

Online Supplement to “Very Large-Scale Neighborhood Search for the Quadratic Assignment Problem”

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INFORMS Journal on Computing

Computational Results for Instances Available at QAPLIB

Table A1: Computational results for symmetric instances

Sl. No.	Problem	size	BKS	2OPT		Implementation 3		Implementation 4	
				% Gap	nRuns	% Gap	nRuns	% Gap	nRuns
1	chr12a	12	9,552	0.000	31,712,292	0.000	16,254,895	0.000	21,082,900
2	chr12b	12	9,742	0.000	26,611,999	0.000	16,530,536	0.000	19,472,739
3	chr12c	12	11,156	0.000	33,270,169	0.000	17,102,975	0.000	15,658,161
4	chr15a	15	9,896	0.000	17,304,596	0.000	8,174,248	0.000	8,012,561
5	chr15b	15	7,990	0.000	16,059,718	0.000	8,831,730	0.000	9,560,663
6	chr15c	15	9,504	0.000	17,210,809	0.000	8,391,655	0.000	7,830,310
7	chr18a	18	11,098	0.000	9,810,866	0.000	4,747,508	0.000	4,451,389
8	chr18b	18	1,534	0.000	11,526,130	0.000	4,467,984	0.000	10,692,947
9	chr20a	20	2,192	0.000	7,692,126	0.000	3,085,174	0.000	6,096,344
10	chr20b	20	2,298	0.000	8,305,308	0.000	3,449,659	0.000	4,603,225
11	chr20c	20	14,142	0.000	6,303,790	0.000	3,143,547	0.000	3,289,192
12	chr22a	22	6,156	0.000	5,323,772	0.000	1,990,571	0.000	3,488,032
13	chr22b	22	6,194	0.000	5,717,439	0.000	1,817,172	0.000	3,034,681
14	chr25a	25	3,796	0.000	3,647,456	0.000	1,494,790	0.000	1,673,174
15	els19	19	17,212,548	0.000	6,405,445	0.000	1,919,968	0.000	3,713,257
16	esc16a	16	68	0.000	21,556,242	0.000	7,438,615	0.000	20,696,247
17	esc16b	16	292	0.000	28,775,197	0.000	6,862,990	0.000	27,097,971
18	esc16c	16	160	0.000	19,392,543	0.000	7,046,453	0.000	17,301,811
19	esc16d	16	16	0.000	21,257,317	0.000	7,157,048	0.000	21,189,753
20	esc16e	16	28	0.000	22,823,090	0.000	9,494,114	0.000	25,490,122
21	esc16f	16	0	0.000	73,490,811	0.000	40,619,875	0.000	90,780,473
22	esc16g	16	26	0.000	20,308,315	0.000	9,759,591	0.000	21,808,809
23	esc16h	16	996	0.000	27,408,083	0.000	8,942,438	0.000	23,660,264
24	esc16i	16	14	0.000	23,927,309	0.000	11,940,972	0.000	24,148,595
25	esc16j	16	8	0.000	30,274,087	0.000	7,036,368	0.000	27,076,828
26	esc32a	32	130	0.000	2,312,502	0.000	699,279	0.000	2,213,783
27	esc32b	32	168	0.000	2,013,151	0.000	912,849	0.000	2,167,570
28	esc32c	32	642	0.000	2,730,836	0.000	871,535	0.000	2,558,298
29	esc32d	32	200	0.000	2,422,403	0.000	932,744	0.000	2,548,921
30	esc32e	32	2	0.000	6,015,653	0.000	1,149,553	0.000	6,882,009
31	esc32f	32	2	0.000	6,298,438	0.000	1,148,633	0.000	6,092,161
32	esc32g	32	6	0.000	5,396,627	0.000	1,215,503	0.000	6,323,472
33	esc32h	32	438	0.000	2,848,142	0.000	705,638	0.000	2,735,300
34	esc64a	64	116	0.000	1,187,380	0.000	235,582	0.000	1,006,388
35	esc128	128	64	0.000	171,922	0.000	24,240	0.000	136,986
36	had12	12	1,652	0.000	28,426,668	0.000	12,638,445	0.000	21,040,999
37	had14	14	2,724	0.000	15,819,435	0.000	6,477,308	0.000	11,940,241
38	had16	16	3,720	0.000	10,028,113	0.000	4,248,945	0.000	8,442,455
39	had18	18	5,358	0.000	7,502,162	0.000	3,187,082	0.000	6,292,564

Table A1 (contd.): Computational results for symmetric instances

Sl. No.	Problem	size	BKS	2OPT		Implementation 3		Implementation 4	
				% Gap	nRuns	% Gap	nRuns	% Gap	nRuns
40	had20	20	6,922	0.000	5,472,203	0.000	2,016,782	0.000	4,517,495
41	kra30a	30	88,900	0.000	2,072,430	0.000	698,648	0.000	2,094,614
42	kra30b	30	91,420	0.000	2,443,596	0.000	738,067	0.000	2,032,130
43	nug12	12	578	0.000	40,640,757	0.000	18,821,619	0.000	25,497,046
44	nug14	14	1,014	0.000	25,162,507	0.000	9,071,632	0.000	15,643,569
45	nug15	15	1,150	0.000	19,873,851	0.000	7,838,694	0.000	10,408,304
46	nug16a	16	1,610	0.000	16,600,517	0.000	5,498,576	0.000	6,316,405
47	nug16b	16	1,240	0.000	16,752,406	0.000	5,837,098	0.000	10,209,108
48	nug17	17	1,732	0.000	13,628,664	0.000	4,652,916	0.000	9,134,037
49	nug18	18	1,930	0.000	11,585,778	0.000	3,913,845	0.000	7,775,618
50	nug20	20	2,570	0.000	8,494,265	0.000	2,847,679	0.000	5,522,913
51	nug21	21	2,438	0.000	6,943,000	0.000	2,349,593	0.000	4,727,305
52	nug22	22	3,596	0.000	5,723,281	0.000	2,052,996	0.000	3,916,112
53	nug24	24	3,488	0.000	4,680,265	0.000	1,516,883	0.000	3,048,448
54	nug25	25	3,744	0.000	4,104,777	0.000	1,364,179	0.000	2,716,776
55	nug27	27	5,234	0.000	3,026,945	0.000	956,958	0.000	1,968,883
56	nug28	28	5,166	0.000	2,788,867	0.000	794,864	0.000	1,556,981
57	nug30	30	6,124	0.000	2,296,632	0.000	699,671	0.000	1,351,978
58	rou12	12	235,528	0.000	39,205,459	0.000	18,443,364	0.000	18,279,741
59	rou15	15	354,210	0.000	21,860,914	0.000	8,864,135	0.000	10,682,547
60	rou20	20	725,522	0.000	9,294,137	0.000	2,773,330	0.000	5,055,579
61	scr12	12	31,410	0.000	35,968,323	0.000	16,962,983	0.000	16,949,739
62	scr15	15	51,140	0.000	18,326,360	0.000	8,698,038	0.000	4,605,403
63	scr20	20	110,030	0.000	7,533,910	0.000	2,845,602	0.000	3,463,400
64	ste36a	36	9,526	0.000	1,249,043	0.000	376,596	0.000	909,320
65	ste36b	36	15,852	0.000	1,119,010	0.000	387,053	0.000	806,522
66	ste36c	36	8,239.11	0.000	1,184,501	0.000	396,727	0.000	823,447
67	tho30	30	149,936	0.000	2,213,935	0.000	717,238	0.000	1,365,423
68	tho40	40	240,516	0.011	931,016	0.043	290,084	0.043	531,569
69	wil50	50	48,816	0.070	857,619	0.033	251,949	0.090	591,795
70	sko42	42	15,812	0.000	1,574,415	0.000	452,626	0.000	1,064,133
71	sko49	49	23,386	0.188	952,764	0.103	271,136	0.214	657,801
72	sko56	56	34,458	0.348	609,897	0.116	178,641	0.226	396,970
73	sko64	64	48,498	0.334	397,207	0.177	110,623	0.433	237,221
74	sko72	72	66,256	0.426	266,498	0.260	71,867	0.465	127,444
75	sko81	81	90,998	0.433	184,553	0.308	46,835	0.516	113,365
76	sko90	90	115,534	0.573	81,239	0.407	33,225	0.457	75,591
77	sko100a	100	152,002	0.524	90,571	0.289	22,536	0.462	55,820
78	sko100b	100	153,890	0.502	91,382	0.395	23,321	0.550	58,200
79	sko100c	100	147,862	0.498	89,829	0.331	22,093	0.594	61,904
80	sko100d	100	149,576	0.580	91,807	0.439	22,601	0.619	61,718

Table A1 (contd.): Computational results for symmetric instances

Sl. No.	Problem	size	BKS	2OPT		Implementation 3		Implementation 4	
				% Gap	nRuns	%Gap	nRuns	%Gap	nRuns
81	sko100e	100	149,150	0.654	90,005	0.257	22,419	0.654	58,861
82	sko100f	100	149,036	0.621	92,669	0.326	22,159	0.652	65,504
83	wil100	100	273,038	0.290	90,931	0.219	23,395	0.281	65,773
84	tho150	150	8,133,484	0.812	23,562	0.681	4,987	0.841	12,686
85	tai12a	12	224,416	0.000	38,533,000	0.000	14,132,061	0.000	14,379,768
86	tai15a	15	388,214	0.000	22,166,179	0.000	8,215,009	0.000	6,890,965
87	tai17a	17	491,812	0.000	15,153,936	0.000	5,260,533	0.000	4,845,802
88	tai20a	20	703,482	0.000	9,566,555	0.000	2,874,825	0.000	2,971,179
89	tai25a	25	1,167,256	0.000	5,158,952	0.000	1,479,942	0.000	1,595,760
90	tai30a	30	1,818,146	0.016	2,910,332	0.000	651,383	0.177	985,694
91	tai35a	35	2,422,002	0.384	1,860,388	0.000	388,448	0.384	609,266
92	tai40a	40	3,139,370	1.160	1,244,839	0.687	241,590	1.099	445,870
93	tai50a	50	4,938,796	1.813	1,288,258	1.151	211,159	1.665	435,550
94	tai60a	60	7,205,962	2.016	736,571	1.400	109,142	1.746	313,690
95	tai64c	64	1,855,928	0.000	1,568,762	0.000	320,094	0.000	1,123,419
96	tai80a	80	13,515,450	2.166	309,320	1.459	34,429	1.957	100,888
97	tai100a	100	21,059,006	2.266	157,090	1.569	14,302	1.900	67,605
98	tai256c	256	44,759,294	0.185	19,821	0.188	3,170	0.187	15,798
99	pal20	20	81,536	0.000	8,839,988	0.000	2,986,987	0.000	6,502,837
100	pal30	30	271,092	0.354	2,793,615	0.404	875,691	0.378	1,946,438
101	pal40	40	837,900	0.288	1,181,202	0.285	354,432	0.288	885,307
102	pal50	50	1,840,356	0.322	1,205,231	0.314	337,582	0.318	811,864
103	pal60	60	2,967,464	0.343	682,184	0.327	186,696	0.343	501,638
104	pal70	70	5,815,290	0.273	362,577	0.263	112,403	0.253	383,459
105	pal80	80	6,597,906	0.296	259,471	0.287	68,472	0.296	293,741
106	pal100	100	15,008,994	0.257	103,297	0.250	28,724	0.256	144,416
107	pal150	150	58,352,664	0.193	24,357	0.188	5,708	0.191	38,978
108	pal200	200	75,405,684	0.178	10,410	0.174	1,769	0.177	15,439

Table A2: Computational results for asymmetric instances

Sl. No.	Problem	size	BKS	2OPT		Implementation 3		Implementation 4	
				% Gap	nRuns	%Gap	nRuns	%Gap	nRuns
1	bur26a	26	5,426,670	0.000	114,672	0.000	85,634	0.000	114,606
2	bur26b	26	3,817,852	0.000	122,308	0.000	87,293	0.000	122,247
3	bur26c	26	5,426,795	0.000	112,625	0.000	82,912	0.000	112,556
4	bur26d	26	3,821,225	0.000	119,809	0.000	87,760	0.000	119,743
5	bur26e	26	5,386,879	0.000	110,953	0.000	83,787	0.000	110,890
6	bur26f	26	3,782,044	0.000	119,957	0.000	87,391	0.000	119,891
7	bur26g	26	10,117,172	0.000	109,920	0.000	83,347	0.000	109,829
8	bur26h	26	7,098,658	0.000	116,744	0.000	93,540	0.000	116,677
9	lipa20a	20	3,683	0.000	386,856	0.000	238,081	0.000	285,714
10	lipa20b	20	27,076	0.000	364,584	0.000	277,407	0.000	233,970
11	lipa30a	30	13,178	0.000	104,987	0.000	54,075	0.000	104,939
12	lipa30b	30	151,426	0.000	102,598	0.000	56,856	0.000	61,550
13	lipa40a	40	31,538	0.907	43,018	0.000	18,082	0.907	36,566
14	lipa40b	40	476,581	0.000	41,186	0.000	19,034	0.000	29,478
15	lipa50a	50	62,093	0.892	42,978	0.849	15,372	0.892	37,043
16	lipa50b	50	1,210,244	0.000	41,633	0.000	16,644	0.000	30,964
17	lipa60a	60	107,218	0.844	24,248	0.787	7,166	0.844	21,339
18	lipa60b	60	2,520,135	0.000	24,046	0.000	7,938	0.000	16,725
19	lipa70a	70	169,755	0.775	15,016	0.725	4,056	0.773	13,187
20	lipa70b	70	4,603,200	0.000	14,644	0.000	4,358	0.000	9,767
21	lipa80a	80	253,195	0.678	10,026	0.628	2,335	0.678	8,510
22	lipa80b	80	7,763,962	0.000	9,701	0.000	2,451	0.000	6,214
23	lipa90a	90	360,630	0.636	6,836	0.581	1,412	0.636	6,231
24	tai12b	12	39,464,925	0.000	1,619,258	0.000	1,682,704	0.000	953,511
25	tai20b	20	122,455,319	0.000	266,289	0.000	207,118	0.000	183,113
26	tai25b	25	344,355,646	0.000	121,862	0.000	83,619	0.000	89,529
27	tai30b	30	637,117,113	0.000	65,700	0.000	38,047	0.000	28,945
28	tai35b	35	283,315,445	0.000	40,095	0.000	23,213	0.000	31,932
29	tai40b	40	637,250,948	0.000	24,696	0.000	13,527	0.000	19,742
30	tai50b	50	458,821,517	0.073	23,734	0.058	11,315	0.073	20,253
31	tai60b	60	608,215,054	0.008	12,713	0.038	4,863	0.089	10,853
32	tai80b	80	818,415,043	1.594	4,988	0.844	1,597	1.594	4,563
33	tai100b	100	1,185,996,137	0.875	2,298	0.653	563	0.762	2,116
34	tai150b	150	498,896,643	1.473	624	1.467	92	1.473	584