

# Online materials

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## 1. Unsolvable instances

### 1.1. *Small instances set*

bay\_04\_05\_090\_1.txt  
bay\_04\_05\_090\_4.txt  
bay\_05\_05\_090\_2.txt  
bay\_06\_05\_090\_1.txt  
bay\_06\_05\_090\_4.txt  
bay\_06\_06\_090\_1.txt  
bay\_06\_06\_090\_4.txt  
bay\_07\_06\_090\_1.txt  
bay\_08\_05\_090\_2.txt  
bay\_08\_05\_090\_4.txt

### 1.2. *Normal instances set*

bay\_08\_06\_090\_3.txt  
bay\_08\_06\_090\_4.txt  
bay\_08\_07\_090\_3.txt

## 2. Results for Caserta et al. (2009) instances

Set size	Re-implementation	Proposed	Dec. re.
3x3	151, 71	143, 73	5, 26%
3x4	196, 84	190, 83	3, 05%
3x5	241, 40	235, 99	2, 24%
3x6	295, 76	289, 34	2, 17%
3x7	341, 42	335, 28	1, 80%
3x8	406, 53	397, 57	2, 20%
4x4	335, 93	307, 36	8, 50%
4x5	418, 08	395, 77	5, 34%
4x6	482, 97	467, 41	3, 22%
4x7	575, 98	553, 24	3, 95%
5x4	509, 38	465, 21	8, 67%
5x5	637, 54	594, 42	6, 76%
5x6	768, 96	722, 77	6, 01%
5x7	878, 46	829, 55	5, 57%
5x8	1011, 00	964, 06	4, 64%
5x9	1149, 15	1091, 49	5, 02%
5x10	1292, 34	1233, 65	4, 54%
6x6	1126, 01	1038, 29	7, 79%
6x10	1827, 31	1732, 39	5, 19%
10x6	3377, 56	3330, 94	1, 38%
10x10	5406, 54	5551, 58	−2, 68%

Table 1: Crane working time for 3s execution time [hours].

Set size	Re-implementation	Proposed	Inc. re.
3x3	4410	4221	4, 48%
3x4	5271	5460	-3, 46%
3x5	5922	6090	-2, 76%
3x6	7121	7376	-3, 46%
3x7	7882	8085	-2, 51%
3x8	9040	9268	-2, 46%
4x4	9176	8789	4, 40%
4x5	11295	11305	-0, 09%
4x6	12047	12595	-4, 35%
4x7	13936	14470	-3, 69%
5x4	14083	13640	3, 25%
5x5	16990	17373	-2, 20%
5x6	19954	20493	-2, 63%
5x7	21604	21812	-0, 95%
5x8	24159	25339	-4, 66%
5x9	26758	27531	-2, 81%
5x10	28997	29985	-3, 29%
6x6	28831	29830	-3, 35%
6x10	40739	43307	-5, 93%
10x6	76748	90285	-14, 99%
10x10	108664	144359	-24, 73%

Table 2: Relocations for 3s execution time.

Set size	Re-implementation	Proposed	Dec. re.
3x3	151, 71	143, 73	5, 26%
3x4	196, 83	190, 83	3, 05%
3x5	240, 83	235, 99	2, 01%
3x6	295, 29	289, 23	2, 05%
3x7	340, 99	335, 25	1, 68%
3x8	405, 44	397, 34	2, 00%
4x4	334, 92	307, 19	8, 28%
4x5	416, 32	395, 41	5, 02%
4x6	481, 20	466, 15	3, 13%
4x7	573, 61	552, 20	3, 73%
5x4	507, 02	463, 91	8, 50%
5x5	633, 06	591, 43	6, 58%
5x6	764, 20	715, 89	6, 32%
5x7	874, 72	825, 56	5, 62%
5x8	1006, 03	957, 95	4, 78%
5x9	1142, 81	1086, 36	4, 94%
5x10	1285, 62	1225, 66	4, 66%
6x6	1116, 94	1030, 07	7, 78%
6x10	1818, 17	1722, 49	5, 26%
10x6	3338, 61	3231, 70	3, 20%
10x10	5368, 97	5415, 95	−0, 88%

Table 3: Crane working time for 30s execution time [hours].

Set size	Re-implementation	Proposed	Inc. re.
3x3	4410	4221	4, 48%
3x4	5271	5460	−3, 46%
3x5	5922	6090	−2, 76%
3x6	7159	7392	−3, 15%
3x7	7924	8085	−1, 99%
3x8	9070	9263	−2, 08%
4x4	9168	8800	4, 18%
4x5	11288	11358	−0, 62%
4x6	12065	12616	−4, 37%
4x7	13897	14496	−4, 13%
5x4	14046	13582	3, 42%
5x5	16984	17259	−1, 59%
5x6	19864	20254	−1, 93%
5x7	21559	21844	−1, 30%
5x8	24144	25226	−4, 29%
5x9	26663	27486	−2, 99%
5x10	28923	29842	−3, 08%
6x6	28697	29610	−3, 08%
6x10	40680	42865	−5, 10%
10x6	75841	86506	−12, 33%
10x10	108048	139029	−22, 28%

Table 4: Relocations for 30s execution time.

Set size	Re-implementation	Proposed	Dec. re.
3x3	151, 71	143, 73	5, 26%
3x4	196, 83	190, 83	3, 05%
3x5	240, 34	235, 99	1, 81%
3x6	294, 16	289, 22	1, 68%
3x7	340, 24	335, 25	1, 46%
3x8	404, 24	397, 28	1, 72%
4x4	334, 27	307, 13	8, 12%
4x5	413, 93	394, 91	4, 59%
4x6	479, 59	464, 90	3, 06%
4x7	570, 28	550, 73	3, 43%
5x4	504, 99	462, 76	8, 36%
5x5	628, 19	589, 09	6, 22%
5x6	756, 54	708, 84	6, 31%
5x7	869, 24	820, 09	5, 65%
5x8	996, 83	949, 58	4, 74%
5x9	1132, 68	1078, 51	4, 78%
5x10	1274, 36	1214, 95	4, 66%
6x6	1103, 23	1015, 42	7, 96%
6x10	1802, 74	1708, 64	5, 22%
10x6	3280, 07	3124, 27	4, 75%
10x10	5314, 64	5221, 30	1, 76%

Table 5: Crane working time for 300s execution time [hours].

Set size	Re-implementation	Proposed	Inc. re.
3x3	4410	4221	4, 48%
3x4	5271	5460	-3, 46%
3x5	5922	6090	-2, 76%
3x6	7207	7392	-2, 50%
3x7	7969	8085	-1, 43%
3x8	9114	9261	-1, 59%
4x4	9154	8799	4, 03%
4x5	11250	11393	-1, 26%
4x6	12076	12586	-4, 05%
4x7	13932	14531	-4, 12%
5x4	14054	13485	4, 22%
5x5	16920	17288	-2, 13%
5x6	19795	20026	-1, 15%
5x7	21521	21861	-1, 56%
5x8	24137	25126	-3, 94%
5x9	26513	27473	-3, 49%
5x10	28821	29831	-3, 39%
6x6	28485	29095	-2, 10%
6x10	40500	42432	-4, 55%
10x6	74667	82431	-9, 42%
10x10	107204	131606	-18, 54%

Table 6: Relocations for 300s execution time.