3	3.0000	0.00	8.28
rndgraph-80-3-3-3-003	4	4.0000	0.00	6.80
rndgraph-80-3-3-3-006	3	3.0000	0.00	5.30
tree-25-1-3-3-001	13	13.0000	0.00	3.22
tree-25-1-3-3-006	13	13.0000	0.00	3.23
tree-25-1-3-3-014	13	13.0000	0.00	3.64
tree-25-1-3-3-015	12	12.0000	0.00	2.89
tree-25-2-2-2-002	17	17.0000	0.00	1.53
tree-25-2-2-2-004	17	17.0000	0.00	1.80
tree-25-2-2-2-005	18	18.0000	0.00	1.65
tree-25-2-2-2-009	17	17.0000	0.00	1.43
tree-25-3-3-3-002	16	16.0000	0.00	6.96
tree-25-3-3-3-010	15	15.0000	0.00	4.97
tree-25-3-3-3-012	17	17.0000	0.00	7.40
tree-25-3-3-3-013	16	16.0000	0.00	6.35
tree-50-1-3-3-004	28	28.0000	0.00	33.79
tree-50-1-3-3-007	32	32.0000	0.00	81.12
tree-50-1-3-3-012	30	30.0000	0.00	73.77
tree-50-1-3-3-014	28	28.0000	0.00	51.78
tree-50-1-5-5-005	25	25.0000	0.00	1234.69
tree-50-1-5-5-006	26	26.0000	0.00	2120.85
tree-50-1-5-5-007	24	24.0000	0.00	1179.44
tree-50-1-5-5-010	26	26.0000	0.00	1702.69
tree-50-3-3-1-003	30	30.0000	0.00	86.00
tree-50-3-3-1-007	31	31.0000	0.00	65.38
tree-50-3-3-1-008	26	26.0000	0.00	43.47
tree-50-3-3-1-015	27	27.0000	0.00	41.45
tree-80-2-2-2-001	56	56.0000	0.00	36.63
tree-80-2-2-2-002	63	63.0000	0.00	57.53
tree-80-2-2-2-007	61	61.0000	0.00	50.60
tree-80-2-2-2-012	57	57.0000	0.00	38.39
tree-80-3-3-1-002	45	45.0000	0.00	339.82
tree-80-3-3-1-004	48	48.0000	0.00	724.77
tree-80-3-3-1-005	48	48.0000	0.00	589.16

Table 9 – continued from previous page

instance	BestSol	LB	%gap	time [s]
tree-80-3-3-1-015	45	45.0000	0.00	361.50
tree-80-3-3-3-004	55	55.0000	0.00	1269.52
tree-80-3-3-3-007	56	56.0000	0.00	844.68
tree-80-3-3-3-009	56	56.0000	0.00	865.83
tree-80-3-3-3-010	58	58.0000	0.00	894.75