

Research Report

“1082 Benchmark Problems related to Resource Leveling Optimization: Best solutions obtained from the Application of different Evolutionary Intelligence Algorithms”

C. Kyriklidis and G. Dounias

*Management and Decision Engineering Laboratory (MDE-Lab)
University of the Aegean,
Dept. of Financial and Management Engineering,
41 Kountouriotou St, 82100 Chios, Greece
<http://labs.fme.aegean.gr/decision>)
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About this report

This research report contains the best scores obtained after extensive experimentation on 1082 benchmark problems related to resource leveling optimization on projects. The work proposes the use of these problems as benchmark problems for resource leveling experimentation.

Two of these problems correspond to real world projects with a big or even huge number of activities and high complexity. The rest of the problems have been taken from the PSP Lib (<http://webserver.wi.tum.de/psplib/main.html>) where they have been used in the past for resource scheduling optimization problems.

Benchmark Problems

The PSP-Lib medium size problems used in this study can be downloaded freely from the web and concern 480 problems of 90 activities with different degree of complexity (critical / non-critical, etc), and 600 problems of 120 activities with similar characteristics. Two real-world projects are also contained in this report:

The first one concerns a specific shipbuilding project of a 50000 DWT ship, which consists of 1178 different activities with several interrelations among them. The project lasted 208 days ($T=208$) and the duration of the activities ranges between 1 and 40 days, according to the plan. In total, 21 different kinds of resources were involved in the ship construction.

The second real world project concerns the construction of a boiler for a power plant, consisting of 46 activities of variable duration ranging from 40 to 159 days each and with a total of $T=314$ days. Eleven (11) different types of resources are involved in this project, while there are several time interval based interrelations among activities.

Methodologies Tested

The solutions were obtained using different resource leveling evaluation functions and a number of different intelligent methodologies, such as genetic algorithms (called standard GA approach, or GA), hybrid genetic algorithm (called HGA approach), hybrid ant colony optimization (called HACO-GA approach), etc. More information on the exact evolutionary methodology used for obtaining the results presented here, can be found in the references given above.

Resource Leveling Evaluation Functions

Let $A = \{1, 2, \dots, n\}$ be the set of the project's activities to be scheduled, where activities 1 and n are dummy activities that represent the starting and ending phase, respectively. Duration and resource requirements for these activities equal to zero. The duration of each activity $i \in A$ is denoted by d_i . T denotes the total duration of the project. Also T is computed by CPM method, where the project network is designed as A.O.N. (Activity On Node). Precedence relations among the activities in A exist. These relations indicate which activities should be completed before a specific activity can start. The underlying assumption is that the type of relationships among activities is finish-to-start with zero lag. Each activity i requires r_i units of k ($k=1, \dots, K$) resource types per time period. If a type of resource is used in resource leveling process, then $c_k=1$ else $c_k=0$.

$$r(i) = \sum_{k \in \{1, \dots, K\}} \sum_{i \in \{1, 2, \dots, n\}} c_k r_{ki}$$

For the profile evaluation in the resource leveling problem, is used one or, are blended more than one of the following seven objectives:

- The minimization of the maximum resource usage for the project (denoted as *min Gf*)

$$G_f = \max \{F(t), t = 1, 2, \dots, T\} \quad (1)$$

- The difference between actual and desirable resource usage (denoted as *min RLI*)

$$RLI = \sum_{q=1}^T \left(\left| \sum_{i=1}^n r_{iq} - \sum_{i=1}^n \frac{r_i d_i}{T} \right| \right) \quad (2)$$

- The minimization of the standard deviation (denoted as *min StD*)

$$StD = \left(\frac{1}{T-1} \sqrt{\sum_{i=1}^n \sum_{t=1}^T (r_i(t) - \bar{r})^2} \right) \quad (3)$$

- The minimization of the squared resource usage (denoted as *min R²*)

$$R^2 = \sum_{i=1}^n \sum_{t=1}^T r_i^2(t) \quad (4)$$

- The minimum uniform resource use from period to period (denoted as *min Step*)

$$Step = \sum_{t=1}^T |F(t) - F(t-1)| \quad (5)$$

- The relation of the selected resource histogram variation to an ideal one (*min RIC*)

$$RIC = \sum_{t=1}^T \frac{(T \cdot R^2)}{(F^2(t))} \quad (6)$$

- The minimum entropy (denoted as *min EV*)

$$EV = \sum_{i=1}^n \left[\left(\frac{r_i}{\sum_{i=1}^n r_i} \right) \cdot \ln \left(\frac{r_i}{\sum_{i=1}^n r_i} \right) \right] \quad (7)$$

Experimentation and Results

Each project has been processed repeatedly several times with each evolutionary methodology and resource profile evaluation function (from 10 to 50 times for each different experimental setting) and the best solution obtained per setting has been recorded for each problem. Results are represented in Tables I-XVII. In addition, all the resulting profiles have been kept separately (as an immediate proof of the result obtained) and have been uploaded in separate zip files below this report in the website of the Management and Decision Engineering Laboratory (MDE-Lab) of the Department of Financial and Management Engineering, University of the Aegean, Chios, Greece. In total, more than 100,000 different experiments have been conducted in the last couple of years on the subject of resource leveling.

Results will be updated often, when improved solutions appear in literature, or are being obtained during additional experimentation from students of the MDE-Lab. All undergraduate or postgraduate students of the University of the Aegean that have contributed to this report while elaborating their diploma thesis are greatly acknowledged.

FOR CITING THIS WORK PLEASE USE THE FOLLOWING REFERENCES:

- C. Kiriklidis and G. Dounias (2015): Research Report: “1082 Benchmark Problems related to Resource Leveling Optimization: Best solutions obtained from the Application of different Evolutionary Intelligence Algorithms”, MDE-Lab, Dept. of Financial and Management Engineering, University of the Aegean, Chios, Greece, available on-line from <http://labs.fme.aegean.gr/decision> (**best scores**)
- Kyriklidis, C., Vassiliadis, V., Kirytopoulos, K. and Dounias, G., "Hybrid nature-inspired intelligence for the resource leveling problem", *Operational Research Journal* (Springer), Vol. 14, No. 3, pp. 387-407, 2014 (**theory and experiments**)
- Kyriklidis, C. and Dounias, G., "Application of Evolutionary Algorithms in Project Management", *Proceedings of Artificial Intelligence Applications and Innovation 2014*, Rhodes, Sept 2014, L. Iliadis et al. (Eds.): AIAI 2014, IFIP AICT 436 (Springer Lecture Notes Series), pp. 335–343, 2014 (**more on theory and experiments**)

Table I: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the G_f resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	G_f	Project	G_f	Project	G_f	Project	G_f
j901_1	57	j906_1	85	j9011_1	137	j9016_1	201
j901_2	38	j906_2	97	j9011_2	123	j9016_2	208
j901_3	57	j906_3	127	j9011_3	163	j9016_3	230
j901_4	53	j906_4	113	j9011_4	164	j9016_4	242
j901_5	46	j906_5	128	j9011_5	154	j9016_5	229
j901_6	58	j906_6	91	j9011_6	180	j9016_6	285
j901_7	50	j906_7	107	j9011_7	143	j9016_7	210
j901_8	58	j906_8	138	j9011_8	165	j9016_8	228
j901_9	62	j906_9	118	j9011_9	151	j9016_9	247
j901_10	52	j906_10	99	j9011_10	140	j9016_10	194
j902_1	45	j907_1	110	j9012_1	165	j9017_1	58
j902_2	36	j907_2	108	j9012_2	159	j9017_2	47
j902_3	53	j907_3	114	j9012_3	145	j9017_3	55
j902_4	65	j907_4	78	j9012_4	195	j9017_4	43
j902_5	42	j907_5	102	j9012_5	154	j9017_5	37
j902_6	58	j907_6	86	j9012_6	153	j9017_6	51
j902_7	51	j907_7	92	j9012_7	185	j9017_7	51
j902_8	56	j907_8	144	j9012_8	150	j9017_8	47
j902_9	56	j907_9	103	j9012_9	183	j9017_9	54
j902_10	45	j907_10	100	j9012_10	152	j9017_10	52
j903_1	45	j908_1	95	j9013_1	178	j9018_1	49
j903_2	43	j908_2	92	j9013_2	219	j9018_2	45
j903_3	55	j908_3	119	j9013_3	213	j9018_3	50
j903_4	41	j908_4	112	j9013_4	208	j9018_4	52
j903_5	56	j908_5	141	j9013_5	188	j9018_5	45
j903_6	56	j908_6	134	j9013_6	219	j9018_6	49
j903_7	39	j908_7	123	j9013_7	189	j9018_7	47
j903_8	45	j908_8	121	j9013_8	266	j9018_8	54
j903_9	59	j908_9	99	j9013_9	196	j9018_9	53
j903_10	59	j908_10	98	j9013_10	215	j9018_10	43
j904_1	52	j909_1	145	j9014_1	180	j9019_1	45
j904_2	46	j909_2	150	j9014_2	197	j9019_2	48
j904_3	64	j909_3	174	j9014_3	187	j9019_3	46
j904_4	50	j909_4	166	j9014_4	192	j9019_4	55
j904_5	43	j909_5	135	j9014_5	204	j9019_5	53
j904_6	52	j909_6	148	j9014_6	231	j9019_6	32
j904_7	58	j909_7	155	j9014_7	202	j9019_7	65
j904_8	44	j909_8	146	j9014_8	224	j9019_8	50
j904_9	49	j909_9	165	j9014_9	180	j9019_9	39
j904_10	60	j909_10	165	j9014_10	206	j9019_10	56
j905_1	108	j9010_1	153	j9015_1	189	j9020_1	55
j905_2	90	j9010_2	147	j9015_2	204	j9020_2	55
j905_3	126	j9010_3	128	j9015_3	186	j9020_3	45
j905_4	101	j9010_4	132	j9015_4	180	j9020_4	53
j905_5	127	j9010_5	169	j9015_5	178	j9020_5	52
j905_6	104	j9010_6	126	j9015_6	281	j9020_6	54
j905_7	105	j9010_7	161	j9015_7	191	j9020_7	46
j905_8	102	j9010_8	142	j9015_8	199	j9020_8	51
j905_9	103	j9010_9	148	j9015_9	233	j9020_9	48
j905_10	102	j9010_10	151	j9015_10	198	j9020_10	43

Table II: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the G_f resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	G_f	Project	G_f	Project	G_f	Project	G_f
j9021_1	105	j9026_1	154	j9031_1	189	j9036_1	44
j9021_2	92	j9026_2	154	j9031_2	228	j9036_2	35
j9021_3	102	j9026_3	148	j9031_3	155	j9036_3	49
j9021_4	92	j9026_4	142	j9031_4	190	j9036_4	42
j9021_5	113	j9026_5	134	j9031_5	200	j9036_5	42
j9021_6	98	j9026_6	124	j9031_6	202	j9036_6	51
j9021_7	92	j9026_7	137	j9031_7	175	j9036_7	42
j9021_8	96	j9026_8	163	j9031_8	182	j9036_8	47
j9021_9	103	j9026_9	133	j9031_9	230	j9036_9	42
j9021_10	101	j9026_10	137	j9031_10	154	j9036_10	41
j9022_1	78	j9027_1	120	j9032_1	199	j9037_1	92
j9022_2	82	j9027_2	181	j9032_2	212	j9037_2	100
j9022_3	106	j9027_3	139	j9032_3	169	j9037_3	70
j9022_4	95	j9027_4	166	j9032_4	179	j9037_4	101
j9022_5	85	j9027_5	128	j9032_5	174	j9037_5	86
j9022_6	111	j9027_6	159	j9032_6	181	j9037_6	98
j9022_7	92	j9027_7	164	j9032_7	203	j9037_7	80
j9022_8	95	j9027_8	156	j9032_8	191	j9037_8	100
j9022_9	95	j9027_9	181	j9032_9	182	j9037_9	86
j9022_10	105	j9027_10	127	j9032_10	174	j9037_10	99
j9023_1	102	j9028_1	163	j9033_1	45	j9038_1	106
j9023_2	103	j9028_2	154	j9033_2	39	j9038_2	94
j9023_3	82	j9028_3	131	j9033_3	36	j9038_3	94
j9023_4	97	j9028_4	158	j9033_4	43	j9038_4	87
j9023_5	84	j9028_5	154	j9033_5	44	j9038_5	96
j9023_6	86	j9028_6	139	j9033_6	47	j9038_6	97
j9023_7	105	j9028_7	135	j9033_7	43	j9038_7	89
j9023_8	89	j9028_8	121	j9033_8	38	j9038_8	99
j9023_9	79	j9028_9	94	j9033_9	45	j9038_9	89
j9023_10	93	j9028_10	160	j9033_10	47	j9038_10	77
j9024_1	98	j9029_1	170	j9034_1	50	j9039_1	79
j9024_2	90	j9029_2	202	j9034_2	47	j9039_2	84
j9024_3	110	j9029_3	180	j9034_3	46	j9039_3	113
j9024_4	95	j9029_4	183	j9034_4	53	j9039_4	105
j9024_5	108	j9029_5	169	j9034_5	52	j9039_5	107
j9024_6	100	j9029_6	210	j9034_6	45	j9039_6	101
j9024_7	95	j9029_7	172	j9034_7	48	j9039_7	112
j9024_8	102	j9029_8	185	j9034_8	51	j9039_8	109
j9024_9	121	j9029_9	208	j9034_9	45	j9039_9	98
j9024_10	96	j9029_10	204	j9034_10	42	j9039_10	91
j9025_1	126	j9030_1	166	j9035_1	44	j9040_1	78
j9025_2	176	j9030_2	208	j9035_2	50	j9040_2	85
j9025_3	143	j9030_3	169	j9035_3	46	j9040_3	93
j9025_4	129	j9030_4	168	j9035_4	52	j9040_4	71
j9025_5	166	j9030_5	176	j9035_5	41	j9040_5	80
j9025_6	169	j9030_6	187	j9035_6	54	j9040_6	95
j9025_7	173	j9030_7	203	j9035_7	49	j9040_7	100
j9025_8	133	j9030_8	213	j9035_8	43	j9040_8	98
j9025_9	132	j9030_9	204	j9035_9	58	j9040_9	95
j9025_10	125	j9030_10	164	j9035_10	46	j9040_10	107

Table III: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the G_f resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9041_1 έως j9048_10)

Project	G_f	Project	G_f	Project	G_f
j9041_1	122	j9044_1	140	j9047_1	174
j9041_2	131	j9044_2	142	j9047_2	171
j9041_3	125	j9044_3	125	j9047_3	183
j9041_4	147	j9044_4	138	j9047_4	174
j9041_5	117	j9044_5	152	j9047_5	175
j9041_6	142	j9044_6	134	j9047_6	180
j9041_7	125	j9044_7	115	j9047_7	186
j9041_8	135	j9044_8	124	j9047_8	154
j9041_9	151	j9044_9	126	j9047_9	176
j9041_10	124	j9044_10	136	j9047_10	194
j9042_1	120	j9045_1	173	j9048_1	216
j9042_2	145	j9045_2	183	j9048_2	167
j9042_3	134	j9045_3	141	j9048_3	180
j9042_4	111	j9045_4	196	j9048_4	180
j9042_5	108	j9045_5	173	j9048_5	203
j9042_6	119	j9045_6	170	j9048_6	166
j9042_7	142	j9045_7	202	j9048_7	171
j9042_8	108	j9045_8	171	j9048_8	180
j9042_9	126	j9045_9	176	j9048_9	169
j9042_10	151	j9045_10	200	j9048_10	180
j9043_1	123	j9046_1	165		
j9043_2	127	j9046_2	156		
j9043_3	120	j9046_3	161		
j9043_4	135	j9046_4	194		
j9043_5	144	j9046_5	185		
j9043_6	113	j9046_6	199		
j9043_7	140	j9046_7	176		
j9043_8	129	j9046_8	183		
j9043_9	139	j9046_9	229		
j9043_10	146	j9046_10	155		

Table IV: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the StD resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	StD	Project	StD	Project	StD	Project	StD
j901_1	10,5831	j906_1	18,5183	j9011_1	20,1507	j9016_1	45,7559
j901_2	7,9458	j906_2	20,5679	j9011_2	19,7324	j9016_2	34,8251
j901_3	13,6071	j906_3	31,5386	j9011_3	34,4067	j9016_3	48,3784
j901_4	12,6695	j906_4	22,5803	j9011_4	30,5033	j9016_4	59,1324
j901_5	10,4648	j906_5	23,9454	j9011_5	31,9929	j9016_5	47,4778
j901_6	13,9444	j906_6	18,7649	j9011_6	41,5975	j9016_6	71,7725
j901_7	11,3426	j906_7	17,2740	j9011_7	33,0713	j9016_7	41,2600
j901_8	15,5474	j906_8	32,2267	j9011_8	39,0256	j9016_8	44,6874
j901_9	17,3777	j906_9	28,6268	j9011_9	28,9352	j9016_9	49,0877
j901_10	11,2312	j906_10	19,5804	j9011_10	28,7036	j9016_10	39,0464
j902_1	8,6380	j907_1	28,6926	j9012_1	27,9272	j9017_1	11,3061
j902_2	7,1417	j907_2	20,2119	j9012_2	31,6956	j9017_2	9,1023
j902_3	10,3514	j907_3	21,7824	j9012_3	33,5865	j9017_3	12,5075
j902_4	13,0831	j907_4	14,1501	j9012_4	50,3041	j9017_4	8,0266
j902_5	7,0540	j907_5	24,7012	j9012_5	32,2330	j9017_5	7,5257
j902_6	10,8521	j907_6	19,0919	j9012_6	30,6035	j9017_6	10,6767
j902_7	9,0928	j907_7	18,8714	j9012_7	42,5577	j9017_7	11,1804
j902_8	11,5600	j907_8	36,7393	j9012_8	29,5762	j9017_8	9,0044
j902_9	12,5397	j907_9	16,3213	j9012_9	38,6184	j9017_9	8,9026
j902_10	7,7955	j907_10	22,7164	j9012_10	32,6527	j9017_10	11,1870
j903_1	7,6582	j908_1	13,3155	j9013_1	33,9272	j9018_1	10,6823
j903_2	8,3406	j908_2	20,1015	j9013_2	50,5057	j9018_2	9,5599
j903_3	11,5880	j908_3	29,2961	j9013_3	40,6272	j9018_3	9,0405
j903_4	6,4124	j908_4	24,2011	j9013_4	43,0727	j9018_4	9,8418
j903_5	13,4072	j908_5	33,7201	j9013_5	36,8926	j9018_5	10,8979
j903_6	12,9100	j908_6	30,7310	j9013_6	42,7273	j9018_6	9,9872
j903_7	6,2049	j908_7	26,3758	j9013_7	37,8390	j9018_7	8,1720
j903_8	10,8018	j908_8	25,0030	j9013_8	59,9331	j9018_8	13,1968
j903_9	10,9796	j908_9	17,3397	j9013_9	45,1838	j9018_9	10,3180
j903_10	12,8316	j908_10	22,4677	j9013_10	42,6807	j9018_10	9,3903
j904_1	11,6013	j909_1	30,2903	j9014_1	32,8276	j9019_1	7,7099
j904_2	9,8149	j909_2	33,6709	j9014_2	39,1479	j9019_2	9,7478
j904_3	13,5856	j909_3	41,8007	j9014_3	34,0224	j9019_3	10,3086
j904_4	8,3680	j909_4	38,6530	j9014_4	38,2475	j9019_4	10,9190
j904_5	7,9939	j909_5	21,2058	j9014_5	41,9944	j9019_5	9,2325
j904_6	10,5037	j909_6	30,8287	j9014_6	47,6096	j9019_6	6,9288
j904_7	10,5879	j909_7	32,0104	j9014_7	39,2982	j9019_7	13,2518
j904_8	9,6946	j909_8	30,5306	j9014_8	50,0752	j9019_8	13,0734
j904_9	11,3098	j909_9	32,8251	j9014_9	35,5122	j9019_9	6,4768
j904_10	13,6689	j909_10	30,6178	j9014_10	46,2445	j9019_10	14,6658
j905_1	19,4241	j9010_1	30,6984	j9015_1	37,1739	j9020_1	12,2917
j905_2	19,6751	j9010_2	27,5290	j9015_2	44,7736	j9020_2	12,7065
j905_3	27,7770	j9010_3	28,3813	j9015_3	31,6978	j9020_3	6,9088
j905_4	18,9999	j9010_4	26,0886	j9015_4	33,8066	j9020_4	11,8027
j905_5	31,5159	j9010_5	35,2001	j9015_5	29,8857	j9020_5	9,5054
j905_6	23,2020	j9010_6	23,8426	j9015_6	61,4064	j9020_6	13,1419
j905_7	23,6047	j9010_7	33,9226	j9015_7	34,8082	j9020_7	8,7862
j905_8	21,0907	j9010_8	33,1907	j9015_8	36,5423	j9020_8	10,3008
j905_9	17,4471	j9010_9	22,5164	j9015_9	58,3107	j9020_9	11,5411
j905_10	19,7951	j9010_10	34,8563	j9015_10	41,5606	j9020_10	8,9740

Table V: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the StD resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	StD	Project	StD	Project	StD	Project	StD
j9021_1	16,9502	j9026_1	36,7161	j9031_1	32,9174	j9036_1	8,7047
j9021_2	18,6798	j9026_2	35,3796	j9031_2	47,7641	j9036_2	6,9127
j9021_3	21,5761	j9026_3	29,2483	j9031_3	33,5667	j9036_3	8,7951
j9021_4	20,1325	j9026_4	25,7506	j9031_4	31,4830	j9036_4	7,6309
j9021_5	25,1451	j9026_5	21,9609	j9031_5	39,2609	j9036_5	9,0779
j9021_6	23,0938	j9026_6	24,9080	j9031_6	35,9792	j9036_6	11,0641
j9021_7	21,3891	j9026_7	25,8013	j9031_7	40,1660	j9036_7	11,3432
j9021_8	20,5685	j9026_8	39,1424	j9031_8	33,7235	j9036_8	9,8497
j9021_9	23,6316	j9026_9	26,3585	j9031_9	45,3455	j9036_9	8,9624
j9021_10	21,0325	j9026_10	24,5319	j9031_10	24,9698	j9036_10	8,2072
j9022_1	18,3453	j9027_1	21,8220	j9032_1	37,7731	j9037_1	19,0298
j9022_2	15,5866	j9027_2	44,0490	j9032_2	48,9139	j9037_2	14,5326
j9022_3	25,4159	j9027_3	28,9269	j9032_3	30,5955	j9037_3	11,9001
j9022_4	19,1220	j9027_4	39,0604	j9032_4	34,4155	j9037_4	25,0866
j9022_5	16,7498	j9027_5	26,6397	j9032_5	31,4194	j9037_5	17,1086
j9022_6	24,0486	j9027_6	36,9411	j9032_6	42,9257	j9037_6	21,2983
j9022_7	17,2242	j9027_7	39,9460	j9032_7	41,0203	j9037_7	16,1544
j9022_8	22,6156	j9027_8	33,0451	j9032_8	42,6480	j9037_8	20,6646
j9022_9	21,6309	j9027_9	50,4472	j9032_9	37,6340	j9037_9	14,4384
j9022_10	16,8269	j9027_10	26,2552	j9032_10	36,2707	j9037_10	22,5156
j9023_1	23,0646	j9028_1	38,5944	j9033_1	6,6703	j9038_1	25,2017
j9023_2	23,6256	j9028_2	34,9813	j9033_2	8,7255	j9038_2	19,3231
j9023_3	19,6740	j9028_3	23,3903	j9033_3	5,9216	j9038_3	15,0206
j9023_4	13,7280	j9028_4	31,9719	j9033_4	7,9464	j9038_4	18,0963
j9023_5	12,8732	j9028_5	30,2924	j9033_5	9,0280	j9038_5	20,2552
j9023_6	15,5141	j9028_6	25,8199	j9033_6	9,6314	j9038_6	23,6583
j9023_7	25,0939	j9028_7	27,7210	j9033_7	8,3228	j9038_7	17,5967
j9023_8	19,0817	j9028_8	23,0944	j9033_8	5,1275	j9038_8	19,1827
j9023_9	18,0207	j9028_9	18,5263	j9033_9	9,9998	j9038_9	20,0842
j9023_10	17,6992	j9028_10	35,2584	j9033_10	11,2560	j9038_10	15,1577
j9024_1	21,6736	j9029_1	37,8155	j9034_1	9,9185	j9039_1	14,0502
j9024_2	18,2516	j9029_2	43,6754	j9034_2	8,8697	j9039_2	18,0259
j9024_3	26,0167	j9029_3	34,2821	j9034_3	9,5840	j9039_3	23,1198
j9024_4	12,5742	j9029_4	31,7171	j9034_4	10,5304	j9039_4	18,2216
j9024_5	23,2385	j9029_5	35,7079	j9034_5	9,0445	j9039_5	24,0756
j9024_6	19,3609	j9029_6	47,5680	j9034_6	10,0572	j9039_6	21,5990
j9024_7	15,7788	j9029_7	23,6144	j9034_7	9,2107	j9039_7	25,4457
j9024_8	24,5863	j9029_8	38,5908	j9034_8	11,7546	j9039_8	26,1517
j9024_9	25,3153	j9029_9	45,3335	j9034_9	11,0992	j9039_9	21,3506
j9024_10	21,0853	j9029_10	47,9552	j9034_10	7,3052	j9039_10	19,0015
j9025_1	24,8401	j9030_1	33,0556	j9035_1	8,3010	j9040_1	15,8577
j9025_2	35,2041	j9030_2	44,7810	j9035_2	10,3998	j9040_2	17,3376
j9025_3	27,8007	j9030_3	34,0273	j9035_3	7,8159	j9040_3	16,2828
j9025_4	29,0494	j9030_4	27,8796	j9035_4	11,9856	j9040_4	16,9620
j9025_5	32,6343	j9030_5	30,4413	j9035_5	8,5752	j9040_5	15,1725
j9025_6	39,5283	j9030_6	35,2153	j9035_6	10,3420	j9040_6	17,4781
j9025_7	42,7861	j9030_7	42,3241	j9035_7	10,7066	j9040_7	20,7709
j9025_8	25,4623	j9030_8	48,8105	j9035_8	8,8439	j9040_8	23,0668
j9025_9	25,1879	j9030_9	42,9562	j9035_9	14,5363	j9040_9	21,9738
j9025_10	26,8590	j9030_10	28,4823	j9035_10	7,4384	j9040_10	22,5976

Table VI: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the StD resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9041_1 έως j9048_10)

Project	StD	Project	StD
j9041_1	22,1821	j9046_1	33,8015
j9041_2	24,8070	j9046_2	33,2892
j9041_3	25,0520	j9046_3	33,0778
j9041_4	29,2133	j9046_4	39,8006
j9041_5	19,9815	j9046_5	40,2393
j9041_6	28,0040	j9046_6	47,5957
j9041_7	25,4229	j9046_7	28,2162
j9041_8	26,0558	j9046_8	27,9326
j9041_9	32,2531	j9046_9	53,8087
j9041_10	25,0617	j9046_10	28,3696
j9042_1	21,9311	j9047_1	30,8101
j9042_2	29,7847	j9047_2	34,1850
j9042_3	28,6324	j9047_3	35,8080
j9042_4	19,8758	j9047_4	25,9257
j9042_5	23,1732	j9047_5	27,5711
j9042_6	19,9805	j9047_6	35,6044
j9042_7	25,3475	j9047_7	45,4216
j9042_8	17,3743	j9047_8	22,6649
j9042_9	20,3352	j9047_9	38,7025
j9042_10	33,7867	j9047_10	41,5752
j9043_1	23,2771	j9048_1	52,1528
j9043_2	23,4544	j9048_2	33,4713
j9043_3	23,4338	j9048_3	36,2956
j9043_4	26,9179	j9048_4	37,5595
j9043_5	30,7164	j9048_5	47,1154
j9043_6	21,1958	j9048_6	35,1581
j9043_7	26,2406	j9048_7	38,1368
j9043_8	26,5698	j9048_8	38,2436
j9043_9	29,5459	j9048_9	28,6667
j9043_10	30,2708	j9048_10	36,5168
j9044_1	25,4134		
j9044_2	31,1153		
j9044_3	27,0360		
j9044_4	27,4248		
j9044_5	33,4215		
j9044_6	31,2385		
j9044_7	21,1012		
j9044_8	25,8885		
j9044_9	20,7288		
j9044_10	27,6290		
j9045_1	31,1192		
j9045_2	37,4852		
j9045_3	26,1453		
j9045_4	42,5340		
j9045_5	28,9625		
j9045_6	36,3732		
j9045_7	45,2948		
j9045_8	34,6358		
j9045_9	33,8094		
j9045_10	44,3391		

Table VII: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the Step resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	Step	Project	Step	Project	Step	Project	Step
j901_1	228	j906_1	447	j9011_1	748	j9016_1	920
j901_2	243	j906_2	571	j9011_2	770	j9016_2	867
j901_3	221	j906_3	549	j9011_3	675	j9016_3	857
j901_4	239	j906_4	615	j9011_4	732	j9016_4	838
j901_5	238	j906_5	454	j9011_5	672	j9016_5	861
j901_6	181	j906_6	579	j9011_6	625	j9016_6	859
j901_7	256	j906_7	475	j9011_7	801	j9016_7	857
j901_8	302	j906_8	473	j9011_8	757	j9016_8	921
j901_9	246	j906_9	439	j9011_9	825	j9016_9	800
j901_10	334*	j906_10	558	j9011_10	771	j9016_10	763
j902_1	284	j907_1	480	j9012_1	672	j9017_1	268
j902_2	319	j907_2	564	j9012_2	736	j9017_2	236
j902_3	243	j907_3	503	j9012_3	835	j9017_3	273
j902_4	244	j907_4	515	j9012_4	699	j9017_4	284
j902_5	243	j907_5	489	j9012_5	749	j9017_5	329
j902_6	242	j907_6	558	j9012_6	746	j9017_6	272
j902_7	284	j907_7	582	j9012_7	676	j9017_7	254
j902_8	246	j907_8	439	j9012_8	655	j9017_8	324
j902_9	249	j907_9	567	j9012_9	731	j9017_9	257
j902_10	252	j907_10	536	j9012_10	717	j9017_10	273
j903_1	242	j908_1	589	j9013_1	858	j9018_1	311
j903_2	231	j908_2	487	j9013_2	888	j9018_2	274
j903_3	223	j908_3	566	j9013_3	946	j9018_3	287
j903_4	274	j908_4	477	j9013_4	984	j9018_4	316
j903_5	232	j908_5	520	j9013_5	969	j9018_5	277*
j903_6	212	j908_6	510	j9013_6	871	j9018_6	278
j903_7	252	j908_7	529	j9013_7	971	j9018_7	246
j903_8	254	j908_8	481	j9013_8	864	j9018_8	269
j903_9	211	j908_9	557	j9013_9	923	j9018_9	254
j903_10	211	j908_10	577	j9013_10	806	j9018_10	284
j904_1	277	j909_1	778	j9014_1	964	j9019_1	287
j904_2	300*	j909_2	735	j9014_2	774	j9019_2	243
j904_3	258	j909_3	627	j9014_3	1018	j9019_3	260
j904_4	271	j909_4	689	j9014_4	921	j9019_4	261
j904_5	273	j909_5	692	j9014_5	858	j9019_5	252
j904_6	259	j909_6	705	j9014_6	803	j9019_6	335
j904_7	255	j909_7	624	j9014_7	1025	j9019_7	241
j904_8	236	j909_8	610	j9014_8	940	j9019_8	262
j904_9	244	j909_9	720	j9014_9	1127	j9019_9	329
j904_10	250	j909_10	692	j9014_10	884	j9019_10	263
j905_1	482	j9010_1	720	j9015_1	928	j9020_1	261
j905_2	577	j9010_2	673	j9015_2	757	j9020_2	219
j905_3	461	j9010_3	783	j9015_3	902	j9020_3	237
j905_4	577	j9010_4	793	j9015_4	1068	j9020_4	279
j905_5	626	j9010_5	668	j9015_5	880	j9020_5	267
j905_6	496	j9010_6	676	j9015_6	868	j9020_6	274
j905_7	533	j9010_7	792	j9015_7	851	j9020_7	279
j905_8	481	j9010_8	644	j9015_8	929	j9020_8	254
j905_9	655	j9010_9	729	j9015_9	935	j9020_9	246
j905_10	444	j9010_10	633	j9015_10	951	j9020_10	268

Table VIII: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the Step resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	Step	Project	Step	Project	Step	Project	Step
j9021_1	507	j9026_1	748	j9031_1	856	j9036_1	316
j9021_2	533	j9026_2	828	j9031_2	855	j9036_2	339
j9021_3	586	j9026_3	778	j9031_3	1036	j9036_3	280
j9021_4	631	j9026_4	749	j9031_4	934	j9036_4	242
j9021_5	533	j9026_5	713	j9031_5	982	j9036_5	276
j9021_6	557	j9026_6	873	j9031_6	907	j9036_6	278
j9021_7	601	j9026_7	629	j9031_7	1011	j9036_7	234
j9021_8	478	j9026_8	743	j9031_8	939	j9036_8	264
j9021_9	511	j9026_9	758	j9031_9	871	j9036_9	284
j9021_10	546	j9026_10	825	j9031_10	983	j9036_10	280
j9022_1	591	j9027_1	730	j9032_1	960	j9037_1	463
j9022_2	569	j9027_2	809	j9032_2	895	j9037_2	484
j9022_3	544	j9027_3	760	j9032_3	982	j9037_3	606
j9022_4	603	j9027_4	642	j9032_4	933	j9037_4	486
j9022_5	569	j9027_5	854	j9032_5	912	j9037_5	595
j9022_6	528	j9027_6	788	j9032_6	915	j9037_6	531
j9022_7	488	j9027_7	633	j9032_7	946	j9037_7	599
j9022_8	599	j9027_8	717	j9032_8	973	j9037_8	552
j9022_9	511	j9027_9	737	j9032_9	1033	j9037_9	605
j9022_10	390	j9027_10	837	j9032_10	997	j9037_10	577
j9023_1	569	j9028_1	732	j9033_1	240	j9038_1	468
j9023_2	508	j9028_2	668	j9033_2	301	j9038_2	600
j9023_3	592	j9028_3	641	j9033_3	262	j9038_3	591
j9023_4	507	j9028_4	741	j9033_4	280	j9038_4	571
j9023_5	497	j9028_5	820	j9033_5	284	j9038_5	478
j9023_6	511	j9028_6	797	j9033_6	311	j9038_6	536
j9023_7	548	j9028_7	791	j9033_7	263	j9038_7	602
j9023_8	520	j9028_8	720	j9033_8	264	j9038_8	552
j9023_9	665	j9028_9	751	j9033_9	244	j9038_9	626
j9023_10	469	j9028_10	650	j9033_10	318	j9038_10	605
j9024_1	527	j9029_1	1019	j9034_1	270	j9039_1	569
j9024_2	478	j9029_2	875	j9034_2	281	j9039_2	642
j9024_3	482	j9029_3	960	j9034_3	239	j9039_3	542
j9024_4	550	j9029_4	877	j9034_4	236	j9039_4	576
j9024_5	518	j9029_5	1030	j9034_5	272	j9039_5	600
j9024_6	526	j9029_6	907	j9034_6	275	j9039_6	518
j9024_7	552	j9029_7	948	j9034_7	290	j9039_7	573
j9024_8	492	j9029_8	959	j9034_8	258	j9039_8	546
j9024_9	526	j9029_9	928	j9034_9	303	j9039_9	536
j9024_10	541	j9029_10	877	j9034_10	295	j9039_10	606
j9025_1	746	j9030_1	909	j9035_1	276	j9040_1	549
j9025_2	783	j9030_2	868	j9035_2	292	j9040_2	557
j9025_3	733	j9030_3	935	j9035_3	276	j9040_3	525
j9025_4	825	j9030_4	1095	j9035_4	247	j9040_4	590
j9025_5	671	j9030_5	909	j9035_5	269	j9040_5	540
j9025_6	622	j9030_6	1012	j9035_6	238	j9040_6	566
j9025_7	759	j9030_7	918	j9035_7	266	j9040_7	481
j9025_8	830	j9030_8	915	j9035_8	268	j9040_8	480
j9025_9	628	j9030_9	919	j9035_9	260	j9040_9	531
j9025_10	735	j9030_10	843	j9035_10	258	j9040_10	619

Table IX: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the StD resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9041_1 έως j9048_10)

Project	Step	Project	Step
j9041_1	730	j9046_1	1108
j9041_2	803	j9046_2	942
j9041_3	834	j9046_3	1013
j9041_4	656	j9046_4	940
j9041_5	662	j9046_5	972
j9041_6	677	j9046_6	999
j9041_7	908	j9046_7	850
j9041_8	931	j9046_8	883
j9041_9	722	j9046_9	848
j9041_10	785	j9046_10	1120
j9042_1	913	j9047_1	959
j9042_2	829	j9047_2	1019
j9042_3	731	j9047_3	1125
j9042_4	737	j9047_4	988
j9042_5	874	j9047_5	1019
j9042_6	795	j9047_6	1158
j9042_7	671	j9047_7	966
j9042_8	840	j9047_8	980
j9042_9	754	j9047_9	953
j9042_10	763	j9047_10	860
j9043_1	753	j9048_1	911
j9043_2	793	j9048_2	943
j9043_3	851	j9048_3	1004
j9043_4	773	j9048_4	1004
j9043_5	894	j9048_5	869
j9043_6	892	j9048_6	1054
j9043_7	839	j9048_7	1062
j9043_8	834	j9048_8	794
j9043_9	801	j9048_9	946
j9043_10	781	j9048_10	1071
j9044_1	856		
j9044_2	683		
j9044_3	887		
j9044_4	620		
j9044_5	756		
j9044_6	710		
j9044_7	807		
j9044_8	703		
j9044_9	860		
j9044_10	744		
j9045_1	892		
j9045_2	1033		
j9045_3	1010		
j9045_4	917		
j9045_5	969		
j9045_6	1108		
j9045_7	948		
j9045_8	962		
j9045_9	985		
j9045_10	921		

Table X: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the Gfresource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	Gf	Project	Gf	Project	Gf	Project	Gf
j901_1	61	j906_1	89	j9011_1	129	j9016_1	200
j901_2	42	j906_2	97	j9011_2	123	j9016_2	201
j901_3	58	j906_3	125	j9011_3	162	j9016_3	231
j901_4	55	j906_4	109	j9011_4	167	j9016_4	239
j901_5	48	j906_5	129	j9011_5	154	j9016_5	227
j901_6	60	j906_6	86	j9011_6	184	j9016_6	300
j901_7	50	j906_7	104	j9011_7	142	j9016_7	209
j901_8	59	j906_8	136	j9011_8	167	j9016_8	220
j901_9	65	j906_9	117	j9011_9	153	j9016_9	250
j901_10	54	j906_10	101	j9011_10	139	j9016_10	201
j902_1	44	j907_1	106	j9012_1	153	j9017_1	57
j902_2	37	j907_2	103	j9012_2	152	j9017_2	47
j902_3	54	j907_3	110	j9012_3	148	j9017_3	56
j902_4	65	j907_4	77	j9012_4	192	j9017_4	42
j902_5	42	j907_5	108	j9012_5	149	j9017_5	37
j902_6	58	j907_6	84	j9012_6	154	j9017_6	51
j902_7	50	j907_7	93	j9012_7	178	j9017_7	51
j902_8	57	j907_8	146	j9012_8	151	j9017_8	44
j902_9	60	j907_9	103	j9012_9	182	j9017_9	54
j902_10	44	j907_10	103	j9012_10	150	j9017_10	54
j903_1	44	j908_1	92	j9013_1	177	j9018_1	49
j903_2	42	j908_2	91	j9013_2	218	j9018_2	46
j903_3	57	j908_3	117	j9013_3	202	j9018_3	51
j903_4	39	j908_4	113	j9013_4	207	j9018_4	50
j903_5	54	j908_5	137	j9013_5	195	j9018_5	47
j903_6	56	j908_6	126	j9013_6	217	j9018_6	50
j903_7	40	j908_7	120	j9013_7	183	j9018_7	47
j903_8	46	j908_8	122	j9013_8	274	j9018_8	53
j903_9	59	j908_9	104	j9013_9	199	j9018_9	51
j903_10	60	j908_10	90	j9013_10	216	j9018_10	44
j904_1	49	j909_1	149	j9014_1	186	j9019_1	44
j904_2	48	j909_2	155	j9014_2	191	j9019_2	48
j904_3	62	j909_3	181	j9014_3	186	j9019_3	47
j904_4	47	j909_4	160	j9014_4	193	j9019_4	55
j904_5	48	j909_5	137	j9014_5	198	j9019_5	51
j904_6	53	j909_6	145	j9014_6	236	j9019_6	32
j904_7	56	j909_7	167	j9014_7	204	j9019_7	65
j904_8	45	j909_8	147	j9014_8	218	j9019_8	48
j904_9	48	j909_9	161	j9014_9	168	j9019_9	40
j904_10	56	j909_10	157	j9014_10	197	j9019_10	52
j905_1	104	j9010_1	152	j9015_1	190	j9020_1	54
j905_2	94	j9010_2	149	j9015_2	212	j9020_2	53
j905_3	128	j9010_3	123	j9015_3	184	j9020_3	47
j905_4	103	j9010_4	137	j9015_4	178	j9020_4	53
j905_5	130	j9010_5	167	j9015_5	175	j9020_5	53
j905_6	99	j9010_6	132	j9015_6	282	j9020_6	54
j905_7	110	j9010_7	158	j9015_7	187	j9020_7	47
j905_8	103	j9010_8	146	j9015_8	199	j9020_8	51
j905_9	111	j9010_9	143	j9015_9	241	j9020_9	47
j905_10	108	j9010_10	156	j9015_10	198	j9020_10	43

Table XI: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the Gf resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	Gf	Project	Gf	Project	Gf	Project	Gf
j9021_1	104	j9026_1	151	j9031_1	189	j9036_1	44
j9021_2	93	j9026_2	151	j9031_2	235	j9036_2	35
j9021_3	103	j9026_3	141	j9031_3	155	j9036_3	50
j9021_4	92	j9026_4	145	j9031_4	189	j9036_4	42
j9021_5	116	j9026_5	135	j9031_5	208	j9036_5	42
j9021_6	101	j9026_6	122	j9031_6	198	j9036_6	49
j9021_7	96	j9026_7	134	j9031_7	189	j9036_7	43
j9021_8	96	j9026_8	172	j9031_8	187	j9036_8	46
j9021_9	104	j9026_9	131	j9031_9	235	j9036_9	42
j9021_10	103	j9026_10	130	j9031_10	153	j9036_10	40
j9022_1	84	j9027_1	117	j9032_1	197	j9037_1	93
j9022_2	85	j9027_2	176	j9032_2	207	j9037_2	92
j9022_3	106	j9027_3	136	j9032_3	169	j9037_3	71
j9022_4	96	j9027_4	166	j9032_4	180	j9037_4	109
j9022_5	84	j9027_5	130	j9032_5	187	j9037_5	87
j9022_6	112	j9027_6	166	j9032_6	185	j9037_6	96
j9022_7	88	j9027_7	170	j9032_7	193	j9037_7	82
j9022_8	90	j9027_8	154	j9032_8	191	j9037_8	100
j9022_9	96	j9027_9	185	j9032_9	183	j9037_9	85
j9022_10	105	j9027_10	128	j9032_10	168	j9037_10	99
j9023_1	99	j9028_1	161	j9033_1	44	j9038_1	109
j9023_2	105	j9028_2	161	j9033_2	39	j9038_2	95
j9023_3	81	j9028_3	132	j9033_3	37	j9038_3	92
j9023_4	96	j9028_4	158	j9033_4	43	j9038_4	91
j9023_5	84	j9028_5	147	j9033_5	42	j9038_5	96
j9023_6	87	j9028_6	134	j9033_6	47	j9038_6	98
j9023_7	105	j9028_7	137	j9033_7	43	j9038_7	90
j9023_8	87	j9028_8	121	j9033_8	36	j9038_8	98
j9023_9	76	j9028_9	95	j9033_9	45	j9038_9	90
j9023_10	93	j9028_10	156	j9033_10	47	j9038_10	76
j9024_1	97	j9029_1	165	j9034_1	51	j9039_1	83
j9024_2	93	j9029_2	203	j9034_2	46	j9039_2	85
j9024_3	111	j9029_3	181	j9034_3	47	j9039_3	113
j9024_4	92	j9029_4	188	j9034_4	53	j9039_4	103
j9024_5	107	j9029_5	174	j9034_5	51	j9039_5	106
j9024_6	101	j9029_6	217	j9034_6	46	j9039_6	97
j9024_7	96	j9029_7	164	j9034_7	46	j9039_7	111
j9024_8	100	j9029_8	188	j9034_8	50	j9039_8	114
j9024_9	122	j9029_9	204	j9034_9	45	j9039_9	101
j9024_10	94	j9029_10	196	j9034_10	41	j9039_10	88
j9025_1	128	j9030_1	166	j9035_1	43	j9040_1	79
j9025_2	173	j9030_2	201	j9035_2	52	j9040_2	82
j9025_3	141	j9030_3	163	j9035_3	44	j9040_3	95
j9025_4	129	j9030_4	167	j9035_4	51	j9040_4	73
j9025_5	169	j9030_5	178	j9035_5	39	j9040_5	80
j9025_6	164	j9030_6	188	j9035_6	53	j9040_6	94
j9025_7	174	j9030_7	202	j9035_7	50	j9040_7	99
j9025_8	133	j9030_8	214	j9035_8	43	j9040_8	99
j9025_9	132	j9030_9	204	j9035_9	58	j9040_9	93
j9025_10	131	j9030_10	159	j9035_10	46	j9040_10	107

Table XII: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the Gfresource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9041_1 έως j9048_10)

Project	Gf	Project	Gf
j9041_1	124	j9046_1	171
j9041_2	129	j9046_2	157
j9041_3	125	j9046_3	166
j9041_4	143	j9046_4	197
j9041_5	117	j9046_5	184
j9041_6	144	j9046_6	196
j9041_7	126	j9046_7	173
j9041_8	136	j9046_8	187
j9041_9	154	j9046_9	232
j9041_10	123	j9046_10	151
j9042_1	115	j9047_1	177
j9042_2	145	j9047_2	167
j9042_3	139	j9047_3	182
j9042_4	104	j9047_4	169
j9042_5	107	j9047_5	179
j9042_6	122	j9047_6	182
j9042_7	145	j9047_7	190
j9042_8	107	j9047_8	154
j9042_9	133	j9047_9	174
j9042_10	148	j9047_10	198
j9043_1	123	j9048_1	218
j9043_2	129	j9048_2	168
j9043_3	121	j9048_3	170
j9043_4	135	j9048_4	186
j9043_5	139	j9048_5	216
j9043_6	113	j9048_6	161
j9043_7	140	j9048_7	170
j9043_8	125	j9048_8	179
j9043_9	140	j9048_9	163
j9043_10	144	j9048_10	178
j9044_1	139		
j9044_2	142		
j9044_3	127		
j9044_4	138		
j9044_5	150		
j9044_6	131		
j9044_7	120		
j9044_8	126		
j9044_9	121		
j9044_10	135		
j9045_1	169		
j9045_2	181		
j9045_3	139		
j9045_4	195		
j9045_5	171		
j9045_6	163		
j9045_7	206		
j9045_8	171		
j9045_9	170		
j9045_10	195		

Table XIII: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the StD resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	StD	Project	StD	Project	StD	Project	StD
j901_1	9,5378	j906_1	18,3084	j9011_1	21,1238	j9016_1	43,6941
j901_2	7,4931	j906_2	21,1728	j9011_2	20,1662	j9016_2	37,2028
j901_3	13,5003	j906_3	29,8747	j9011_3	32,2700	j9016_3	51,0057
j901_4	12,1604	j906_4	24,1189	j9011_4	30,3557	j9016_4	56,2726
j901_5	11,2022	j906_5	27,8785	j9011_5	32,2614	j9016_5	47,6028
j901_6	14,9280	j906_6	19,6384	j9011_6	40,3515	j9016_6	74,4356
j901_7	11,4613	j906_7	16,2285	j9011_7	33,1869	j9016_7	40,1031
j901_8	14,8351	j906_8	34,1074	j9011_8	36,6971	j9016_8	45,6870
j901_9	16,9910	j906_9	28,2389	j9011_9	32,0935	j9016_9	50,4290
j901_10	11,8841	j906_10	19,8996	j9011_10	28,4099	j9016_10	39,7732
j902_1	8,4046	j907_1	27,3492	j9012_1	28,7211	j9017_1	12,1403
j902_2	7,1417	j907_2	20,3417	j9012_2	29,5347	j9017_2	10,3381
j902_3	10,3187	j907_3	21,8102	j9012_3	35,6006	j9017_3	13,0426
j902_4	13,1351	j907_4	14,0366	j9012_4	52,1869	j9017_4	6,5806
j902_5	7,4578	j907_5	21,5298	j9012_5	31,9117	j9017_5	7,3716
j902_6	11,1441	j907_6	19,9592	j9012_6	31,4444	j9017_6	11,2887
j902_7	8,5149	j907_7	19,6319	j9012_7	43,6421	j9017_7	11,2818
j902_8	12,2526	j907_8	38,8157	j9012_8	27,4709	j9017_8	7,5418
j902_9	13,4541	j907_9	17,7831	j9012_9	40,3920	j9017_9	9,9118
j902_10	6,9216	j907_10	23,1181	j9012_10	29,8118	j9017_10	10,6689
j903_1	8,0404	j908_1	15,6103	j9013_1	32,9503	j9018_1	9,7268
j903_2	8,2374	j908_2	19,2736	j9013_2	48,4837	j9018_2	9,8579
j903_3	11,6323	j908_3	29,7536	j9013_3	41,4834	j9018_3	9,6196
j903_4	6,5901	j908_4	24,4881	j9013_4	40,3659	j9018_4	9,5979
j903_5	13,2195	j908_5	33,5378	j9013_5	32,6247	j9018_5	10,9432
j903_6	14,2320	j908_6	31,4922	j9013_6	43,6421	j9018_6	10,7879
j903_7	6,8498	j908_7	26,6176	j9013_7	37,0442	j9018_7	8,5475
j903_8	10,9414	j908_8	27,0575	j9013_8	63,5204	j9018_8	13,0461
j903_9	10,8621	j908_9	16,3401	j9013_9	40,5943	j9018_9	10,3341
j903_10	13,4963	j908_10	22,4124	j9013_10	43,1518	j9018_10	9,1666
j904_1	10,1126	j909_1	30,5492	j9014_1	35,0129	j9019_1	8,5518
j904_2	8,3972	j909_2	30,8974	j9014_2	39,7517	j9019_2	9,9362
j904_3	13,3618	j909_3	43,8647	j9014_3	34,5350	j9019_3	9,6646
j904_4	8,2543	j909_4	40,7791	j9014_4	36,2561	j9019_4	10,0650
j904_5	7,8561	j909_5	20,5056	j9014_5	42,1256	j9019_5	8,9807
j904_6	11,4331	j909_6	31,0238	j9014_6	44,4184	j9019_6	7,3359
j904_7	10,7528	j909_7	32,4579	j9014_7	41,9183	j9019_7	13,6903
j904_8	9,1868	j909_8	31,4146	j9014_8	47,9075	j9019_8	12,2030
j904_9	11,6107	j909_9	33,2434	j9014_9	37,2450	j9019_9	7,2525
j904_10	12,3846	j909_10	30,8903	j9014_10	46,7021	j9019_10	13,5168
j905_1	18,2294	j9010_1	32,3159	j9015_1	37,1247	j9020_1	12,0639
j905_2	17,5278	j9010_2	28,0557	j9015_2	47,1837	j9020_2	13,1124
j905_3	28,6538	j9010_3	24,8038	j9015_3	31,3867	j9020_3	8,4137
j905_4	19,0259	j9010_4	27,0585	j9015_4	37,5966	j9020_4	11,9582
j905_5	29,9730	j9010_5	37,6306	j9015_5	27,4425	j9020_5	9,5090
j905_6	22,9449	j9010_6	24,0647	j9015_6	61,9173	j9020_6	13,0665
j905_7	23,6952	j9010_7	32,6775	j9015_7	35,9767	j9020_7	9,0669
j905_8	21,7282	j9010_8	30,4289	j9015_8	40,9824	j9020_8	10,3515
j905_9	18,2779	j9010_9	27,9642	j9015_9	55,9880	j9020_9	11,1078
j905_10	21,2028	j9010_10	32,5380	j9015_10	38,2134	j9020_10	8,5019

Table XIV: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the StD resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	StD	Project	StD	Project	StD	Project	StD
j9021_1	15,7193	j9026_1	35,4335	j9031_1	30,8195	j9036_1	8,2879
j9021_2	18,2667	j9026_2	33,5495	j9031_2	51,9239	j9036_2	6,8238
j9021_3	21,2393	j9026_3	28,2385	j9031_3	31,1185	j9036_3	9,2972
j9021_4	20,8044	j9026_4	24,5828	j9031_4	29,8560	j9036_4	7,2642
j9021_5	25,4310	j9026_5	24,6569	j9031_5	40,3518	j9036_5	8,7894
j9021_6	24,6995	j9026_6	24,6489	j9031_6	37,5769	j9036_6	10,3305
j9021_7	20,3165	j9026_7	25,0679	j9031_7	42,3381	j9036_7	11,2183
j9021_8	20,6032	j9026_8	39,0078	j9031_8	33,5400	j9036_8	10,0579
j9021_9	24,7981	j9026_9	25,6684	j9031_9	46,8780	j9036_9	7,8101
j9021_10	21,7736	j9026_10	25,3804	j9031_10	23,8982	j9036_10	8,0166
j9022_1	17,1832	j9027_1	23,2599	j9032_1	36,4161	j9037_1	18,7357
j9022_2	15,7273	j9027_2	40,8431	j9032_2	47,8995	j9037_2	17,0144
j9022_3	24,9408	j9027_3	28,5496	j9032_3	28,9693	j9037_3	12,5362
j9022_4	19,1143	j9027_4	40,8279	j9032_4	36,7980	j9037_4	24,7965
j9022_5	16,1150	j9027_5	25,6563	j9032_5	34,9882	j9037_5	16,8778
j9022_6	26,0196	j9027_6	37,0122	j9032_6	41,6278	j9037_6	21,5591
j9022_7	19,7262	j9027_7	40,0872	j9032_7	41,7547	j9037_7	16,4293
j9022_8	21,6465	j9027_8	29,9987	j9032_8	44,5376	j9037_8	20,4385
j9022_9	23,5416	j9027_9	48,1431	j9032_9	34,6566	j9037_9	15,3952
j9022_10	18,0842	j9027_10	25,0886	j9032_10	33,3034	j9037_10	22,9237
j9023_1	25,1051	j9028_1	38,3991	j9033_1	7,1024	j9038_1	26,6939
j9023_2	24,7713	j9028_2	35,0338	j9033_2	8,4498	j9038_2	19,2665
j9023_3	20,0192	j9028_3	25,6217	j9033_3	6,1992	j9038_3	16,6053
j9023_4	15,8979	j9028_4	31,4604	j9033_4	7,8119	j9038_4	19,2648
j9023_5	14,1420	j9028_5	30,2084	j9033_5	9,1631	j9038_5	20,2962
j9023_6	15,2640	j9028_6	27,0213	j9033_6	9,8703	j9038_6	23,7973
j9023_7	25,4980	j9028_7	28,3883	j9033_7	9,1417	j9038_7	17,3260
j9023_8	19,3431	j9028_8	25,6732	j9033_8	5,9372	j9038_8	19,7433
j9023_9	16,4913	j9028_9	16,1925	j9033_9	10,5851	j9038_9	18,6563
j9023_10	17,8516	j9028_10	34,1911	j9033_10	10,9627	j9038_10	15,4937
j9024_1	20,2802	j9029_1	37,3223	j9034_1	10,4210	j9039_1	14,7597
j9024_2	18,6765	j9029_2	44,1955	j9034_2	9,5186	j9039_2	18,9929
j9024_3	24,9414	j9029_3	34,0473	j9034_3	9,5891	j9039_3	24,1513
j9024_4	14,3626	j9029_4	31,9610	j9034_4	10,8816	j9039_4	18,2244
j9024_5	23,2590	j9029_5	34,0927	j9034_5	8,7847	j9039_5	23,7971
j9024_6	20,3992	j9029_6	48,7359	j9034_6	9,9413	j9039_6	20,7408
j9024_7	17,8291	j9029_7	22,8322	j9034_7	9,2559	j9039_7	24,5688
j9024_8	24,5615	j9029_8	39,9705	j9034_8	11,7954	j9039_8	26,6948
j9024_9	28,1731	j9029_9	45,1260	j9034_9	10,7707	j9039_9	20,7852
j9024_10	19,9396	j9029_10	48,9209	j9034_10	7,6358	j9039_10	19,2686
j9025_1	26,0284	j9030_1	32,0640	j9035_1	8,6837	j9040_1	16,1311
j9025_2	33,8910	j9030_2	44,6883	j9035_2	10,3330	j9040_2	17,4258
j9025_3	29,2554	j9030_3	33,0271	j9035_3	8,2292	j9040_3	16,6013
j9025_4	29,0472	j9030_4	31,9503	j9035_4	11,8652	j9040_4	15,4696
j9025_5	34,5695	j9030_5	31,0093	j9035_5	8,9446	j9040_5	15,5162
j9025_6	38,7830	j9030_6	34,8013	j9035_6	11,6703	j9040_6	16,5700
j9025_7	43,1566	j9030_7	42,1563	j9035_7	10,9797	j9040_7	20,7597
j9025_8	23,5714	j9030_8	49,7847	j9035_8	7,6765	j9040_8	22,4031
j9025_9	25,9956	j9030_9	41,2398	j9035_9	14,3962	j9040_9	22,0198
j9025_10	25,7558	j9030_10	25,8841	j9035_10	7,8045	j9040_10	21,7167

Table XV: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the StD resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9041_1 έως j9048_10)

Project	StD	Project	StD
j9041_1	21,1924	j9046_1	32,3060
j9041_2	24,2662	j9046_2	29,2019
j9041_3	24,8171	j9046_3	36,7234
j9041_4	28,5255	j9046_4	39,4538
j9041_5	16,5560	j9046_5	41,1946
j9041_6	30,5974	j9046_6	46,0372
j9041_7	24,4379	j9046_7	40,2051
j9041_8	25,2888	j9046_8	32,8609
j9041_9	33,4625	j9046_9	56,2176
j9041_10	25,9172	j9046_10	27,4485
j9042_1	20,9798	j9047_1	30,5764
j9042_2	31,0400	j9047_2	33,6219
j9042_3	27,6528	j9047_3	36,8370
j9042_4	19,3293	j9047_4	29,5832
j9042_5	22,1602	j9047_5	29,7802
j9042_6	19,8459	j9047_6	37,8723
j9042_7	28,1175	j9047_7	35,5627
j9042_8	18,4792	j9047_8	25,0164
j9042_9	19,7993	j9047_9	38,5993
j9042_10	36,3942	j9047_10	40,9126
j9043_1	23,7226	j9048_1	52,7965
j9043_2	24,3830	j9048_2	34,1079
j9043_3	22,9962	j9048_3	37,0282
j9043_4	27,8760	j9048_4	40,5277
j9043_5	28,0639	j9048_5	47,5667
j9043_6	22,9518	j9048_6	30,9808
j9043_7	26,7421	j9048_7	36,3731
j9043_8	26,6563	j9048_8	39,2672
j9043_9	28,6941	j9048_9	27,6419
j9043_10	29,1934	j9048_10	37,7658
j9044_1	26,1299		
j9044_2	28,7790		
j9044_3	23,5884		
j9044_4	28,6159		
j9044_5	34,3404		
j9044_6	28,3741		
j9044_7	19,0827		
j9044_8	24,2675		
j9044_9	20,8882		
j9044_10	27,1375		
j9045_1	33,7183		
j9045_2	36,0722		
j9045_3	24,9980		
j9045_4	41,3444		
j9045_5	32,1312		
j9045_6	36,5690		
j9045_7	45,7030		
j9045_8	31,8187		
j9045_9	34,1319		
j9045_10	42,3971		

Table XVI: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the Step resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	Step	Project	Step	Project	Step	Project	Step
j901_1	236	j906_1	441	j9011_1	720	j9016_1	897
j901_2	235	j906_2	589	j9011_2	809	j9016_2	865
j901_3	203	j906_3	593	j9011_3	655	j9016_3	897
j901_4	247	j906_4	617	j9011_4	718	j9016_4	870
j901_5	219	j906_5	460	j9011_5	694	j9016_5	855
j901_6	189	j906_6	597	j9011_6	641	j9016_6	842
j901_7	221	j906_7	486	j9011_7	767	j9016_7	830
j901_8	289	j906_8	500	j9011_8	819	j9016_8	896
j901_9	241	j906_9	449	j9011_9	859	j9016_9	758
j901_10	304	j906_10	478	j9011_10	715	j9016_10	787
j902_1	322	j907_1	494	j9012_1	676	j9017_1	275
j902_2	318	j907_2	576	j9012_2	716	j9017_2	236
j902_3	229	j907_3	523	j9012_3	813	j9017_3	264
j902_4	244	j907_4	481	j9012_4	667	j9017_4	278
j902_5	268	j907_5	513	j9012_5	754	j9017_5	327
j902_6	256	j907_6	543	j9012_6	720	j9017_6	274
j902_7	292	j907_7	567	j9012_7	720	j9017_7	256
j902_8	262	j907_8	455	j9012_8	737	j9017_8	314
j902_9	267	j907_9	565	j9012_9	679	j9017_9	281
j902_10	270	j907_10	560	j9012_10	719	j9017_10	297
j903_1	225	j908_1	543	j9013_1	818	j9018_1	315
j903_2	237	j908_2	489	j9013_2	933	j9018_2	313
j903_3	218	j908_3	563	j9013_3	956	j9018_3	305
j903_4	267	j908_4	475	j9013_4	1031	j9018_4	323
j903_5	226	j908_5	504	j9013_5	853	j9018_5	284
j903_6	222	j908_6	536	j9013_6	878	j9018_6	299
j903_7	284	j908_7	538	j9013_7	967	j9018_7	236
j903_8	248	j908_8	489	j9013_8	836	j9018_8	285
j903_9	213	j908_9	579	j9013_9	909	j9018_9	251
j903_10	209	j908_10	578	j9013_10	804	j9018_10	266
j904_1	299	j909_1	748	j9014_1	1050	j9019_1	266
j904_2	268	j909_2	727	j9014_2	851	j9019_2	259
j904_3	282	j909_3	611	j9014_3	966	j9019_3	281
j904_4	265	j909_4	698	j9014_4	951	j9019_4	271
j904_5	279	j909_5	708	j9014_5	866	j9019_5	237
j904_6	259	j909_6	655	j9014_6	805	j9019_6	337
j904_7	267	j909_7	708	j9014_7	1009	j9019_7	249
j904_8	252	j909_8	647	j9014_8	916	j9019_8	237
j904_9	252	j909_9	734	j9014_9	1177	j9019_9	324
j904_10	226	j909_10	690	j9014_10	892	j9019_10	257
j905_1	489	j9010_1	676	j9015_1	894	j9020_1	287
j905_2	583	j9010_2	809	j9015_2	777	j9020_2	228
j905_3	435	j9010_3	883	j9015_3	904	j9020_3	233
j905_4	576	j9010_4	819	j9015_4	1114	j9020_4	281
j905_5	606	j9010_5	686	j9015_5	925	j9020_5	285
j905_6	504	j9010_6	642	j9015_6	910	j9020_6	270
j905_7	494	j9010_7	801	j9015_7	927	j9020_7	273
j905_8	460	j9010_8	717	j9015_8	939	j9020_8	252
j905_9	630	j9010_9	720	j9015_9	964	j9020_9	263
j905_10	468	j9010_10	662	j9015_10	916	j9020_10	252

Table XVII: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the Step resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	Step	Project	Step	Project	Step	Project	Step
j9021_1	496	j9026_1	650	j9031_1	848	j9036_1	316
j9021_2	523	j9026_2	808	j9031_2	890	j9036_2	361
j9021_3	596	j9026_3	786	j9031_3	1020	j9036_3	278
j9021_4	631	j9026_4	783	j9031_4	964	j9036_4	256
j9021_5	541	j9026_5	689	j9031_5	918	j9036_5	282
j9021_6	605	j9026_6	836	j9031_6	891	j9036_6	274
j9021_7	543	j9026_7	657	j9031_7	1015	j9036_7	244
j9021_8	506	j9026_8	693	j9031_8	1015	j9036_8	278
j9021_9	484	j9026_9	773	j9031_9	857	j9036_9	288
j9021_10	575	j9026_10	823	j9031_10	1103	j9036_10	294
j9022_1	599	j9027_1	726	j9032_1	920	j9037_1	511
j9022_2	581	j9027_2	823	j9032_2	882	j9037_2	544
j9022_3	554	j9027_3	717	j9032_3	989	j9037_3	570
j9022_4	557	j9027_4	639	j9032_4	829	j9037_4	556
j9022_5	539	j9027_5	861	j9032_5	924	j9037_5	567
j9022_6	512	j9027_6	771	j9032_6	860	j9037_6	573
j9022_7	476	j9027_7	632	j9032_7	978	j9037_7	597
j9022_8	623	j9027_8	697	j9032_8	927	j9037_8	570
j9022_9	538	j9027_9	715	j9032_9	1064	j9037_9	565
j9022_10	468	j9027_10	855	j9032_10	971	j9037_10	563
j9023_1	588	j9028_1	671	j9033_1	231	j9038_1	470
j9023_2	515	j9028_2	703	j9033_2	319	j9038_2	626
j9023_3	610	j9028_3	713	j9033_3	270	j9038_3	555
j9023_4	589	j9028_4	724	j9033_4	276	j9038_4	587
j9023_5	496	j9028_5	866	j9033_5	308	j9038_5	503
j9023_6	470	j9028_6	753	j9033_6	295	j9038_6	530
j9023_7	537	j9028_7	806	j9033_7	274	j9038_7	601
j9023_8	578	j9028_8	762	j9033_8	270	j9038_8	546
j9023_9	707	j9028_9	757	j9033_9	238	j9038_9	601
j9023_10	495	j9028_10	680	j9033_10	330	j9038_10	661
j9024_1	536	j9029_1	1012	j9034_1	275	j9039_1	652
j9024_2	491	j9029_2	881	j9034_2	298	j9039_2	648
j9024_3	484	j9029_3	931	j9034_3	240	j9039_3	542
j9024_4	506	j9029_4	855	j9034_4	247	j9039_4	559
j9024_5	527	j9029_5	1090	j9034_5	263	j9039_5	568
j9024_6	533	j9029_6	925	j9034_6	287	j9039_6	570
j9024_7	586	j9029_7	966	j9034_7	266	j9039_7	614
j9024_8	516	j9029_8	945	j9034_8	262	j9039_8	502
j9024_9	469	j9029_9	924	j9034_9	287	j9039_9	518
j9024_10	551	j9029_10	822	j9034_10	309	j9039_10	576
j9025_1	736	j9030_1	1016	j9035_1	274	j9040_1	553
j9025_2	787	j9030_2	886	j9035_2	294	j9040_2	575
j9025_3	701	j9030_3	929	j9035_3	243	j9040_3	542
j9025_4	809	j9030_4	987	j9035_4	268	j9040_4	556
j9025_5	695	j9030_5	911	j9035_5	279	j9040_5	534
j9025_6	658	j9030_6	1067	j9035_6	234	j9040_6	595
j9025_7	738	j9030_7	900	j9035_7	276	j9040_7	521
j9025_8	772	j9030_8	914	j9035_8	280	j9040_8	520
j9025_9	586	j9030_9	867	j9035_9	247	j9040_9	541
j9025_10	757	j9030_10	895	j9035_10	274	j9040_10	574

Table XVIII: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the Step resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9041_1 έως j9048_10)

Project	Step	Project	Step
j9041_1	832	j9046_1	1096
j9041_2	851	j9046_2	932
j9041_3	851	j9046_3	1101
j9041_4	756	j9046_4	971
j9041_5	726	j9046_5	1068
j9041_6	675	j9046_6	983
j9041_7	914	j9046_7	944
j9041_8	929	j9046_8	983
j9041_9	785	j9046_9	878
j9041_10	809	j9046_10	1230
j9042_1	886	j9047_1	955
j9042_2	840	j9047_2	1057
j9042_3	734	j9047_3	1118
j9042_4	749	j9047_4	982
j9042_5	826	j9047_5	1003
j9042_6	807	j9047_6	1124
j9042_7	653	j9047_7	1024
j9042_8	879	j9047_8	1004
j9042_9	748	j9047_9	978
j9042_10	720	j9047_10	850
j9043_1	801	j9048_1	1019
j9043_2	773	j9048_2	1007
j9043_3	883	j9048_3	1056
j9043_4	865	j9048_4	1016
j9043_5	914	j9048_5	857
j9043_6	916	j9048_6	1116
j9043_7	837	j9048_7	1100
j9043_8	864	j9048_8	846
j9043_9	835	j9048_9	1006
j9043_10	811	j9048_10	1017
j9044_1	840		
j9044_2	729		
j9044_3	896		
j9044_4	678		
j9044_5	821		
j9044_6	756		
j9044_7	769		
j9044_8	782		
j9044_9	829		
j9044_10	792		
j9045_1	850		
j9045_2	993		
j9045_3	962		
j9045_4	897		
j9045_5	982		
j9045_6	1109		
j9045_7	994		
j9045_8	1012		
j9045_9	892		
j9045_10	896		

Table XIX: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the G_f resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	G_f	Project	G_f	Project	G_f	Project	G_f
j901_1	65	j906_1	101	j9011_1	134	j9016_1	216
j901_2	43	j906_2	120	j9011_2	130	j9016_2	281
j901_3	68	j906_3	138	j9011_3	155	j9016_3	248
j901_4	68	j906_4	116	j9011_4	202	j9016_4	250
j901_5	51	j906_5	133	j9011_5	162	j9016_5	244
j901_6	62	j906_6	103	j9011_6	214	j9016_6	325
j901_7	51	j906_7	122	j9011_7	156	j9016_7	220
j901_8	57	j906_8	154	j9011_8	188	j9016_8	213
j901_9	65	j906_9	115	j9011_9	171	j9016_9	264
j901_10	55	j906_10	96	j9011_10	157	j9016_10	261
j902_1	56	j907_1	109	j9012_1	180	j9017_1	63
j902_2	39	j907_2	114	j9012_2	141	j9017_2	53
j902_3	66	j907_3	108	j9012_3	151	j9017_3	53
j902_4	78	j907_4	101	j9012_4	205	j9017_4	44
j902_5	41	j907_5	109	j9012_5	169	j9017_5	45
j902_6	63	j907_6	96	j9012_6	175	j9017_6	56
j902_7	52	j907_7	92	j9012_7	174	j9017_7	53
j902_8	55	j907_8	158	j9012_8	150	j9017_8	55
j902_9	65	j907_9	100	j9012_9	191	j9017_9	62
j902_10	47	j907_10	103	j9012_10	168	j9017_10	64
j903_1	57	j908_1	105	j9013_1	214	j9018_1	50
j903_2	44	j908_2	101	j9013_2	220	j9018_2	54
j903_3	62	j908_3	153	j9013_3	191	j9018_3	55
j903_4	50	j908_4	120	j9013_4	206	j9018_4	55
j903_5	52	j908_5	143	j9013_5	176	j9018_5	53
j903_6	56	j908_6	149	j9013_6	224	j9018_6	54
j903_7	49	j908_7	133	j9013_7	199	j9018_7	56
j903_8	46	j908_8	131	j9013_8	317	j9018_8	51
j903_9	64	j908_9	102	j9013_9	175	j9018_9	48
j903_10	64	j908_10	117	j9013_10	286	j9018_10	53
j904_1	54	j909_1	150	j9014_1	182	j9019_1	49
j904_2	50	j909_2	188	j9014_2	198	j9019_2	50
j904_3	60	j909_3	179	j9014_3	187	j9019_3	46
j904_4	53	j909_4	178	j9014_4	220	j9019_4	69
j904_5	57	j909_5	143	j9014_5	242	j9019_5	56
j904_6	57	j909_6	148	j9014_6	270	j9019_6	38
j904_7	62	j909_7	178	j9014_7	211	j9019_7	68
j904_8	49	j909_8	179	j9014_8	226	j9019_8	57
j904_9	49	j909_9	176	j9014_9	179	j9019_9	49
j904_10	67	j909_10	178	j9014_10	216	j9019_10	60
j905_1	110	j9010_1	145	j9015_1	206	j9020_1	56
j905_2	97	j9010_2	187	j9015_2	305	j9020_2	69
j905_3	163	j9010_3	135	j9015_3	225	j9020_3	54
j905_4	103	j9010_4	150	j9015_4	210	j9020_4	56
j905_5	132	j9010_5	181	j9015_5	207	j9020_5	66
j905_6	100	j9010_6	133	j9015_6	280	j9020_6	58
j905_7	137	j9010_7	152	j9015_7	227	j9020_7	45
j905_8	128	j9010_8	178	j9015_8	216	j9020_8	57
j905_9	122	j9010_9	144	j9015_9	225	j9020_9	47
j905_10	120	j9010_10	151	j9015_10	185	j9020_10	44

Table XX: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the G_f resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	G_f	Project	G_f	Project	G_f	Project	G_f
j9021_1	114	j9026_1	148	j9031_1	186	j9036_1	45
j9021_2	97	j9026_2	161	j9031_2	259	j9036_2	36
j9021_3	108	j9026_3	149	j9031_3	159	j9036_3	53
j9021_4	103	j9026_4	158	j9031_4	191	j9036_4	45
j9021_5	102	j9026_5	162	j9031_5	216	j9036_5	44
j9021_6	119	j9026_6	115	j9031_6	215	j9036_6	51
j9021_7	121	j9026_7	150	j9031_7	201	j9036_7	47
j9021_8	109	j9026_8	191	j9031_8	175	j9036_8	53
j9021_9	110	j9026_9	125	j9031_9	245	j9036_9	48
j9021_10	115	j9026_10	138	j9031_10	144	j9036_10	40
j9022_1	106	j9027_1	132	j9032_1	190	j9037_1	94
j9022_2	87	j9027_2	187	j9032_2	208	j9037_2	97
j9022_3	121	j9027_3	156	j9032_3	170	j9037_3	91
j9022_4	108	j9027_4	172	j9032_4	189	j9037_4	107
j9022_5	105	j9027_5	138	j9032_5	180	j9037_5	92
j9022_6	122	j9027_6	168	j9032_6	186	j9037_6	102
j9022_7	98	j9027_7	160	j9032_7	209	j9037_7	95
j9022_8	97	j9027_8	170	j9032_8	191	j9037_8	124
j9022_9	93	j9027_9	183	j9032_9	168	j9037_9	93
j9022_10	98	j9027_10	140	j9032_10	220	j9037_10	103
j9023_1	134	j9028_1	163	j9033_1	50	j9038_1	120
j9023_2	127	j9028_2	174	j9033_2	40	j9038_2	97
j9023_3	86	j9028_3	165	j9033_3	36	j9038_3	114
j9023_4	109	j9028_4	186	j9033_4	44	j9038_4	97
j9023_5	82	j9028_5	140	j9033_5	43	j9038_5	116
j9023_6	85	j9028_6	147	j9033_6	60	j9038_6	108
j9023_7	115	j9028_7	134	j9033_7	45	j9038_7	95
j9023_8	83	j9028_8	152	j9033_8	48	j9038_8	94
j9023_9	84	j9028_9	123	j9033_9	46	j9038_9	94
j9023_10	109	j9028_10	159	j9033_10	54	j9038_10	86
j9024_1	105	j9029_1	167	j9034_1	58	j9039_1	90
j9024_2	109	j9029_2	197	j9034_2	52	j9039_2	110
j9024_3	115	j9029_3	173	j9034_3	52	j9039_3	121
j9024_4	111	j9029_4	197	j9034_4	52	j9039_4	106
j9024_5	107	j9029_5	179	j9034_5	56	j9039_5	106
j9024_6	96	j9029_6	251	j9034_6	49	j9039_6	115
j9024_7	113	j9029_7	226	j9034_7	50	j9039_7	111
j9024_8	133	j9029_8	190	j9034_8	51	j9039_8	124
j9024_9	120	j9029_9	229	j9034_9	48	j9039_9	107
j9024_10	107	j9029_10	191	j9034_10	45	j9039_10	112
j9025_1	165	j9030_1	178	j9035_1	44	j9040_1	91
j9025_2	175	j9030_2	198	j9035_2	55	j9040_2	84
j9025_3	151	j9030_3	196	j9035_3	48	j9040_3	102
j9025_4	146	j9030_4	195	j9035_4	57	j9040_4	93
j9025_5	176	j9030_5	197	j9035_5	54	j9040_5	96
j9025_6	151	j9030_6	185	j9035_6	57	j9040_6	105
j9025_7	210	j9030_7	210	j9035_7	47	j9040_7	109
j9025_8	157	j9030_8	193	j9035_8	44	j9040_8	106
j9025_9	144	j9030_9	216	j9035_9	57	j9040_9	101
j9025_10	132	j9030_10	196	j9035_10	46	j9040_10	114

Table XXI: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the G_f resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9041_1 έως j9048_10)

Project	G_f	Project	G_f	Project	G_f
j9041_1	139	j9044_1	147	j9047_1	179
j9041_2	142	j9044_2	152	j9047_2	200
j9041_3	130	j9044_3	128	j9047_3	189
j9041_4	175	j9044_4	157	j9047_4	193
j9041_5	139	j9044_5	167	j9047_5	203
j9041_6	153	j9044_6	161	j9047_6	195
j9041_7	124	j9044_7	136	j9047_7	192
j9041_8	163	j9044_8	130	j9047_8	169
j9041_9	155	j9044_9	137	j9047_9	174
j9041_10	133	j9044_10	174	j9047_10	197
j9042_1	113	j9045_1	186	j9048_1	200
j9042_2	183	j9045_2	195	j9048_2	167
j9042_3	143	j9045_3	147	j9048_3	192
j9042_4	115	j9045_4	204	j9048_4	183
j9042_5	118	j9045_5	188	j9048_5	226
j9042_6	127	j9045_6	186	j9048_6	175
j9042_7	140	j9045_7	204	j9048_7	168
j9042_8	140	j9045_8	163	j9048_8	180
j9042_9	167	j9045_9	197	j9048_9	179
j9042_10	151	j9045_10	223	j9048_10	215
j9043_1	134	j9046_1	169		
j9043_2	126	j9046_2	153		
j9043_3	135	j9046_3	182		
j9043_4	161	j9046_4	195		
j9043_5	123	j9046_5	187		
j9043_6	166	j9046_6	210		
j9043_7	153	j9046_7	185		
j9043_8	122	j9046_8	235		
j9043_9	159	j9046_9	243		
j9043_10	146	j9046_10	160		

Table XXII: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the StD resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	StD	Project	StD	Project	StD	Project	StD
j901_1	11,6931	j906_1	24,7019	j9011_1	21,9968	j9016_1	51,1581
j901_2	6,7949	j906_2	26,9043	j9011_2	31,1926	j9016_2	66,7782
j901_3	16,0564	j906_3	29,2595	j9011_3	28,0100	j9016_3	51,2976
j901_4	16,1628	j906_4	24,1199	j9011_4	51,9368	j9016_4	56,2020
j901_5	8,4793	j906_5	29,1054	j9011_5	32,9442	j9016_5	59,2756
j901_6	14,3879	j906_6	24,7852	j9011_6	58,1609	j9016_6	87,6841
j901_7	10,8817	j906_7	23,4111	j9011_7	31,1303	j9016_7	38,0075
j901_8	12,9893	j906_8	37,8167	j9011_8	45,2830	j9016_8	45,1067
j901_9	16,6295	j906_9	26,9028	j9011_9	41,7695	j9016_9	54,9652
j901_10	9,9872	j906_10	16,0435	j9011_10	36,4307	j9016_10	63,5719
j902_1	13,2118	j907_1	23,5025	j9012_1	38,8909	j9017_1	12,9237
j902_2	6,7924	j907_2	20,8307	j9012_2	21,2054	j9017_2	12,3596
j902_3	15,8076	j907_3	24,7870	j9012_3	38,5550	j9017_3	9,8239
j902_4	20,3963	j907_4	25,0226	j9012_4	54,9353	j9017_4	8,5490
j902_5	5,5489	j907_5	21,9882	j9012_5	36,6931	j9017_5	9,1827
j902_6	12,7569	j907_6	21,5221	j9012_6	43,4971	j9017_6	13,8175
j902_7	8,1738	j907_7	18,1683	j9012_7	38,3786	j9017_7	11,6619
j902_8	10,7567	j907_8	43,5717	j9012_8	27,6042	j9017_8	11,9791
j902_9	15,0329	j907_9	16,0234	j9012_9	37,0549	j9017_9	13,0516
j902_10	8,7662	j907_10	22,1535	j9012_10	45,9431	j9017_10	15,6812
j903_1	12,8110	j908_1	20,7485	j9013_1	48,6496	j9018_1	10,2182
j903_2	8,3637	j908_2	24,2651	j9013_2	49,9493	j9018_2	12,1317
j903_3	15,2305	j908_3	36,7183	j9013_3	38,5678	j9018_3	10,6862
j903_4	13,2332	j908_4	25,5015	j9013_4	49,7919	j9018_4	11,3961
j903_5	9,9863	j908_5	28,7880	j9013_5	29,4525	j9018_5	11,6639
j903_6	13,3778	j908_6	32,7913	j9013_6	50,3735	j9018_6	10,4852
j903_7	11,6235	j908_7	29,5683	j9013_7	44,1415	j9018_7	11,6167
j903_8	9,3215	j908_8	31,7258	j9013_8	80,0485	j9018_8	11,1917
j903_9	12,9016	j908_9	20,2402	j9013_9	33,5323	j9018_9	7,9308
j903_10	15,8102	j908_10	27,7831	j9013_10	79,2008	j9018_10	12,0020
j904_1	11,3129	j909_1	25,1015	j9014_1	36,2067	j9019_1	9,6206
j904_2	10,1002	j909_2	48,5463	j9014_2	42,4372	j9019_2	11,4293
j904_3	12,0576	j909_3	41,1611	j9014_3	36,6999	j9019_3	10,0440
j904_4	10,7234	j909_4	48,1875	j9014_4	45,8032	j9019_4	16,5470
j904_5	12,9896	j909_5	33,0685	j9014_5	60,8493	j9019_5	12,0566
j904_6	12,6117	j909_6	35,9846	j9014_6	68,0098	j9019_6	8,0448
j904_7	12,0601	j909_7	33,0314	j9014_7	37,3400	j9019_7	15,3396
j904_8	10,0929	j909_8	41,0972	j9014_8	51,9256	j9019_8	12,5593
j904_9	9,5401	j909_9	41,0310	j9014_9	39,8732	j9019_9	10,3489
j904_10	14,3612	j909_10	45,2167	j9014_10	51,6645	j9019_10	13,3520
j905_1	18,2984	j9010_1	26,0101	j9015_1	38,4316	j9020_1	10,8415
j905_2	17,0350	j9010_2	43,5821	j9015_2	77,5517	j9020_2	15,3219
j905_3	42,1693	j9010_3	30,2328	j9015_3	48,2993	j9020_3	12,8215
j905_4	14,0219	j9010_4	31,2546	j9015_4	47,1473	j9020_4	12,7514
j905_5	29,2131	j9010_5	37,6502	j9015_5	47,3946	j9020_5	13,8989
j905_6	16,2608	j9010_6	24,7805	j9015_6	69,6521	j9020_6	12,5815
j905_7	31,4789	j9010_7	27,8184	j9015_7	56,5293	j9020_7	6,8032
j905_8	31,5257	j9010_8	39,9368	j9015_8	53,5378	j9020_8	11,0081
j905_9	25,1869	j9010_9	34,9406	j9015_9	55,4498	j9020_9	9,9128
j905_10	22,3619	j9010_10	34,6838	j9015_10	35,9925	j9020_10	8,0459

Table XXIII: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the StD resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	StD	Project	StD	Project	StD	Project	StD
j9021_1	19,5688	j9026_1	29,8845	j9031_1	34,4293	j9036_1	8,6808
j9021_2	19,0148	j9026_2	31,2513	j9031_2	62,2443	j9036_2	6,1065
j9021_3	27,5392	j9026_3	26,3807	j9031_3	31,5607	j9036_3	10,2584
j9021_4	25,4993	j9026_4	35,3785	j9031_4	33,4905	j9036_4	8,3987
j9021_5	22,3295	j9026_5	33,7892	j9031_5	42,9413	j9036_5	8,5889
j9021_6	26,6043	j9026_6	20,2493	j9031_6	41,7530	j9036_6	12,6291
j9021_7	24,7266	j9026_7	31,9468	j9031_7	41,2911	j9036_7	10,8935
j9021_8	19,1700	j9026_8	44,7546	j9031_8	29,4384	j9036_8	11,4704
j9021_9	25,9848	j9026_9	18,9444	j9031_9	46,0278	j9036_9	8,5148
j9021_10	26,6653	j9026_10	28,9495	j9031_10	17,7695	j9036_10	8,3037
j9022_1	27,1409	j9027_1	31,9000	j9032_1	35,0302	j9037_1	17,8201
j9022_2	15,5866	j9027_2	42,7035	j9032_2	46,0683	j9037_2	20,4303
j9022_3	27,8702	j9027_3	34,4747	j9032_3	29,0320	j9037_3	22,5699
j9022_4	22,7200	j9027_4	46,9178	j9032_4	44,9513	j9037_4	22,8230
j9022_5	24,8992	j9027_5	22,6170	j9032_5	31,0823	j9037_5	15,2237
j9022_6	30,0108	j9027_6	36,4822	j9032_6	42,8448	j9037_6	22,6831
j9022_7	23,2640	j9027_7	34,9653	j9032_7	44,5759	j9037_7	21,3030
j9022_8	21,3358	j9027_8	33,2279	j9032_8	43,4863	j9037_8	28,2952
j9022_9	20,7470	j9027_9	44,6626	j9032_9	25,1514	j9037_9	17,8694
j9022_10	14,7880	j9027_10	26,0533	j9032_10	51,1992	j9037_10	23,7233
j9023_1	29,3207	j9028_1	41,7768	j9033_1	9,6340	j9038_1	29,3208
j9023_2	33,9106	j9028_2	34,6227	j9033_2	8,0986	j9038_2	19,3204
j9023_3	19,1208	j9028_3	35,8346	j9033_3	4,6521	j9038_3	23,9638
j9023_4	23,7628	j9028_4	46,2867	j9033_4	8,2406	j9038_4	17,5498
j9023_5	12,3028	j9028_5	24,6855	j9033_5	9,5159	j9038_5	26,3797
j9023_6	12,4765	j9028_6	29,5985	j9033_6	13,1977	j9038_6	26,3590
j9023_7	31,9076	j9028_7	25,3101	j9033_7	8,7301	j9038_7	18,4055
j9023_8	15,0575	j9028_8	40,8640	j9033_8	9,1743	j9038_8	16,4985
j9023_9	16,4893	j9028_9	26,7119	j9033_9	10,6173	j9038_9	19,9252
j9023_10	26,7926	j9028_10	31,9335	j9033_10	12,9139	j9038_10	16,5292
j9024_1	19,8254	j9029_1	37,6344	j9034_1	15,3213	j9039_1	20,2061
j9024_2	29,9498	j9029_2	38,4946	j9034_2	11,9379	j9039_2	27,4239
j9024_3	23,7991	j9029_3	34,3945	j9034_3	11,3779	j9039_3	26,5268
j9024_4	18,8596	j9029_4	39,0863	j9034_4	9,1496	j9039_4	17,9980
j9024_5	21,5512	j9029_5	33,2917	j9034_5	9,2178	j9039_5	20,7069
j9024_6	15,7080	j9029_6	62,4704	j9034_6	9,1372	j9039_6	20,0179
j9024_7	21,9268	j9029_7	56,3309	j9034_7	9,4638	j9039_7	22,6360
j9024_8	33,7340	j9029_8	43,0772	j9034_8	11,0860	j9039_8	27,6498
j9024_9	26,4269	j9029_9	55,7934	j9034_9	10,5772	j9039_9	19,3967
j9024_10	22,0670	j9029_10	42,9168	j9034_10	9,3907	j9039_10	24,5589
j9025_1	36,0214	j9030_1	32,9431	j9035_1	8,2960	j9040_1	21,7324
j9025_2	33,3640	j9030_2	41,3715	j9035_2	10,4398	j9040_2	16,8257
j9025_3	30,9445	j9030_3	45,0656	j9035_3	11,7211	j9040_3	22,7890
j9025_4	30,4508	j9030_4	43,8852	j9035_4	10,3938	j9040_4	22,0548
j9025_5	36,2416	j9030_5	41,6307	j9035_5	14,1271	j9040_5	16,7957
j9025_6	31,1805	j9030_6	33,9240	j9035_6	13,5740	j9040_6	19,9181
j9025_7	53,7689	j9030_7	43,7228	j9035_7	8,7836	j9040_7	22,7706
j9025_8	36,7090	j9030_8	38,7760	j9035_8	9,8343	j9040_8	20,3256
j9025_9	31,3062	j9030_9	36,4279	j9035_9	12,5495	j9040_9	23,6221
j9025_10	28,1192	j9030_10	44,4260	j9035_10	7,2160	j9040_10	25,4358

Table XXIV: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the StD resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9041_1 έως j9048_10)

Project	StD	Project	StD
j9041_1	31,4572	j9046_1	37,2065
j9041_2	30,9529	j9046_2	23,8666
j9041_3	26,2937	j9046_3	38,3753
j9041_4	40,7404	j9046_4	36,7130
j9041_5	32,2936	j9046_5	42,6239
j9041_6	33,6191	j9046_6	47,5080
j9041_7	21,6448	j9046_7	33,0536
j9041_8	36,2188	j9046_8	50,3601
j9041_9	28,1682	j9046_9	63,4311
j9041_10	30,3434	j9046_10	30,7241
j9042_1	16,1852	j9047_1	33,6973
j9042_2	42,1946	j9047_2	40,4792
j9042_3	31,7000	j9047_3	35,9363
j9042_4	19,2960	j9047_4	40,9219
j9042_5	23,0567	j9047_5	52,4853
j9042_6	23,8865	j9047_6	40,4669
j9042_7	31,5081	j9047_7	30,8897
j9042_8	26,8729	j9047_8	31,3544
j9042_9	38,4834	j9047_9	35,8583
j9042_10	33,6493	j9047_10	37,5761
j9043_1	33,8687	j9048_1	44,2893
j9043_2	20,2999	j9048_2	32,6365
j9043_3	26,2885	j9048_3	34,6258
j9043_4	34,8208	j9048_4	36,9017
j9043_5	22,4975	j9048_5	43,4933
j9043_6	44,6707	j9048_6	37,7700
j9043_7	33,5507	j9048_7	36,2186
j9043_8	20,8296	j9048_8	32,6852
j9043_9	32,5699	j9048_9	36,2279
j9043_10	28,6983	j9048_10	52,9749
j9044_1	28,7929		
j9044_2	33,3089		
j9044_3	26,5905		
j9044_4	36,5085		
j9044_5	36,1638		
j9044_6	35,6239		
j9044_7	27,7383		
j9044_8	24,8910		
j9044_9	29,4761		
j9044_10	40,5381		
j9045_1	36,1493		
j9045_2	39,7538		
j9045_3	27,2877		
j9045_4	40,6808		
j9045_5	36,6722		
j9045_6	35,2820		
j9045_7	40,0542		
j9045_8	30,2747		
j9045_9	47,3273		
j9045_10	50,0707		

Table XXV: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the Step resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	Step	Project	Step	Project	Step	Project	Step
j901_1	183	j906_1	410	j9011_1	718	j9016_1	892
j901_2	153	j906_2	543	j9011_2	794	j9016_2	1066
j901_3	159	j906_3	563	j9011_3	643	j9016_3	981
j901_4	184	j906_4	636	j9011_4	598	j9016_4	764
j901_5	202	j906_5	480	j9011_5	687	j9016_5	895
j901_6	150	j906_6	476	j9011_6	671	j9016_6	864
j901_7	181	j906_7	455	j9011_7	825	j9016_7	906
j901_8	211	j906_8	428	j9011_8	765	j9016_8	925
j901_9	198	j906_9	459	j9011_9	776	j9016_9	838
j901_10	209	j906_10	560	j9011_10	699	j9016_10	869
j902_1	247	j907_1	528	j9012_1	751	j9017_1	173
j902_2	276	j907_2	545	j9012_2	740	j9017_2	231
j902_3	237	j907_3	491	j9012_3	818	j9017_3	202
j902_4	201	j907_4	426	j9012_4	689	j9017_4	201
j902_5	240	j907_5	498	j9012_5	661	j9017_5	263
j902_6	158	j907_6	548	j9012_6	770	j9017_6	218
j902_7	236	j907_7	528	j9012_7	718	j9017_7	190
j902_8	165	j907_8	372	j9012_8	673	j9017_8	219
j902_9	160	j907_9	599	j9012_9	707	j9017_9	201
j902_10	214	j907_10	528	j9012_10	720	j9017_10	218
j903_1	193	j908_1	597	j9013_1	904	j9018_1	228
j903_2	208	j908_2	433	j9013_2	911	j9018_2	252
j903_3	192	j908_3	457	j9013_3	1064	j9018_3	229
j903_4	210	j908_4	554	j9013_4	898	j9018_4	209
j903_5	180	j908_5	538	j9013_5	957	j9018_5	251
j903_6	188	j908_6	475	j9013_6	991	j9018_6	203
j903_7	263	j908_7	540	j9013_7	911	j9018_7	164
j903_8	208	j908_8	465	j9013_8	833	j9018_8	213
j903_9	150	j908_9	589	j9013_9	996	j9018_9	168
j903_10	158	j908_10	535	j9013_10	777	j9018_10	206
j904_1	256	j909_1	849	j9014_1	909	j9019_1	216
j904_2	194	j909_2	747	j9014_2	960	j9019_2	149
j904_3	219	j909_3	633	j9014_3	1026	j9019_3	193
j904_4	218	j909_4	689	j9014_4	961	j9019_4	164
j904_5	259	j909_5	772	j9014_5	840	j9019_5	189
j904_6	200	j909_6	667	j9014_6	950	j9019_6	312
j904_7	224	j909_7	730	j9014_7	1042	j9019_7	173
j904_8	176	j909_8	658	j9014_8	1003	j9019_8	254
j904_9	158	j909_9	657	j9014_9	1217	j9019_9	263
j904_10	170	j909_10	626	j9014_10	972	j9019_10	213
j905_1	510	j9010_1	621	j9015_1	804	j9020_1	177
j905_2	679	j9010_2	823	j9015_2	879	j9020_2	170
j905_3	460	j9010_3	820	j9015_3	1014	j9020_3	168
j905_4	560	j9010_4	743	j9015_4	1128	j9020_4	227
j905_5	600	j9010_5	642	j9015_5	949	j9020_5	225
j905_6	516	j9010_6	725	j9015_6	915	j9020_6	168
j905_7	492	j9010_7	819	j9015_7	1009	j9020_7	188
j905_8	352	j9010_8	641	j9015_8	816	j9020_8	172
j905_9	656	j9010_9	700	j9015_9	903	j9020_9	192
j905_10	525	j9010_10	590	j9015_10	973	j9020_10	212

Table XXVI: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the Step resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	Step	Project	Step	Project	Step	Project	Step
j9021_1	525	j9026_1	799	j9031_1	956	j9036_1	237
j9021_2	439	j9026_2	740	j9031_2	848	j9036_2	253
j9021_3	582	j9026_3	710	j9031_3	1203	j9036_3	244
j9021_4	579	j9026_4	749	j9031_4	1052	j9036_4	181
j9021_5	457	j9026_5	612	j9031_5	908	j9036_5	192
j9021_6	497	j9026_6	963	j9031_6	949	j9036_6	187
j9021_7	653	j9026_7	571	j9031_7	979	j9036_7	159
j9021_8	467	j9026_8	643	j9031_8	1056	j9036_8	187
j9021_9	548	j9026_9	666	j9031_9	893	j9036_9	218
j9021_10	499	j9026_10	843	j9031_10	943	j9036_10	221
j9022_1	512	j9027_1	774	j9032_1	878	j9037_1	456
j9022_2	587	j9027_2	790	j9032_2	882	j9037_2	467
j9022_3	513	j9027_3	835	j9032_3	1027	j9037_3	477
j9022_4	515	j9027_4	576	j9032_4	952	j9037_4	355
j9022_5	524	j9027_5	738	j9032_5	978	j9037_5	542
j9022_6	423	j9027_6	751	j9032_6	950	j9037_6	384
j9022_7	471	j9027_7	663	j9032_7	947	j9037_7	379
j9022_8	637	j9027_8	613	j9032_8	966	j9037_8	487
j9022_9	430	j9027_9	677	j9032_9	1040	j9037_9	579
j9022_10	361	j9027_10	721	j9032_10	1006	j9037_10	484
j9023_1	616	j9028_1	679	j9033_1	190	j9038_1	382
j9023_2	456	j9028_2	664	j9033_2	204	j9038_2	523
j9023_3	653	j9028_3	791	j9033_3	229	j9038_3	464
j9023_4	573	j9028_4	666	j9033_4	184	j9038_4	499
j9023_5	492	j9028_5	817	j9033_5	187	j9038_5	456
j9023_6	455	j9028_6	677	j9033_6	193	j9038_6	436
j9023_7	428	j9028_7	757	j9033_7	177	j9038_7	458
j9023_8	583	j9028_8	754	j9033_8	186	j9038_8	425
j9023_9	739	j9028_9	839	j9033_9	161	j9038_9	504
j9023_10	369	j9028_10	597	j9033_10	263	j9038_10	607
j9024_1	529	j9029_1	977	j9034_1	227	j9039_1	500
j9024_2	407	j9029_2	878	j9034_2	195	j9039_2	544
j9024_3	363	j9029_3	966	j9034_3	164	j9039_3	460
j9024_4	570	j9029_4	819	j9034_4	174	j9039_4	493
j9024_5	583	j9029_5	1050	j9034_5	177	j9039_5	458
j9024_6	490	j9029_6	910	j9034_6	215	j9039_6	512
j9024_7	513	j9029_7	1010	j9034_7	203	j9039_7	587
j9024_8	477	j9029_8	949	j9034_8	190	j9039_8	399
j9024_9	420	j9029_9	1004	j9034_9	267	j9039_9	392
j9024_10	622	j9029_10	853	j9034_10	216	j9039_10	555
j9025_1	662	j9030_1	1050	j9035_1	197	j9040_1	460
j9025_2	700	j9030_2	886	j9035_2	211	j9040_2	436
j9025_3	501	j9030_3	900	j9035_3	174	j9040_3	498
j9025_4	770	j9030_4	1125	j9035_4	186	j9040_4	578
j9025_5	634	j9030_5	961	j9035_5	225	j9040_5	486
j9025_6	534	j9030_6	1047	j9035_6	171	j9040_6	497
j9025_7	698	j9030_7	895	j9035_7	195	j9040_7	411
j9025_8	845	j9030_8	881	j9035_8	171	j9040_8	449
j9025_9	594	j9030_9	860	j9035_9	176	j9040_9	509
j9025_10	862	j9030_10	893	j9035_10	150	j9040_10	500

Table XXVII: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the Step resource profile evaluation function in the 90-activities projects of the PSP-Lib collection (j9041_1 έως j9048_10)

Project	Step	Project	Step
j9041_1	744	j9046_1	1075
j9041_2	903	j9046_2	1004
j9041_3	794	j9046_3	1146
j9041_4	584	j9046_4	885
j9041_5	594	j9046_5	992
j9041_6	521	j9046_6	964
j9041_7	793	j9046_7	924
j9041_8	928	j9046_8	935
j9041_9	658	j9046_9	746
j9041_10	627	j9046_10	1130
j9042_1	860	j9047_1	885
j9042_2	744	j9047_2	1061
j9042_3	790	j9047_3	1164
j9042_4	716	j9047_4	940
j9042_5	812	j9047_5	1038
j9042_6	702	j9047_6	1126
j9042_7	436	j9047_7	997
j9042_8	852	j9047_8	1008
j9042_9	699	j9047_9	1037
j9042_10	664	j9047_10	773
j9043_1	752	j9048_1	1054
j9043_2	725	j9048_2	964
j9043_3	847	j9048_3	1040
j9043_4	757	j9048_4	1032
j9043_5	932	j9048_5	732
j9043_6	912	j9048_6	1038
j9043_7	787	j9048_7	1196
j9043_8	877	j9048_8	698
j9043_9	709	j9048_9	936
j9043_10	726	j9048_10	1038
j9044_1	808		
j9044_2	799		
j9044_3	898		
j9044_4	613		
j9044_5	756		
j9044_6	693		
j9044_7	757		
j9044_8	849		
j9044_9	666		
j9044_10	859		
j9045_1	775		
j9045_2	894		
j9045_3	1013		
j9045_4	781		
j9045_5	1020		
j9045_6	1072		
j9045_7	963		
j9045_8	840		
j9045_9	978		
j9045_10	1069		

Table XXVIII: Best scores obtained after repeated experiments with the s hybrid genetic algorithm approach (HGA) using the Gf resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	Gf	Project	Gf	Project	Gf	Project	Gf
j1201_1	56	j1206_1	138	j12011_1	186	j12016_1	285
j1201_2	64	j1206_2	150	j12011_2	202	j12016_2	287
j1201_3	73	j1206_3	130	j12011_3	201	j12016_3	269
j1201_4	66	j1206_4	98	j12011_4	173	j12016_4	280
j1201_5	60	j1206_5	157	j12011_5	202	j12016_5	264
j1201_6	76	j1206_6	142	j12011_6	207	j12016_6	338
j1201_7	54	j1206_7	121	j12011_7	178	j12016_7	249
j1201_8	67	j1206_8	107	j12011_8	177	j12016_8	283
j1201_9	71	j1206_9	165	j12011_9	227	j12016_9	234
j1201_10	63	j1206_10	155	j12011_10	194	j12016_10	239
j1202_1	87	j1207_1	159	j12012_1	149	j12017_1	265
j1202_2	73	j1207_2	120	j12012_2	229	j12017_2	299
j1202_3	91	j1207_3	122	j12012_3	216	j12017_3	300
j1202_4	62	j1207_4	127	j12012_4	169	j12017_4	262
j1202_5	70	j1207_5	143	j12012_5	187	j12017_5	248
j1202_6	80	j1207_6	126	j12012_6	210	j12017_6	310
j1202_7	64	j1207_7	135	j12012_7	217	j12017_7	275
j1202_8	67	j1207_8	143	j12012_8	242	j12017_8	318
j1202_9	67	j1207_9	143	j12012_9	203	j12017_9	266
j1202_10	87	j1207_10	128	j12012_10	206	j12017_10	289
j1203_1	78	j1208_1	131	j12013_1	166	j12018_1	244
j1203_2	57	j1208_2	152	j12013_2	224	j12018_2	216
j1203_3	72	j1208_3	119	j12013_3	171	j12018_3	310
j1203_4	65	j1208_4	130	j12013_4	211	j12018_4	295
j1203_5	70	j1208_5	131	j12013_5	215	j12018_5	274
j1203_6	61	j1208_6	132	j12013_6	197	j12018_6	185
j1203_7	57	j1208_7	152	j12013_7	176	j12018_7	267
j1203_8	72	j1208_8	135	j12013_8	184	j12018_8	244
j1203_9	66	j1208_9	139	j12013_9	201	j12018_9	301
j1203_10	60	j1208_10	169	j12013_10	223	j12018_10	295
j1204_1	75	j1209_1	134	j12014_1	262	j12019_1	280
j1204_2	58	j1209_2	125	j12014_2	242	j12019_2	316
j1204_3	63	j1209_3	120	j12014_3	206	j12019_3	317
j1204_4	75	j1209_4	139	j12014_4	190	j12019_4	251
j1204_5	81	j1209_5	112	j12014_5	185	j12019_5	289
j1204_6	68	j1209_6	133	j12014_6	184	j12019_6	267
j1204_7	73	j1209_7	144	j12014_7	210	j12019_7	246
j1204_8	66	j1209_8	136	j12014_8	188	j12019_8	255
j1204_9	67	j1209_9	116	j12014_9	173	j12019_9	302
j1204_10	66	j1209_10	136	j12014_10	210	j12019_10	276
j1205_1	72	j12010_1	114	j12015_1	216	j12020_1	261
j1205_2	77	j12010_2	130	j12015_2	259	j12020_2	253
j1205_3	78	j12010_3	119	j12015_3	185	j12020_3	311
j1205_4	61	j12010_4	120	j12015_4	228	j12020_4	266
j1205_5	71	j12010_5	122	j12015_5	188	j12020_5	312
j1205_6	78	j12010_6	134	j12015_6	195	j12020_6	256
j1205_7	70	j12010_7	135	j12015_7	219	j12020_7	254
j1205_8	73	j12010_8	106	j12015_8	157	j12020_8	238
j1205_9	57	j12010_9	145	j12015_9	174	j12020_9	310
j1205_10	63	j12010_10	191	j12015_10	207	j12020_10	295

Table XXIX: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the Gf resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	Gf	Project	Gf	Project	Gf	Project	Gf
j12021_1	63	j12026_1	139	j12031_1	189	j12036_1	239
j12021_2	63	j12026_2	101	j12031_2	210	j12036_2	279
j12021_3	59	j12026_3	128	j12031_3	201	j12036_3	256
j12021_4	62	j12026_4	120	j12031_4	144	j12036_4	257
j12021_5	55	j12026_5	143	j12031_5	187	j12036_5	229
j12021_6	61	j12026_6	94	j12031_6	197	j12036_6	214
j12021_7	75	j12026_7	126	j12031_7	169	j12036_7	234
j12021_8	51	j12026_8	103	j12031_8	193	j12036_8	213
j12021_9	63	j12026_9	105	j12031_9	198	j12036_9	216
j12021_10	65	j12026_10	98	j12031_10	184	j12036_10	250
j12022_1	66	j12027_1	170	j12032_1	183	j12037_1	233
j12022_2	69	j12027_2	118	j12032_2	163	j12037_2	266
j12022_3	79	j12027_3	119	j12032_3	206	j12037_3	204
j12022_4	77	j12027_4	124	j12032_4	161	j12037_4	278
j12022_5	67	j12027_5	116	j12032_5	183	j12037_5	218
j12022_6	69	j12027_6	143	j12032_6	184	j12037_6	245
j12022_7	50	j12027_7	110	j12032_7	189	j12037_7	245
j12022_8	75	j12027_8	129	j12032_8	201	j12037_8	226
j12022_9	72	j12027_9	127	j12032_9	204	j12037_9	289
j12022_10	69	j12027_10	119	j12032_10	182	j12037_10	261
j12023_1	61	j12028_1	133	j12033_1	158	j12038_1	226
j12023_2	56	j12028_2	108	j12033_2	183	j12038_2	255
j12023_3	60	j12028_3	102	j12033_3	193	j12038_3	230
j12023_4	53	j12028_4	115	j12033_4	165	j12038_4	219
j12023_5	56	j12028_5	105	j12033_5	175	j12038_5	245
j12023_6	63	j12028_6	131	j12033_6	151	j12038_6	258
j12023_7	54	j12028_7	135	j12033_7	213	j12038_7	292
j12023_8	55	j12028_8	130	j12033_8	193	j12038_8	242
j12023_9	59	j12028_9	129	j12033_9	180	j12038_9	199
j12023_10	70	j12028_10	108	j12033_10	207	j12038_10	285
j12024_1	64	j12029_1	118	j12034_1	242	j12039_1	216
j12024_2	63	j12029_2	127	j12034_2	183	j12039_2	215
j12024_3	68	j12029_3	167	j12034_3	199	j12039_3	236
j12024_4	56	j12029_4	150	j12034_4	195	j12039_4	275
j12024_5	55	j12029_5	126	j12034_5	167	j12039_5	201
j12024_6	62	j12029_6	135	j12034_6	190	j12039_6	216
j12024_7	64	j12029_7	125	j12034_7	166	j12039_7	239
j12024_8	66	j12029_8	137	j12034_8	213	j12039_8	232
j12024_9	65	j12029_9	117	j12034_9	197	j12039_9	280
j12024_10	66	j12029_10	107	j12034_10	196	j12039_10	218
j12025_1	72	j12030_1	125	j12035_1	190	j12040_1	262
j12025_2	61	j12030_2	112	j12035_2	171	j12040_2	279
j12025_3	63	j12030_3	117	j12035_3	234	j12040_3	255
j12025_4	59	j12030_4	137	j12035_4	176	j12040_4	217
j12025_5	53	j12030_5	135	j12035_5	174	j12040_5	215
j12025_6	65	j12030_6	144	j12035_6	194	j12040_6	274
j12025_7	62	j12030_7	142	j12035_7	172	j12040_7	238
j12025_8	80	j12030_8	148	j12035_8	180	j12040_8	222
j12025_9	61	j12030_9	127	j12035_9	183	j12040_9	205
j12025_10	62	j12030_10	135	j12035_10	207	j12040_10	270

Table XXX: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the Gf resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9041_1 έως j9060_10)

Project	Gf	Project	Gf	Project	Gf	Project	Gf
j12041_1	58	j12046_1	109	j12051_1	174	j12056_1	229
j12041_2	63	j12046_2	103	j12051_2	158	j12056_2	219
j12041_3	53	j12046_3	111	j12051_3	167	j12056_3	228
j12041_4	63	j12046_4	124	j12051_4	161	j12056_4	223
j12041_5	53	j12046_5	111	j12051_5	167	j12056_5	211
j12041_6	56	j12046_6	112	j12051_6	159	j12056_6	224
j12041_7	63	j12046_7	92	j12051_7	158	j12056_7	204
j12041_8	51	j12046_8	129	j12051_8	175	j12056_8	229
j12041_9	59	j12046_9	118	j12051_9	157	j12056_9	233
j12041_10	51	j12046_10	116	j12051_10	164	j12056_10	213
j12042_1	60	j12047_1	104	j12052_1	133	j12057_1	210
j12042_2	44	j12047_2	113	j12052_2	157	j12057_2	228
j12042_3	54	j12047_3	122	j12052_3	147	j12057_3	221
j12042_4	52	j12047_4	110	j12052_4	162	j12057_4	207
j12042_5	56	j12047_5	106	j12052_5	149	j12057_5	245
j12042_6	63	j12047_6	119	j12052_6	167	j12057_6	208
j12042_7	52	j12047_7	151	j12052_7	168	j12057_7	189
j12042_8	54	j12047_8	135	j12052_8	143	j12057_8	259
j12042_9	55	j12047_9	112	j12052_9	178	j12057_9	200
j12042_10	61	j12047_10	116	j12052_10	171	j12057_10	189
j12043_1	57	j12048_1	118	j12053_1	148	j12058_1	176
j12043_2	46	j12048_2	117	j12053_2	171	j12058_2	213
j12043_3	55	j12048_3	104	j12053_3	141	j12058_3	259
j12043_4	60	j12048_4	120	j12053_4	146	j12058_4	209
j12043_5	58	j12048_5	122	j12053_5	163	j12058_5	233
j12043_6	63	j12048_6	120	j12053_6	168	j12058_6	234
j12043_7	62	j12048_7	117	j12053_7	149	j12058_7	215
j12043_8	53	j12048_8	113	j12053_8	169	j12058_8	232
j12043_9	65	j12048_9	106	j12053_9	139	j12058_9	242
j12043_10	54	j12048_10	109	j12053_10	155	j12058_10	193
j12044_1	52	j12049_1	105	j12054_1	150	j12059_1	245
j12044_2	55	j12049_2	115	j12054_2	128	j12059_2	212
j12044_3	57	j12049_3	122	j12054_3	156	j12059_3	190
j12044_4	63	j12049_4	130	j12054_4	144	j12059_4	185
j12044_5	71	j12049_5	120	j12054_5	194	j12059_5	225
j12044_6	58	j12049_6	98	j12054_6	179	j12059_6	216
j12044_7	63	j12049_7	120	j12054_7	154	j12059_7	228
j12044_8	48	j12049_8	99	j12054_8	180	j12059_8	230
j12044_9	47	j12049_9	125	j12054_9	150	j12059_9	185
j12044_10	70	j12049_10	107	j12054_10	159	j12059_10	176
j12045_1	48	j12050_1	109	j12055_1	179	j12060_1	203
j12045_2	59	j12050_2	112	j12055_2	174	j12060_2	234
j12045_3	64	j12050_3	98	j12055_3	128	j12060_3	229
j12045_4	50	j12050_4	119	j12055_4	199	j12060_4	210
j12045_5	58	j12050_5	111	j12055_5	171	j12060_5	205
j12045_6	49	j12050_6	120	j12055_6	163	j12060_6	201
j12045_7	51	j12050_7	93	j12055_7	157	j12060_7	253
j12045_8	57	j12050_8	107	j12055_8	173	j12060_8	229
j12045_9	49	j12050_9	118	j12055_9	165	j12060_9	233
j12045_10	57	j12050_10	118	j12055_10	160	j12060_10	255

Table XXXI: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the StD resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	StD	Project	StD	Project	StD	Project	StD
j1201_1	11,4254	j1206_1	31,5850	j12011_1	39,5954	j12016_1	64,8455
j1201_2	17,7623	j1206_2	35,0352	j12011_2	46,2118	j12016_2	80,3384
j1201_3	15,9704	j1206_3	30,8199	j12011_3	47,1814	j12016_3	65,3981
j1201_4	13,8989	j1206_4	20,7648	j12011_4	35,2177	j12016_4	58,7836
j1201_5	14,1748	j1206_5	39,8469	j12011_5	37,9260	j12016_5	64,9272
j1201_6	18,6354	j1206_6	25,6842	j12011_6	58,2318	j12016_6	89,3707
j1201_7	9,6615	j1206_7	27,8251	j12011_7	32,8858	j12016_7	49,5513
j1201_8	15,3216	j1206_8	22,7724	j12011_8	41,1504	j12016_8	65,4603
j1201_9	13,5897	j1206_9	43,9948	j12011_9	52,7981	j12016_9	50,4367
j1201_10	14,8029	j1206_10	35,5806	j12011_10	45,1998	j12016_10	59,7900
j1202_1	21,5894	j1207_1	40,8963	j12012_1	29,0629	j12017_1	53,2613
j1202_2	19,7498	j1207_2	29,8460	j12012_2	58,1399	j12017_2	73,9320
j1202_3	22,5398	j1207_3	29,7025	j12012_3	53,9992	j12017_3	69,7566
j1202_4	13,3597	j1207_4	25,2982	j12012_4	39,9385	j12017_4	56,2688
j1202_5	13,5071	j1207_5	32,6687	j12012_5	39,2966	j12017_5	56,9899
j1202_6	18,2209	j1207_6	29,1490	j12012_6	42,6944	j12017_6	71,1075
j1202_7	13,9016	j1207_7	34,6679	j12012_7	53,5308	j12017_7	59,3085
j1202_8	15,9220	j1207_8	29,0421	j12012_8	59,5004	j12017_8	83,0774
j1202_9	14,1324	j1207_9	35,7777	j12012_9	49,7831	j12017_9	54,3902
j1202_10	25,9433	j1207_10	28,8928	j12012_10	52,4006	j12017_10	60,7161
j1203_1	19,9110	j1208_1	26,8906	j12013_1	38,3392	j12018_1	45,2997
j1203_2	11,7526	j1208_2	43,2424	j12013_2	61,6818	j12018_2	41,7131
j1203_3	15,1659	j1208_3	23,0458	j12013_3	36,6935	j12018_3	64,4063
j1203_4	19,3321	j1208_4	30,8890	j12013_4	53,3468	j12018_4	70,6262
j1203_5	18,3961	j1208_5	30,3753	j12013_5	65,5993	j12018_5	61,2876
j1203_6	14,1718	j1208_6	33,9031	j12013_6	41,3109	j12018_6	31,7032
j1203_7	11,4738	j1208_7	36,8186	j12013_7	32,6239	j12018_7	60,1362
j1203_8	15,9248	j1208_8	32,1256	j12013_8	39,8089	j12018_8	47,5057
j1203_9	13,9267	j1208_9	37,3616	j12013_9	44,6943	j12018_9	70,5635
j1203_10	12,0596	j1208_10	46,9412	j12013_10	53,0029	j12018_10	74,0716
j1204_1	17,7097	j1209_1	30,0614	j12014_1	60,2773	j12019_1	71,6716
j1204_2	12,0502	j1209_2	28,9871	j12014_2	63,6915	j12019_2	66,2996
j1204_3	14,0967	j1209_3	24,6626	j12014_3	54,0036	j12019_3	65,0055
j1204_4	17,8150	j1209_4	30,1371	j12014_4	46,2280	j12019_4	53,7304
j1204_5	18,4812	j1209_5	24,3473	j12014_5	41,5081	j12019_5	67,9100
j1204_6	14,7208	j1209_6	20,5121	j12014_6	37,8214	j12019_6	53,0164
j1204_7	14,4895	j1209_7	32,9328	j12014_7	56,6491	j12019_7	50,5856
j1204_8	15,7300	j1209_8	27,5814	j12014_8	36,6101	j12019_8	56,6629
j1204_9	14,1295	j1209_9	31,1888	j12014_9	33,5406	j12019_9	65,1829
j1204_10	13,6127	j1209_10	25,0551	j12014_10	50,4024	j12019_10	62,7593
j1205_1	13,5851	j12010_1	23,7164	j12015_1	51,6884	j12020_1	61,9966
j1205_2	17,1249	j12010_2	31,8018	j12015_2	70,4433	j12020_2	56,1260
j1205_3	15,9278	j12010_3	27,2260	j12015_3	45,1848	j12020_3	59,5565
j1205_4	12,1809	j12010_4	27,1250	j12015_4	59,0021	j12020_4	58,4078
j1205_5	17,5684	j12010_5	30,0337	j12015_5	44,9971	j12020_5	75,1423
j1205_6	19,9766	j12010_6	35,0509	j12015_6	35,4297	j12020_6	52,1212
j1205_7	15,9147	j12010_7	30,8823	j12015_7	47,1718	j12020_7	58,2739
j1205_8	17,6599	j12010_8	24,6492	j12015_8	32,6653	j12020_8	44,6922
j1205_9	13,1938	j12010_9	37,8659	j12015_9	35,8167	j12020_9	74,9523
j1205_10	13,6175	j12010_10	51,5887	j12015_10	49,8048	j12020_10	65,5824

Table XXXII: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the StD resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	StD	Project	StD	Project	StD	Project	StD
j12021_1	14,7038	j12026_1	33,0416	j12031_1	39,1363	j12036_1	48,9882
j12021_2	12,1889	j12026_2	19,4802	j12031_2	48,1801	j12036_2	59,8551
j12021_3	12,8823	j12026_3	23,9308	j12031_3	52,1977	j12036_3	56,2002
j12021_4	12,7670	j12026_4	29,7581	j12031_4	29,3192	j12036_4	49,7816
j12021_5	10,9511	j12026_5	30,6779	j12031_5	41,4020	j12036_5	51,2575
j12021_6	14,0663	j12026_6	19,2014	j12031_6	44,1255	j12036_6	42,9887
j12021_7	16,3393	j12026_7	30,4157	j12031_7	38,1896	j12036_7	45,2490
j12021_8	12,5542	j12026_8	16,6017	j12031_8	45,4732	j12036_8	44,4342
j12021_9	12,0758	j12026_9	25,0168	j12031_9	46,3264	j12036_9	48,4359
j12021_10	15,7120	j12026_10	20,5601	j12031_10	34,6111	j12036_10	47,6443
j12022_1	13,6814	j12027_1	43,9697	j12032_1	36,3372	j12037_1	49,9401
j12022_2	15,6542	j12027_2	20,2419	j12032_2	35,3743	j12037_2	65,0279
j12022_3	19,8157	j12027_3	22,4278	j12032_3	50,4158	j12037_3	37,9580
j12022_4	16,7940	j12027_4	28,8479	j12032_4	34,2849	j12037_4	65,0300
j12022_5	15,2547	j12027_5	24,0258	j12032_5	46,0863	j12037_5	40,6949
j12022_6	20,6987	j12027_6	28,8573	j12032_6	42,7121	j12037_6	56,1642
j12022_7	10,5152	j12027_7	23,6545	j12032_7	42,9136	j12037_7	52,3801
j12022_8	19,7979	j12027_8	28,0141	j12032_8	54,3992	j12037_8	55,3453
j12022_9	16,3594	j12027_9	27,3464	j12032_9	46,6303	j12037_9	69,3923
j12022_10	12,1217	j12027_10	26,0825	j12032_10	38,5719	j12037_10	55,0388
j12023_1	14,3418	j12028_1	31,3567	j12033_1	35,4371	j12038_1	46,4456
j12023_2	11,1506	j12028_2	24,6844	j12033_2	40,0848	j12038_2	51,5260
j12023_3	14,3665	j12028_3	18,3502	j12033_3	40,1886	j12038_3	52,5813
j12023_4	10,4907	j12028_4	28,1064	j12033_4	27,6834	j12038_4	41,9736
j12023_5	14,4461	j12028_5	20,9980	j12033_5	41,0862	j12038_5	48,5058
j12023_6	14,2809	j12028_6	29,5904	j12033_6	34,6425	j12038_6	50,8901
j12023_7	13,7784	j12028_7	28,6923	j12033_7	54,4448	j12038_7	77,4725
j12023_8	13,0988	j12028_8	25,0343	j12033_8	39,7094	j12038_8	52,1255
j12023_9	11,8021	j12028_9	32,7534	j12033_9	38,4344	j12038_9	38,5583
j12023_10	16,1904	j12028_10	20,6992	j12033_10	43,6905	j12038_10	51,3167
j12024_1	14,5887	j12029_1	25,2064	j12034_1	58,3679	j12039_1	40,9931
j12024_2	11,2940	j12029_2	28,1820	j12034_2	42,0173	j12039_2	40,0817
j12024_3	15,9168	j12029_3	40,8430	j12034_3	47,6612	j12039_3	40,9424
j12024_4	9,9276	j12029_4	38,5581	j12034_4	42,9339	j12039_4	55,8253
j12024_5	9,2666	j12029_5	29,3873	j12034_5	34,6181	j12039_5	38,8391
j12024_6	13,9002	j12029_6	31,7807	j12034_6	42,0016	j12039_6	43,6929
j12024_7	12,7319	j12029_7	27,4134	j12034_7	33,0032	j12039_7	52,2104
j12024_8	13,8135	j12029_8	22,8602	j12034_8	48,6030	j12039_8	47,0812
j12024_9	14,4774	j12029_9	27,4306	j12034_9	38,5337	j12039_9	54,0412
j12024_10	10,7730	j12029_10	21,1916	j12034_10	40,2003	j12039_10	44,3179
j12025_1	15,1773	j12030_1	29,3625	j12035_1	43,4422	j12040_1	62,5348
j12025_2	16,1784	j12030_2	22,6301	j12035_2	38,2163	j12040_2	66,9538
j12025_3	13,1309	j12030_3	22,2293	j12035_3	51,9431	j12040_3	58,1050
j12025_4	13,1713	j12030_4	29,1986	j12035_4	33,0215	j12040_4	46,7988
j12025_5	9,3181	j12030_5	23,0915	j12035_5	36,2486	j12040_5	44,2480
j12025_6	11,6677	j12030_6	33,0998	j12035_6	42,0966	j12040_6	67,2383
j12025_7	14,9534	j12030_7	29,9815	j12035_7	36,4820	j12040_7	52,1954
j12025_8	16,4746	j12030_8	34,2190	j12035_8	37,3624	j12040_8	39,7813
j12025_9	15,2529	j12030_9	20,4299	j12035_9	42,9596	j12040_9	38,8151
j12025_10	13,8021	j12030_10	33,8965	j12035_10	54,1908	j12040_10	49,7791

Table XXXIII: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the StD resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9041_1 έως j9060_10)

Project	StD	Project	StD	Project	StD	Project	StD
j12041_1	15,3626	j12046_1	25,6802	j12051_1	39,1969	j12056_1	48,0284
j12041_2	11,3810	j12046_2	20,8792	j12051_2	25,4314	j12056_2	46,3869
j12041_3	10,7785	j12046_3	23,1975	j12051_3	34,2382	j12056_3	43,9765
j12041_4	14,4173	j12046_4	31,0677	j12051_4	31,2051	j12056_4	44,1417
j12041_5	10,5041	j12046_5	21,4874	j12051_5	37,6531	j12056_5	43,1189
j12041_6	10,2494	j12046_6	25,3656	j12051_6	35,4405	j12056_6	50,9373
j12041_7	14,8319	j12046_7	17,7724	j12051_7	32,1086	j12056_7	36,7493
j12041_8	10,5522	j12046_8	31,3466	j12051_8	36,7900	j12056_8	45,0411
j12041_9	14,1227	j12046_9	22,8746	j12051_9	30,9855	j12056_9	48,4756
j12041_10	12,3097	j12046_10	26,0357	j12051_10	31,9580	j12056_10	43,1467
j12042_1	11,7608	j12047_1	21,0643	j12052_1	24,4225	j12057_1	43,1589
j12042_2	9,3915	j12047_2	23,6041	j12052_2	34,7747	j12057_2	41,9490
j12042_3	12,5339	j12047_3	28,4003	j12052_3	28,6115	j12057_3	48,0321
j12042_4	10,8600	j12047_4	27,4336	j12052_4	34,5248	j12057_4	43,4956
j12042_5	12,7706	j12047_5	23,8205	j12052_5	31,9652	j12057_5	66,1881
j12042_6	12,6605	j12047_6	25,2204	j12052_6	41,0818	j12057_6	35,9892
j12042_7	12,1056	j12047_7	41,0416	j12052_7	30,9626	j12057_7	41,2239
j12042_8	12,9557	j12047_8	26,2983	j12052_8	29,8313	j12057_8	62,6693
j12042_9	10,7975	j12047_9	23,7268	j12052_9	37,1268	j12057_9	45,0991
j12042_10	12,7852	j12047_10	27,4525	j12052_10	29,7355	j12057_10	33,4032
j12043_1	13,7087	j12048_1	23,1415	j12053_1	34,8136	j12058_1	33,9125
j12043_2	7,9714	j12048_2	24,5752	j12053_2	36,1325	j12058_2	42,1756
j12043_3	11,5357	j12048_3	16,4979	j12053_3	28,9012	j12058_3	58,9885
j12043_4	15,0949	j12048_4	26,4906	j12053_4	34,9590	j12058_4	39,5158
j12043_5	13,0138	j12048_5	29,1113	j12053_5	32,3728	j12058_5	53,1162
j12043_6	12,8335	j12048_6	24,1607	j12053_6	32,3106	j12058_6	58,5626
j12043_7	14,8501	j12048_7	29,6495	j12053_7	27,5649	j12058_7	43,5018
j12043_8	13,1219	j12048_8	25,3015	j12053_8	39,4255	j12058_8	49,0685
j12043_9	14,9145	j12048_9	21,2461	j12053_9	35,5532	j12058_9	50,0088
j12043_10	11,6785	j12048_10	21,6246	j12053_10	30,3643	j12058_10	31,5478
j12044_1	10,8736	j12049_1	20,9333	j12054_1	27,7248	j12059_1	63,1054
j12044_2	13,5905	j12049_2	24,2805	j12054_2	28,6230	j12059_2	39,4069
j12044_3	13,2405	j12049_3	30,3821	j12054_3	31,2393	j12059_3	40,5669
j12044_4	14,5136	j12049_4	30,0345	j12054_4	32,7060	j12059_4	37,4179
j12044_5	16,6239	j12049_5	27,8215	j12054_5	42,1023	j12059_5	48,7989
j12044_6	11,4046	j12049_6	18,0990	j12054_6	45,4098	j12059_6	44,7069
j12044_7	12,4817	j12049_7	26,5294	j12054_7	29,9817	j12059_7	39,1692
j12044_8	11,0968	j12049_8	21,8272	j12054_8	44,4825	j12059_8	46,0209
j12044_9	8,8424	j12049_9	24,3441	j12054_9	29,8325	j12059_9	39,8421
j12044_10	17,2782	j12049_10	19,5666	j12054_10	34,8599	j12059_10	29,1007
j12045_1	9,5680	j12050_1	25,2136	j12055_1	34,5584	j12060_1	40,6582
j12045_2	10,7104	j12050_2	21,9764	j12055_2	34,3568	j12060_2	55,0807
j12045_3	16,2990	j12050_3	18,1543	j12055_3	26,9834	j12060_3	41,7609
j12045_4	10,6472	j12050_4	23,2404	j12055_4	44,7806	j12060_4	39,1847
j12045_5	12,4712	j12050_5	24,3230	j12055_5	39,4596	j12060_5	35,5407
j12045_6	11,3161	j12050_6	24,9710	j12055_6	39,4475	j12060_6	41,1405
j12045_7	9,6204	j12050_7	21,6619	j12055_7	35,1743	j12060_7	50,6673
j12045_8	13,8377	j12050_8	20,2239	j12055_8	44,0379	j12060_8	49,7795
j12045_9	10,0950	j12050_9	23,8295	j12055_9	33,7864	j12060_9	49,1785
j12045_10	12,1878	j12050_10	31,6986	j12055_10	33,0574	j12060_10	63,9385

Table XXXIV: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the Step resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	Step	Project	Step	Project	Step	Project	Step
j1201_1	346	j1206_1	658	j12011_1	902	j12016_1	1031
j1201_2	329	j1206_2	631	j12011_2	890	j12016_2	1159
j1201_3	316	j1206_3	667	j12011_3	1022	j12016_3	1244
j1201_4	312	j1206_4	691	j12011_4	1021	j12016_4	1069
j1201_5	356	j1206_5	577	j12011_5	1044	j12016_5	1135
j1201_6	265	j1206_6	655	j12011_6	945	j12016_6	1096
j1201_7	318	j1206_7	728	j12011_7	939	j12016_7	1197
j1201_8	300	j1206_8	707	j12011_8	849	j12016_8	1114
j1201_9	316	j1206_9	697	j12011_9	893	j12016_9	1298
j1201_10	318	j1206_10	671	j12011_10	958	j12016_10	1255
j1202_1	308	j1207_1	634	j12012_1	920	j12017_1	1192
j1202_2	278	j1207_2	706	j12012_2	837	j12017_2	1150
j1202_3	322	j1207_3	646	j12012_3	921	j12017_3	1187
j1202_4	323	j1207_4	673	j12012_4	925	j12017_4	1225
j1202_5	321	j1207_5	650	j12012_5	1045	j12017_5	1144
j1202_6	303	j1207_6	666	j12012_6	929	j12017_6	1075
j1202_7	302	j1207_7	698	j12012_7	934	j12017_7	1350
j1202_8	285	j1207_8	497	j12012_8	940	j12017_8	1075
j1202_9	349	j1207_9	637	j12012_9	829	j12017_9	1226
j1202_10	302	j1207_10	684	j12012_10	925	j12017_10	1154
j1203_1	351	j1208_1	751	j12013_1	936	j12018_1	1235
j1203_2	283	j1208_2	743	j12013_2	791	j12018_2	1370
j1203_3	350	j1208_3	697	j12013_3	964	j12018_3	1092
j1203_4	304	j1208_4	623	j12013_4	931	j12018_4	1154
j1203_5	360	j1208_5	620	j12013_5	850	j12018_5	1219
j1203_6	344	j1208_6	667	j12013_6	964	j12018_6	1169
j1203_7	342	j1208_7	677	j12013_7	1079	j12018_7	1175
j1203_8	271	j1208_8	699	j12013_8	1006	j12018_8	1205
j1203_9	314	j1208_9	612	j12013_9	968	j12018_9	963
j1203_10	371	j1208_10	689	j12013_10	925	j12018_10	1218
j1204_1	294	j1209_1	625	j12014_1	911	j12019_1	1202
j1204_2	347	j1209_2	719	j12014_2	928	j12019_2	1144
j1204_3	327	j1209_3	664	j12014_3	932	j12019_3	1183
j1204_4	330	j1209_4	642	j12014_4	923	j12019_4	1162
j1204_5	313	j1209_5	644	j12014_5	842	j12019_5	1266
j1204_6	309	j1209_6	472	j12014_6	1086	j12019_6	1073
j1204_7	345	j1209_7	657	j12014_7	952	j12019_7	1285
j1204_8	332	j1209_8	612	j12014_8	891	j12019_8	1168
j1204_9	293	j1209_9	585	j12014_9	866	j12019_9	1137
j1204_10	321	j1209_10	698	j12014_10	874	j12019_10	1105
j1205_1	337	j12010_1	782	j12015_1	1027	j12020_1	1182
j1205_2	332	j12010_2	748	j12015_2	842	j12020_2	1261
j1205_3	263	j12010_3	787	j12015_3	960	j12020_3	1078
j1205_4	360	j12010_4	629	j12015_4	879	j12020_4	1230
j1205_5	324	j12010_5	643	j12015_5	936	j12020_5	928
j1205_6	305	j12010_6	677	j12015_6	1007	j12020_6	1165
j1205_7	308	j12010_7	667	j12015_7	801	j12020_7	1079
j1205_8	301	j12010_8	677	j12015_8	1119	j12020_8	1251
j1205_9	354	j12010_9	639	j12015_9	1097	j12020_9	1168
j1205_10	326	j12010_10	579	j12015_10	1046	j12020_10	1147

Table XXXV: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the Step resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	Step	Project	Step	Project	Step	Project	Step
j12021_1	368	j12026_1	747	j12031_1	847	j12036_1	1294
j12021_2	303	j12026_2	680	j12031_2	946	j12036_2	1165
j12021_3	382	j12026_3	659	j12031_3	875	j12036_3	1189
j12021_4	420	j12026_4	772	j12031_4	1112	j12036_4	1326
j12021_5	351	j12026_5	720	j12031_5	980	j12036_5	1249
j12021_6	363	j12026_6	785	j12031_6	998	j12036_6	1368
j12021_7	346	j12026_7	592	j12031_7	1071	j12036_7	1259
j12021_8	354	j12026_8	693	j12031_8	1054	j12036_8	1281
j12021_9	342	j12026_9	838	j12031_9	1079	j12036_9	1312
j12021_10	315	j12026_10	816	j12031_10	943	j12036_10	1139
j12022_1	310	j12027_1	666	j12032_1	916	j12037_1	1158
j12022_2	385	j12027_2	676	j12032_2	989	j12037_2	1152
j12022_3	359	j12027_3	649	j12032_3	1037	j12037_3	1275
j12022_4	296	j12027_4	614	j12032_4	1064	j12037_4	1099
j12022_5	346	j12027_5	585	j12032_5	1052	j12037_5	1302
j12022_6	349	j12027_6	758	j12032_6	1028	j12037_6	1277
j12022_7	361	j12027_7	755	j12032_7	1145	j12037_7	1189
j12022_8	355	j12027_8	859	j12032_8	899	j12037_8	1356
j12022_9	337	j12027_9	744	j12032_9	960	j12037_9	1280
j12022_10	329	j12027_10	797	j12032_10	1033	j12037_10	1175
j12023_1	336	j12028_1	802	j12033_1	994	j12038_1	1440
j12023_2	338	j12028_2	744	j12033_2	1059	j12038_2	1192
j12023_3	343	j12028_3	772	j12033_3	987	j12038_3	1157
j12023_4	362	j12028_4	659	j12033_4	1070	j12038_4	1487
j12023_5	326	j12028_5	829	j12033_5	1134	j12038_5	1319
j12023_6	331	j12028_6	752	j12033_6	1044	j12038_6	1415
j12023_7	362	j12028_7	749	j12033_7	985	j12038_7	1268
j12023_8	358	j12028_8	606	j12033_8	1016	j12038_8	1332
j12023_9	365	j12028_9	689	j12033_9	1072	j12038_9	1475
j12023_10	331	j12028_10	603	j12033_10	969	j12038_10	1100
j12024_1	325	j12029_1	793	j12034_1	847	j12039_1	1293
j12024_2	341	j12029_2	694	j12034_2	1024	j12039_2	1353
j12024_3	336	j12029_3	609	j12034_3	998	j12039_3	1259
j12024_4	343	j12029_4	652	j12034_4	964	j12039_4	1091
j12024_5	328	j12029_5	830	j12034_5	1007	j12039_5	1368
j12024_6	368	j12029_6	669	j12034_6	1082	j12039_6	1269
j12024_7	334	j12029_7	756	j12034_7	964	j12039_7	1225
j12024_8	369	j12029_8	537	j12034_8	840	j12039_8	1219
j12024_9	316	j12029_9	682	j12034_9	968	j12039_9	1196
j12024_10	358	j12029_10	739	j12034_10	953	j12039_10	1248
j12025_1	278	j12030_1	667	j12035_1	906	j12040_1	1146
j12025_2	378	j12030_2	742	j12035_2	1093	j12040_2	1246
j12025_3	343	j12030_3	770	j12035_3	900	j12040_3	1282
j12025_4	386	j12030_4	674	j12035_4	984	j12040_4	1376
j12025_5	366	j12030_5	661	j12035_5	901	j12040_5	1194
j12025_6	331	j12030_6	686	j12035_6	1018	j12040_6	1229
j12025_7	349	j12030_7	622	j12035_7	1014	j12040_7	1173
j12025_8	296	j12030_8	614	j12035_8	984	j12040_8	1272
j12025_9	329	j12030_9	738	j12035_9	980	j12040_9	1218
j12025_10	347	j12030_10	641	j12035_10	967	j12040_10	1368

Table XXXVI: Best scores obtained after repeated experiments with the hybrid genetic algorithm approach (HGA) using the Step resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9041_1 έως j9060_10)

Project	Step	Project	Step	Project	Step	Project	Step
j12041_1	356	j12046_1	834	j12051_1	743	j12056_1	1220
j12041_2	371	j12046_2	717	j12051_2	982	j12056_2	1168
j12041_3	357	j12046_3	771	j12051_3	756	j12056_3	1258
j12041_4	306	j12046_4	624	j12051_4	791	j12056_4	1277
j12041_5	352	j12046_5	797	j12051_5	958	j12056_5	1393
j12041_6	304	j12046_6	733	j12051_6	980	j12056_6	1363
j12041_7	348	j12046_7	751	j12051_7	952	j12056_7	1399
j12041_8	385	j12046_8	697	j12051_8	964	j12056_8	1366
j12041_9	342	j12046_9	723	j12051_9	1144	j12056_9	1188
j12041_10	425	j12046_10	775	j12051_10	1122	j12056_10	1243
j12042_1	389	j12047_1	756	j12052_1	1060	j12057_1	1305
j12042_2	397	j12047_2	823	j12052_2	1075	j12057_2	1408
j12042_3	386	j12047_3	702	j12052_3	1116	j12057_3	1332
j12042_4	339	j12047_4	758	j12052_4	1084	j12057_4	1339
j12042_5	389	j12047_5	839	j12052_5	981	j12057_5	1154
j12042_6	307	j12047_6	717	j12052_6	1037	j12057_6	1140
j12042_7	369	j12047_7	751	j12052_7	983	j12057_7	1396
j12042_8	304	j12047_8	796	j12052_8	1144	j12057_8	1201
j12042_9	356	j12047_9	782	j12052_9	950	j12057_9	1302
j12042_10	355	j12047_10	754	j12052_10	1008	j12057_10	1436
j12043_1	323	j12048_1	711	j12053_1	1213	j12058_1	1388
j12043_2	410	j12048_2	643	j12053_2	1091	j12058_2	1404
j12043_3	353	j12048_3	762	j12053_3	1025	j12058_3	1312
j12043_4	387	j12048_4	807	j12053_4	1031	j12058_4	1190
j12043_5	344	j12048_5	638	j12053_5	888	j12058_5	1297
j12043_6	328	j12048_6	752	j12053_6	899	j12058_6	1188
j12043_7	340	j12048_7	704	j12053_7	1177	j12058_7	1295
j12043_8	428	j12048_8	728	j12053_8	1150	j12058_8	1212
j12043_9	433	j12048_9	766	j12053_9	1154	j12058_9	1407
j12043_10	377	j12048_10	708	j12053_10	1130	j12058_10	1200
j12044_1	388	j12049_1	703	j12054_1	1039	j12059_1	1295
j12044_2	314	j12049_2	697	j12054_2	1171	j12059_2	1237
j12044_3	403	j12049_3	643	j12054_3	1198	j12059_3	1309
j12044_4	346	j12049_4	676	j12054_4	1134	j12059_4	1409
j12044_5	345	j12049_5	668	j12054_5	1037	j12059_5	1248
j12044_6	345	j12049_6	798	j12054_6	1058	j12059_6	1297
j12044_7	366	j12049_7	752	j12054_7	928	j12059_7	1180
j12044_8	372	j12049_8	750	j12054_8	886	j12059_8	1319
j12044_9	311	j12049_9	721	j12054_9	855	j12059_9	1394
j12044_10	382	j12049_10	610	j12054_10	862	j12059_10	1132
j12045_1	393	j12050_1	738	j12055_1	1120	j12060_1	1244
j12045_2	334	j12050_2	821	j12055_2	966	j12060_2	1124
j12045_3	370	j12050_3	780	j12055_3	1104	j12060_3	1248
j12045_4	367	j12050_4	698	j12055_4	1060	j12060_4	1217
j12045_5	367	j12050_5	728	j12055_5	997	j12060_5	1315
j12045_6	406	j12050_6	666	j12055_6	977	j12060_6	1511
j12045_7	315	j12050_7	859	j12055_7	1092	j12060_7	1088
j12045_8	381	j12050_8	835	j12055_8	1150	j12060_8	1356
j12045_9	415	j12050_9	805	j12055_9	987	j12060_9	1411
j12045_10	353	j12050_10	780	j12055_10	1143	j12060_10	977

Table XXXVII: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the Gfresource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	Gf	Project	Gf	Project	Gf	Project	Gf
j1201_1	56	j1206_1	133	j12011_1	189	j12016_1	284
j1201_2	64	j1206_2	151	j12011_2	193	j12016_2	292
j1201_3	70	j1206_3	128	j12011_3	202	j12016_3	267
j1201_4	65	j1206_4	100	j12011_4	178	j12016_4	280
j1201_5	60	j1206_5	155	j12011_5	182	j12016_5	268
j1201_6	74	j1206_6	141	j12011_6	210	j12016_6	335
j1201_7	54	j1206_7	114	j12011_7	169	j12016_7	245
j1201_8	64	j1206_8	106	j12011_8	174	j12016_8	272
j1201_9	70	j1206_9	173	j12011_9	234	j12016_9	245
j1201_10	64	j1206_10	139	j12011_10	197	j12016_10	253
j1202_1	87	j1207_1	157	j12012_1	151	j12017_1	271
j1202_2	71	j1207_2	122	j12012_2	233	j12017_2	298
j1202_3	87	j1207_3	122	j12012_3	221	j12017_3	294
j1202_4	60	j1207_4	124	j12012_4	166	j12017_4	260
j1202_5	67	j1207_5	141	j12012_5	183	j12017_5	249
j1202_6	81	j1207_6	120	j12012_6	205	j12017_6	317
j1202_7	65	j1207_7	128	j12012_7	210	j12017_7	257
j1202_8	70	j1207_8	140	j12012_8	236	j12017_8	315
j1202_9	66	j1207_9	136	j12012_9	199	j12017_9	264
j1202_10	87	j1207_10	125	j12012_10	208	j12017_10	274
j1203_1	75	j1208_1	129	j12013_1	158	j12018_1	223
j1203_2	56	j1208_2	151	j12013_2	236	j12018_2	212
j1203_3	62	j1208_3	118	j12013_3	174	j12018_3	300
j1203_4	75	j1208_4	127	j12013_4	205	j12018_4	291
j1203_5	73	j1208_5	128	j12013_5	225	j12018_5	266
j1203_6	61	j1208_6	133	j12013_6	191	j12018_6	195
j1203_7	55	j1208_7	142	j12013_7	167	j12018_7	252
j1203_8	70	j1208_8	129	j12013_8	189	j12018_8	237
j1203_9	63	j1208_9	141	j12013_9	200	j12018_9	298
j1203_10	56	j1208_10	157	j12013_10	222	j12018_10	292
j1204_1	76	j1209_1	128	j12014_1	246	j12019_1	266
j1204_2	54	j1209_2	123	j12014_2	236	j12019_2	301
j1204_3	64	j1209_3	120	j12014_3	209	j12019_3	309
j1204_4	73	j1209_4	143	j12014_4	190	j12019_4	244
j1204_5	80	j1209_5	111	j12014_5	176	j12019_5	284
j1204_6	66	j1209_6	125	j12014_6	182	j12019_6	259
j1204_7	73	j1209_7	153	j12014_7	210	j12019_7	247
j1204_8	66	j1209_8	133	j12014_8	181	j12019_8	255
j1204_9	67	j1209_9	120	j12014_9	162	j12019_9	282
j1204_10	66	j1209_10	133	j12014_10	211	j12019_10	274
j1205_1	60	j12010_1	112	j12015_1	209	j12020_1	261
j1205_2	75	j12010_2	132	j12015_2	261	j12020_2	237
j1205_3	75	j12010_3	130	j12015_3	187	j12020_3	305
j1205_4	60	j12010_4	122	j12015_4	227	j12020_4	256
j1205_5	69	j12010_5	121	j12015_5	192	j12020_5	294
j1205_6	77	j12010_6	139	j12015_6	187	j12020_6	249
j1205_7	67	j12010_7	138	j12015_7	214	j12020_7	244
j1205_8	74	j12010_8	110	j12015_8	154	j12020_8	217
j1205_9	56	j12010_9	145	j12015_9	172	j12020_9	300
j1205_10	61	j12010_10	185	j12015_10	200	j12020_10	283

Table XXXVIII: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the Gfresource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	Gf	Project	Gf	Project	Gf	Project	Gf
j12021_1	63	j12026_1	128	j12031_1	172	j12036_1	222
j12021_2	61	j12026_2	101	j12031_2	213	j12036_2	262
j12021_3	58	j12026_3	123	j12031_3	199	j12036_3	250
j12021_4	60	j12026_4	117	j12031_4	147	j12036_4	254
j12021_5	54	j12026_5	140	j12031_5	183	j12036_5	234
j12021_6	62	j12026_6	94	j12031_6	181	j12036_6	207
j12021_7	71	j12026_7	126	j12031_7	164	j12036_7	220
j12021_8	48	j12026_8	100	j12031_8	194	j12036_8	210
j12021_9	61	j12026_9	107	j12031_9	185	j12036_9	214
j12021_10	62	j12026_10	99	j12031_10	180	j12036_10	248
j12022_1	65	j12027_1	165	j12032_1	180	j12037_1	223
j12022_2	68	j12027_2	123	j12032_2	158	j12037_2	264
j12022_3	76	j12027_3	114	j12032_3	200	j12037_3	205
j12022_4	75	j12027_4	121	j12032_4	149	j12037_4	272
j12022_5	65	j12027_5	112	j12032_5	177	j12037_5	209
j12022_6	68	j12027_6	137	j12032_6	175	j12037_6	245
j12022_7	49	j12027_7	106	j12032_7	178	j12037_7	257
j12022_8	74	j12027_8	123	j12032_8	202	j12037_8	207
j12022_9	69	j12027_9	123	j12032_9	203	j12037_9	285
j12022_10	68	j12027_10	117	j12032_10	183	j12037_10	256
j12023_1	58	j12028_1	129	j12033_1	152	j12038_1	222
j12023_2	52	j12028_2	110	j12033_2	182	j12038_2	242
j12023_3	55	j12028_3	103	j12033_3	193	j12038_3	220
j12023_4	51	j12028_4	115	j12033_4	161	j12038_4	209
j12023_5	57	j12028_5	103	j12033_5	168	j12038_5	233
j12023_6	61	j12028_6	124	j12033_6	140	j12038_6	251
j12023_7	56	j12028_7	132	j12033_7	213	j12038_7	281
j12023_8	55	j12028_8	123	j12033_8	191	j12038_8	235
j12023_9	56	j12028_9	123	j12033_9	179	j12038_9	184
j12023_10	66	j12028_10	102	j12033_10	192	j12038_10	269
j12024_1	62	j12029_1	115	j12034_1	239	j12039_1	207
j12024_2	59	j12029_2	124	j12034_2	179	j12039_2	210
j12024_3	68	j12029_3	165	j12034_3	190	j12039_3	226
j12024_4	55	j12029_4	146	j12034_4	186	j12039_4	267
j12024_5	57	j12029_5	126	j12034_5	170	j12039_5	193
j12024_6	60	j12029_6	130	j12034_6	190	j12039_6	218
j12024_7	57	j12029_7	120	j12034_7	157	j12039_7	238
j12024_8	62	j12029_8	134	j12034_8	207	j12039_8	214
j12024_9	66	j12029_9	110	j12034_9	184	j12039_9	273
j12024_10	63	j12029_10	106	j12034_10	187	j12039_10	202
j12025_1	67	j12030_1	124	j12035_1	183	j12040_1	261
j12025_2	59	j12030_2	103	j12035_2	169	j12040_2	276
j12025_3	59	j12030_3	109	j12035_3	232	j12040_3	247
j12025_4	55	j12030_4	132	j12035_4	170	j12040_4	209
j12025_5	55	j12030_5	128	j12035_5	171	j12040_5	202
j12025_6	62	j12030_6	147	j12035_6	188	j12040_6	271
j12025_7	62	j12030_7	138	j12035_7	166	j12040_7	235
j12025_8	74	j12030_8	144	j12035_8	169	j12040_8	212
j12025_9	59	j12030_9	124	j12035_9	181	j12040_9	198
j12025_10	62	j12030_10	130	j12035_10	202	j12040_10	249

Table XXXIX: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the Gf resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9041_1 έως j9060_10)

Project	Gf	Project	Gf	Project	Gf	Project	Gf
j12041_1	58	j12046_1	108	j12051_1	163	j12056_1	213
j12041_2	62	j12046_2	109	j12051_2	166	j12056_2	218
j12041_3	52	j12046_3	113	j12051_3	170	j12056_3	217
j12041_4	61	j12046_4	125	j12051_4	164	j12056_4	222
j12041_5	53	j12046_5	107	j12051_5	170	j12056_5	204
j12041_6	55	j12046_6	110	j12051_6	162	j12056_6	223
j12041_7	63	j12046_7	94	j12051_7	161	j12056_7	202
j12041_8	50	j12046_8	131	j12051_8	178	j12056_8	229
j12041_9	61	j12046_9	115	j12051_9	156	j12056_9	238
j12041_10	52	j12046_10	117	j12051_10	162	j12056_10	209
j12042_1	59	j12047_1	104	j12052_1	140	j12057_1	213
j12042_2	44	j12047_2	114	j12052_2	157	j12057_2	211
j12042_3	54	j12047_3	124	j12052_3	147	j12057_3	218
j12042_4	55	j12047_4	112	j12052_4	161	j12057_4	207
j12042_5	58	j12047_5	108	j12052_5	151	j12057_5	249
j12042_6	60	j12047_6	117	j12052_6	168	j12057_6	212
j12042_7	52	j12047_7	158	j12052_7	170	j12057_7	189
j12042_8	57	j12047_8	134	j12052_8	138	j12057_8	255
j12042_9	54	j12047_9	113	j12052_9	174	j12057_9	203
j12042_10	60	j12047_10	119	j12052_10	160	j12057_10	179
j12043_1	59	j12048_1	119	j12053_1	148	j12058_1	178
j12043_2	47	j12048_2	122	j12053_2	165	j12058_2	219
j12043_3	55	j12048_3	106	j12053_3	146	j12058_3	253
j12043_4	61	j12048_4	119	j12053_4	154	j12058_4	218
j12043_5	58	j12048_5	123	j12053_5	159	j12058_5	231
j12043_6	65	j12048_6	112	j12053_6	163	j12058_6	236
j12043_7	62	j12048_7	117	j12053_7	148	j12058_7	217
j12043_8	52	j12048_8	119	j12053_8	168	j12058_8	229
j12043_9	63	j12048_9	104	j12053_9	140	j12058_9	242
j12043_10	51	j12048_10	106	j12053_10	155	j12058_10	193
j12044_1	52	j12049_1	109	j12054_1	150	j12059_1	244
j12044_2	56	j12049_2	114	j12054_2	126	j12059_2	217
j12044_3	55	j12049_3	125	j12054_3	161	j12059_3	194
j12044_4	63	j12049_4	128	j12054_4	144	j12059_4	182
j12044_5	69	j12049_5	118	j12054_5	203	j12059_5	228
j12044_6	57	j12049_6	96	j12054_6	182	j12059_6	211
j12044_7	61	j12049_7	120	j12054_7	152	j12059_7	233
j12044_8	49	j12049_8	103	j12054_8	183	j12059_8	220
j12044_9	48	j12049_9	122	j12054_9	155	j12059_9	184
j12044_10	71	j12049_10	107	j12054_10	162	j12059_10	186
j12045_1	46	j12050_1	112	j12055_1	178	j12060_1	186
j12045_2	60	j12050_2	117	j12055_2	175	j12060_2	248
j12045_3	63	j12050_3	99	j12055_3	132	j12060_3	234
j12045_4	50	j12050_4	121	j12055_4	195	j12060_4	206
j12045_5	57	j12050_5	108	j12055_5	171	j12060_5	208
j12045_6	52	j12050_6	116	j12055_6	165	j12060_6	207
j12045_7	48	j12050_7	95	j12055_7	164	j12060_7	260
j12045_8	56	j12050_8	106	j12055_8	172	j12060_8	224
j12045_9	49	j12050_9	115	j12055_9	163	j12060_9	236
j12045_10	54	j12050_10	122	j12055_10	161	j12060_10	254

Table XL: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the StD resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	StD	Project	StD	Project	StD	Project	StD
j1201_1	10,9157	j1206_1	32,2200	j12011_1	40,1180	j12016_1	60,4650
j1201_2	17,0383	j1206_2	34,7166	j12011_2	40,2770	j12016_2	77,1954
j1201_3	16,4539	j1206_3	29,7787	j12011_3	48,1355	j12016_3	61,5406
j1201_4	13,5713	j1206_4	20,7871	j12011_4	35,1411	j12016_4	63,8112
j1201_5	14,4043	j1206_5	36,5067	j12011_5	39,6255	j12016_5	62,8186
j1201_6	18,7541	j1206_6	26,3551	j12011_6	60,0897	j12016_6	86,9267
j1201_7	10,6163	j1206_7	26,1496	j12011_7	30,3253	j12016_7	49,8141
j1201_8	15,6453	j1206_8	22,0088	j12011_8	36,5079	j12016_8	65,7151
j1201_9	15,8142	j1206_9	45,3148	j12011_9	53,0528	j12016_9	46,5035
j1201_10	13,4709	j1206_10	35,5540	j12011_10	46,1995	j12016_10	59,5505
j1202_1	20,9890	j1207_1	38,6736	j12012_1	28,0760	j12017_1	55,6847
j1202_2	19,4772	j1207_2	29,2222	j12012_2	58,1053	j12017_2	66,4981
j1202_3	23,1296	j1207_3	28,9663	j12012_3	58,6949	j12017_3	67,0679
j1202_4	13,1315	j1207_4	26,0618	j12012_4	35,3952	j12017_4	56,8786
j1202_5	13,8908	j1207_5	29,9385	j12012_5	38,8372	j12017_5	49,7032
j1202_6	18,7675	j1207_6	28,8429	j12012_6	39,7356	j12017_6	70,4527
j1202_7	14,1830	j1207_7	33,0753	j12012_7	52,8918	j12017_7	57,5949
j1202_8	15,6578	j1207_8	32,0088	j12012_8	58,9253	j12017_8	83,2216
j1202_9	15,1857	j1207_9	33,7744	j12012_9	48,0155	j12017_9	55,5625
j1202_10	25,6015	j1207_10	28,3013	j12012_10	50,7972	j12017_10	64,3575
j1203_1	17,1886	j1208_1	25,9754	j12013_1	37,7641	j12018_1	39,3536
j1203_2	11,7105	j1208_2	41,6100	j12013_2	65,6422	j12018_2	39,0133
j1203_3	14,1837	j1208_3	26,2207	j12013_3	34,2389	j12018_3	63,8962
j1203_4	19,3151	j1208_4	30,1763	j12013_4	52,4833	j12018_4	69,0777
j1203_5	18,7301	j1208_5	33,2457	j12013_5	63,7190	j12018_5	61,1533
j1203_6	13,4951	j1208_6	32,3890	j12013_6	43,2027	j12018_6	36,1723
j1203_7	11,0068	j1208_7	30,0256	j12013_7	33,7253	j12018_7	63,5794
j1203_8	15,8900	j1208_8	27,4715	j12013_8	34,2726	j12018_8	53,0719
j1203_9	12,9978	j1208_9	37,2986	j12013_9	42,8934	j12018_9	70,3476
j1203_10	11,2190	j1208_10	46,1537	j12013_10	48,3857	j12018_10	71,7415
j1204_1	16,9007	j1209_1	29,4842	j12014_1	60,0614	j12019_1	74,4889
j1204_2	11,4446	j1209_2	30,1166	j12014_2	62,1803	j12019_2	69,0321
j1204_3	14,5039	j1209_3	24,8130	j12014_3	53,8985	j12019_3	65,1003
j1204_4	17,8264	j1209_4	31,4500	j12014_4	45,6316	j12019_4	55,9679
j1204_5	18,7388	j1209_5	20,9651	j12014_5	43,7816	j12019_5	59,8824
j1204_6	14,4094	j1209_6	23,8974	j12014_6	34,1254	j12019_6	50,5149
j1204_7	14,7112	j1209_7	33,4613	j12014_7	55,5858	j12019_7	50,5456
j1204_8	15,8105	j1209_8	27,4000	j12014_8	38,6088	j12019_8	52,3676
j1204_9	14,7632	j1209_9	31,2547	j12014_9	28,7362	j12019_9	59,4163
j1204_10	14,6536	j1209_10	24,4344	j12014_10	49,7296	j12019_10	60,6025
j1205_1	12,7670	j12010_1	23,2139	j12015_1	49,6265	j12020_1	63,2625
j1205_2	16,4939	j12010_2	31,4886	j12015_2	73,7480	j12020_2	57,2738
j1205_3	16,4001	j12010_3	29,0509	j12015_3	47,5332	j12020_3	62,1275
j1205_4	12,7165	j12010_4	22,0685	j12015_4	59,9766	j12020_4	54,9888
j1205_5	16,9377	j12010_5	29,1291	j12015_5	42,3567	j12020_5	75,2344
j1205_6	20,9281	j12010_6	33,7111	j12015_6	38,3897	j12020_6	48,1641
j1205_7	15,9895	j12010_7	30,0900	j12015_7	49,5364	j12020_7	57,7736
j1205_8	17,8210	j12010_8	24,7499	j12015_8	32,6361	j12020_8	44,4456
j1205_9	12,2467	j12010_9	37,5603	j12015_9	37,9761	j12020_9	72,3031
j1205_10	13,5325	j12010_10	51,5362	j12015_10	45,1432	j12020_10	66,7287

Table XLI: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the StD resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	StD	Project	StD	Project	StD	Project	StD
j12021_1	15,0886	j12026_1	31,8119	j12031_1	38,4639	j12036_1	47,3603
j12021_2	12,4587	j12026_2	18,8187	j12031_2	49,4167	j12036_2	59,3870
j12021_3	12,9443	j12026_3	25,4098	j12031_3	51,2409	j12036_3	54,9145
j12021_4	12,8762	j12026_4	30,5928	j12031_4	28,2503	j12036_4	47,7813
j12021_5	11,4822	j12026_5	29,9154	j12031_5	43,0373	j12036_5	51,4839
j12021_6	13,6231	j12026_6	19,5883	j12031_6	41,9056	j12036_6	38,3895
j12021_7	16,6672	j12026_7	32,0163	j12031_7	35,0706	j12036_7	43,2896
j12021_8	12,2137	j12026_8	17,2845	j12031_8	45,2440	j12036_8	41,7532
j12021_9	11,5886	j12026_9	24,8855	j12031_9	47,5232	j12036_9	47,8911
j12021_10	15,5214	j12026_10	20,6195	j12031_10	32,6954	j12036_10	49,3662
j12022_1	13,7472	j12027_1	42,4916	j12032_1	35,8751	j12037_1	52,2438
j12022_2	15,5347	j12027_2	21,7387	j12032_2	33,7476	j12037_2	65,9004
j12022_3	18,9396	j12027_3	23,0055	j12032_3	48,9913	j12037_3	42,2603
j12022_4	17,7948	j12027_4	28,6832	j12032_4	33,2217	j12037_4	65,4008
j12022_5	14,7895	j12027_5	26,6191	j12032_5	43,4349	j12037_5	40,7633
j12022_6	20,4387	j12027_6	31,4363	j12032_6	38,5099	j12037_6	55,4362
j12022_7	9,4473	j12027_7	22,7898	j12032_7	45,6871	j12037_7	50,9707
j12022_8	18,9989	j12027_8	27,5163	j12032_8	52,5762	j12037_8	53,7434
j12022_9	16,2790	j12027_9	26,7183	j12032_9	43,7639	j12037_9	70,8356
j12022_10	12,0377	j12027_10	24,3415	j12032_10	39,5425	j12037_10	54,5214
j12023_1	13,8478	j12028_1	30,6833	j12033_1	32,3857	j12038_1	46,1226
j12023_2	11,1553	j12028_2	24,7160	j12033_2	40,4858	j12038_2	51,7692
j12023_3	13,0090	j12028_3	17,8350	j12033_3	41,9173	j12038_3	53,2084
j12023_4	10,0779	j12028_4	26,9984	j12033_4	29,1083	j12038_4	45,8640
j12023_5	14,9412	j12028_5	20,7638	j12033_5	38,9445	j12038_5	49,2086
j12023_6	14,4257	j12028_6	27,3285	j12033_6	33,4092	j12038_6	52,6920
j12023_7	13,3555	j12028_7	30,0502	j12033_7	53,6228	j12038_7	73,3901
j12023_8	11,7371	j12028_8	26,6348	j12033_8	37,6184	j12038_8	51,2226
j12023_9	11,6661	j12028_9	32,5868	j12033_9	38,0421	j12038_9	37,6522
j12023_10	15,9040	j12028_10	21,3853	j12033_10	46,8616	j12038_10	52,6153
j12024_1	15,4349	j12029_1	23,8402	j12034_1	58,2988	j12039_1	40,3508
j12024_2	11,6599	j12029_2	27,5504	j12034_2	42,3467	j12039_2	39,4058
j12024_3	17,1127	j12029_3	41,9741	j12034_3	45,7976	j12039_3	44,2202
j12024_4	10,4450	j12029_4	40,6703	j12034_4	41,9443	j12039_4	53,7311
j12024_5	10,7205	j12029_5	28,1194	j12034_5	34,7117	j12039_5	36,7078
j12024_6	13,5820	j12029_6	30,8867	j12034_6	40,8376	j12039_6	45,3992
j12024_7	12,7158	j12029_7	28,2008	j12034_7	31,9856	j12039_7	49,7991
j12024_8	13,5881	j12029_8	24,0301	j12034_8	47,5277	j12039_8	44,8428
j12024_9	15,2620	j12029_9	24,8227	j12034_9	41,3123	j12039_9	54,6621
j12024_10	11,1091	j12029_10	20,3442	j12034_10	38,2821	j12039_10	40,5474
j12025_1	15,4410	j12030_1	28,7543	j12035_1	42,3998	j12040_1	63,9402
j12025_2	14,9223	j12030_2	21,4466	j12035_2	41,2032	j12040_2	67,5723
j12025_3	13,1232	j12030_3	22,3923	j12035_3	53,0391	j12040_3	58,1194
j12025_4	12,5903	j12030_4	30,2662	j12035_4	32,5413	j12040_4	45,2200
j12025_5	10,4620	j12030_5	23,7290	j12035_5	36,0026	j12040_5	46,4632
j12025_6	12,3163	j12030_6	34,8801	j12035_6	42,9830	j12040_6	66,2712
j12025_7	15,0969	j12030_7	31,5836	j12035_7	36,5943	j12040_7	48,2079
j12025_8	16,3910	j12030_8	35,9949	j12035_8	37,8847	j12040_8	43,0630
j12025_9	14,5375	j12030_9	23,2101	j12035_9	42,1114	j12040_9	36,8607
j12025_10	14,8595	j12030_10	33,1515	j12035_10	52,6395	j12040_10	50,6293

Table XLII: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the StD resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9041_1 έως j9060_10)

Project	StD	Project	StD	Project	StD	Project	StD
j12041_1	14,5700	j12046_1	24,8101	j12051_1	35,5621	j12056_1	49,8439
j12041_2	10,2159	j12046_2	18,9102	j12051_2	27,7249	j12056_2	46,8700
j12041_3	10,5657	j12046_3	25,8751	j12051_3	34,6698	j12056_3	42,9557
j12041_4	14,3437	j12046_4	30,4618	j12051_4	30,3425	j12056_4	43,9127
j12041_5	10,7615	j12046_5	23,2078	j12051_5	38,2399	j12056_5	42,0157
j12041_6	10,4342	j12046_6	25,5543	j12051_6	34,0730	j12056_6	51,7182
j12041_7	14,8251	j12046_7	17,2287	j12051_7	30,7839	j12056_7	39,0037
j12041_8	9,70241	j12046_8	33,5066	j12051_8	37,1145	j12056_8	42,7514
j12041_9	14,5728	j12046_9	22,9331	j12051_9	30,8417	j12056_9	50,7146
j12041_10	12,4718	j12046_10	24,9840	j12051_10	31,5915	j12056_10	46,0737
j12042_1	11,0224	j12047_1	19,9369	j12052_1	23,2877	j12057_1	41,2285
j12042_2	8,3623	j12047_2	23,4792	j12052_2	32,8128	j12057_2	43,7607
j12042_3	12,1891	j12047_3	29,5363	j12052_3	28,0414	j12057_3	49,0127
j12042_4	11,3521	j12047_4	26,0273	j12052_4	35,6270	j12057_4	44,1156
j12042_5	13,1222	j12047_5	22,9916	j12052_5	31,1784	j12057_5	66,5319
j12042_6	13,9222	j12047_6	25,7558	j12052_6	39,9687	j12057_6	37,3751
j12042_7	11,9385	j12047_7	41,8041	j12052_7	33,9857	j12057_7	37,4120
j12042_8	13,0020	j12047_8	25,4868	j12052_8	28,7007	j12057_8	61,9248
j12042_9	10,6750	j12047_9	23,5790	j12052_9	35,9416	j12057_9	43,9473
j12042_10	13,0246	j12047_10	26,5041	j12052_10	31,2363	j12057_10	34,8718
j12043_1	14,1938	j12048_1	24,3642	j12053_1	33,3438	j12058_1	34,1798
j12043_2	8,7278	j12048_2	26,5237	j12053_2	35,1585	j12058_2	41,2445
j12043_3	12,2008	j12048_3	16,4873	j12053_3	31,2244	j12058_3	60,6130
j12043_4	15,3016	j12048_4	25,3294	j12053_4	35,9035	j12058_4	38,2870
j12043_5	13,0920	j12048_5	30,3174	j12053_5	32,6644	j12058_5	50,3197
j12043_6	13,5747	j12048_6	26,0813	j12053_6	32,0801	j12058_6	58,8177
j12043_7	14,4523	j12048_7	30,3890	j12053_7	26,6249	j12058_7	44,1151
j12043_8	13,0003	j12048_8	27,0274	j12053_8	38,5438	j12058_8	48,3308
j12043_9	13,3522	j12048_9	21,3335	j12053_9	32,5316	j12058_9	49,4715
j12043_10	10,3188	j12048_10	21,9558	j12053_10	30,3976	j12058_10	31,7449
j12044_1	10,7531	j12049_1	21,4828	j12054_1	27,4313	j12059_1	65,6572
j12044_2	13,5108	j12049_2	25,4881	j12054_2	26,8216	j12059_2	39,2469
j12044_3	13,4308	j12049_3	29,7703	j12054_3	30,4246	j12059_3	42,3747
j12044_4	15,4312	j12049_4	28,9828	j12054_4	29,7935	j12059_4	36,2031
j12044_5	16,9961	j12049_5	29,1007	j12054_5	40,9574	j12059_5	49,4685
j12044_6	11,8124	j12049_6	17,7981	j12054_6	44,8293	j12059_6	44,8789
j12044_7	12,5878	j12049_7	25,7702	j12054_7	29,0088	j12059_7	40,6391
j12044_8	10,5968	j12049_8	19,9087	j12054_8	44,8537	j12059_8	47,0677
j12044_9	8,7755	j12049_9	26,2638	j12054_9	29,0088	j12059_9	38,9306
j12044_10	17,0493	j12049_10	20,0596	j12054_10	33,3118	j12059_10	29,5264
j12045_1	9,4649	j12050_1	22,5968	j12055_1	35,0457	j12060_1	38,5421
j12045_2	12,2066	j12050_2	20,6413	j12055_2	36,7728	j12060_2	54,8574
j12045_3	16,6383	j12050_3	19,5042	j12055_3	24,3576	j12060_3	42,8920
j12045_4	10,8289	j12050_4	24,2169	j12055_4	44,0097	j12060_4	41,7052
j12045_5	13,1671	j12050_5	23,1664	j12055_5	38,7103	j12060_5	36,7278
j12045_6	11,3303	j12050_6	24,8363	j12055_6	38,5465	j12060_6	39,3832
j12045_7	9,5251	j12050_7	20,5560	j12055_7	37,0153	j12060_7	57,3883
j12045_8	13,4344	j12050_8	19,0830	j12055_8	43,1047	j12060_8	49,6319
j12045_9	10,1831	j12050_9	23,7689	j12055_9	33,0489	j12060_9	47,0351
j12045_10	12,2004	j12050_10	31,3131	j12055_10	33,3107	j12060_10	62,6699

Table XLIII: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the Step resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	Step	Project	Step	Project	Step	Project	Step
j1201_1	346	j1206_1	620	j12011_1	906	j12016_1	993
j1201_2	318	j1206_2	613	j12011_2	898	j12016_2	1117
j1201_3	320	j1206_3	690	j12011_3	996	j12016_3	1276
j1201_4	296	j1206_4	691	j12011_4	986	j12016_4	1073
j1201_5	350	j1206_5	575	j12011_5	986	j12016_5	1139
j1201_6	274	j1206_6	691	j12011_6	926	j12016_6	1160
j1201_7	314	j1206_7	837	j12011_7	923	j12016_7	1193
j1201_8	316	j1206_8	730	j12011_8	903	j12016_8	1168
j1201_9	296	j1206_9	747	j12011_9	874	j12016_9	1200
j1201_10	342	j1206_10	655	j12011_10	970	j12016_10	1113
j1202_1	324	j1207_1	635	j12012_1	898	j12017_1	1161
j1202_2	287	j1207_2	720	j12012_2	861	j12017_2	1118
j1202_3	326	j1207_3	663	j12012_3	795	j12017_3	1091
j1202_4	301	j1207_4	659	j12012_4	868	j12017_4	1222
j1202_5	339	j1207_5	684	j12012_5	1055	j12017_5	1138
j1202_6	321	j1207_6	704	j12012_6	920	j12017_6	1045
j1202_7	328	j1207_7	718	j12012_7	858	j12017_7	1378
j1202_8	322	j1207_8	535	j12012_8	917	j12017_8	1125
j1202_9	323	j1207_9	623	j12012_9	881	j12017_9	1222
j1202_10	330	j1207_10	664	j12012_10	967	j12017_10	1130
j1203_1	347	j1208_1	768	j12013_1	1004	j12018_1	1280
j1203_2	289	j1208_2	743	j12013_2	979	j12018_2	1412
j1203_3	356	j1208_3	724	j12013_3	964	j12018_3	1092
j1203_4	302	j1208_4	649	j12013_4	945	j12018_4	1133
j1203_5	347	j1208_5	639	j12013_5	864	j12018_5	1248
j1203_6	294	j1208_6	709	j12013_6	948	j12018_6	1141
j1203_7	349	j1208_7	691	j12013_7	1139	j12018_7	1209
j1203_8	319	j1208_8	717	j12013_8	1013	j12018_8	1179
j1203_9	304	j1208_9	616	j12013_9	926	j12018_9	999
j1203_10	383	j1208_10	628	j12013_10	921	j12018_10	1240
j1204_1	297	j1209_1	640	j12014_1	927	j12019_1	1233
j1204_2	369	j1209_2	752	j12014_2	894	j12019_2	1174
j1204_3	309	j1209_3	671	j12014_3	936	j12019_3	1095
j1204_4	302	j1209_4	630	j12014_4	861	j12019_4	1056
j1204_5	319	j1209_5	638	j12014_5	814	j12019_5	1243
j1204_6	328	j1209_6	688	j12014_6	978	j12019_6	1161
j1204_7	357	j1209_7	719	j12014_7	946	j12019_7	1291
j1204_8	330	j1209_8	566	j12014_8	1011	j12019_8	1223
j1204_9	308	j1209_9	590	j12014_9	880	j12019_9	1170
j1204_10	317	j1209_10	709	j12014_10	888	j12019_10	1193
j1205_1	345	j12010_1	775	j12015_1	977	j12020_1	1216
j1205_2	330	j12010_2	745	j12015_2	860	j12020_2	1251
j1205_3	287	j12010_3	761	j12015_3	940	j12020_3	1063
j1205_4	354	j12010_4	593	j12015_4	933	j12020_4	1203
j1205_5	312	j12010_5	681	j12015_5	902	j12020_5	945
j1205_6	316	j12010_6	691	j12015_6	1015	j12020_6	1147
j1205_7	320	j12010_7	631	j12015_7	817	j12020_7	1039
j1205_8	301	j12010_8	699	j12015_8	1134	j12020_8	1267
j1205_9	330	j12010_9	667	j12015_9	1010	j12020_9	1146
j1205_10	333	j12010_10	633	j12015_10	1093	j12020_10	1209

Table XLIV: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the Step resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	Step	Project	Step	Project	Step	Project	Step
j12021_1	374	j12026_1	705	j12031_1	921	j12036_1	1210
j12021_2	311	j12026_2	716	j12031_2	934	j12036_2	1157
j12021_3	392	j12026_3	727	j12031_3	916	j12036_3	1221
j12021_4	416	j12026_4	749	j12031_4	1061	j12036_4	1310
j12021_5	350	j12026_5	720	j12031_5	1026	j12036_5	1248
j12021_6	365	j12026_6	821	j12031_6	982	j12036_6	1394
j12021_7	362	j12026_7	614	j12031_7	1075	j12036_7	1268
j12021_8	373	j12026_8	728	j12031_8	1071	j12036_8	1200
j12021_9	348	j12026_9	870	j12031_9	1107	j12036_9	1281
j12021_10	331	j12026_10	862	j12031_10	925	j12036_10	1123
j12022_1	333	j12027_1	683	j12032_1	927	j12037_1	1301
j12022_2	378	j12027_2	674	j12032_2	989	j12037_2	1118
j12022_3	343	j12027_3	551	j12032_3	1079	j12037_3	1291
j12022_4	283	j12027_4	598	j12032_4	1066	j12037_4	1162
j12022_5	350	j12027_5	595	j12032_5	1048	j12037_5	1325
j12022_6	337	j12027_6	737	j12032_6	962	j12037_6	1195
j12022_7	353	j12027_7	679	j12032_7	1166	j12037_7	1217
j12022_8	360	j12027_8	827	j12032_8	985	j12037_8	1446
j12022_9	335	j12027_9	689	j12032_9	938	j12037_9	1308
j12022_10	311	j12027_10	783	j12032_10	1019	j12037_10	1195
j12023_1	363	j12028_1	716	j12033_1	969	j12038_1	1412
j12023_2	380	j12028_2	757	j12033_2	1036	j12038_2	1189
j12023_3	357	j12028_3	816	j12033_3	975	j12038_3	1187
j12023_4	359	j12028_4	717	j12033_4	1069	j12038_4	1407
j12023_5	296	j12028_5	813	j12033_5	1106	j12038_5	1294
j12023_6	318	j12028_6	783	j12033_6	1058	j12038_6	1368
j12023_7	351	j12028_7	781	j12033_7	909	j12038_7	1305
j12023_8	366	j12028_8	637	j12033_8	961	j12038_8	1357
j12023_9	361	j12028_9	739	j12033_9	1008	j12038_9	1385
j12023_10	353	j12028_10	651	j12033_10	1003	j12038_10	1098
j12024_1	356	j12029_1	881	j12034_1	863	j12039_1	1313
j12024_2	341	j12029_2	745	j12034_2	974	j12039_2	1427
j12024_3	350	j12029_3	642	j12034_3	967	j12039_3	1293
j12024_4	325	j12029_4	666	j12034_4	980	j12039_4	1141
j12024_5	318	j12029_5	768	j12034_5	1031	j12039_5	1357
j12024_6	361	j12029_6	659	j12034_6	1068	j12039_6	1383
j12024_7	324	j12029_7	768	j12034_7	1036	j12039_7	1285
j12024_8	378	j12029_8	553	j12034_8	845	j12039_8	1203
j12024_9	324	j12029_9	656	j12034_9	955	j12039_9	1047
j12024_10	370	j12029_10	728	j12034_10	1043	j12039_10	1069
j12025_1	274	j12030_1	671	j12035_1	884	j12040_1	1042
j12025_2	366	j12030_2	789	j12035_2	1094	j12040_2	1270
j12025_3	361	j12030_3	760	j12035_3	898	j12040_3	1211
j12025_4	390	j12030_4	716	j12035_4	917	j12040_4	1342
j12025_5	362	j12030_5	631	j12035_5	927	j12040_5	1212
j12025_6	339	j12030_6	618	j12035_6	1015	j12040_6	1215
j12025_7	372	j12030_7	621	j12035_7	1045	j12040_7	1202
j12025_8	304	j12030_8	622	j12035_8	978	j12040_8	1296
j12025_9	363	j12030_9	746	j12035_9	956	j12040_9	1234
j12025_10	338	j12030_10	655	j12035_10	1001	j12040_10	1271

Table XLV: Best scores obtained after repeated experiments with the standard genetic algorithm approach (GA) using the Step resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9041_1 έως j9060_10)

Project	Step	Project	Step	Project	Step	Project	Step
j12041_1	355	j12046_1	799	j12051_1	945	j12056_1	1251
j12041_2	378	j12046_2	749	j12051_2	1015	j12056_2	1163
j12041_3	415	j12046_3	758	j12051_3	860	j12056_3	1266
j12041_4	303	j12046_4	710	j12051_4	965	j12056_4	1313
j12041_5	386	j12046_5	803	j12051_5	1013	j12056_5	1405
j12041_6	318	j12046_6	795	j12051_6	1052	j12056_6	1281
j12041_7	340	j12046_7	767	j12051_7	973	j12056_7	1444
j12041_8	395	j12046_8	689	j12051_8	976	j12056_8	1209
j12041_9	334	j12046_9	738	j12051_9	1146	j12056_9	1238
j12041_10	404	j12046_10	725	j12051_10	1090	j12056_10	1247
j12042_1	353	j12047_1	738	j12052_1	1098	j12057_1	1323
j12042_2	417	j12047_2	786	j12052_2	1073	j12057_2	1350
j12042_3	365	j12047_3	745	j12052_3	1174	j12057_3	1291
j12042_4	370	j12047_4	743	j12052_4	1154	j12057_4	1317
j12042_5	435	j12047_5	811	j12052_5	1035	j12057_5	1154
j12042_6	304	j12047_6	765	j12052_6	1007	j12057_6	1192
j12042_7	379	j12047_7	709	j12052_7	957	j12057_7	1500
j12042_8	344	j12047_8	776	j12052_8	1122	j12057_8	1171
j12042_9	346	j12047_9	801	j12052_9	982	j12057_9	1293
j12042_10	331	j12047_10	796	j12052_10	1036	j12057_10	1543
j12043_1	307	j12048_1	685	j12053_1	1257	j12058_1	1446
j12043_2	430	j12048_2	636	j12053_2	1095	j12058_2	1400
j12043_3	353	j12048_3	806	j12053_3	955	j12058_3	1204
j12043_4	385	j12048_4	812	j12053_4	1052	j12058_4	1254
j12043_5	366	j12048_5	622	j12053_5	937	j12058_5	1271
j12043_6	329	j12048_6	770	j12053_6	913	j12058_6	1282
j12043_7	380	j12048_7	734	j12053_7	1209	j12058_7	1389
j12043_8	436	j12048_8	740	j12053_8	1042	j12058_8	1348
j12043_9	419	j12048_9	760	j12053_9	1148	j12058_9	1361
j12043_10	369	j12048_10	672	j12053_10	1153	j12058_10	1196
j12044_1	392	j12049_1	735	j12054_1	1003	j12059_1	1277
j12044_2	341	j12049_2	709	j12054_2	1109	j12059_2	1153
j12044_3	412	j12049_3	714	j12054_3	1216	j12059_3	1454
j12044_4	362	j12049_4	689	j12054_4	1160	j12059_4	1421
j12044_5	327	j12049_5	688	j12054_5	1073	j12059_5	1293
j12044_6	321	j12049_6	792	j12054_6	1012	j12059_6	1320
j12044_7	350	j12049_7	714	j12054_7	912	j12059_7	1184
j12044_8	386	j12049_8	823	j12054_8	878	j12059_8	1254
j12044_9	327	j12049_9	703	j12054_9	945	j12059_9	1398
j12044_10	389	j12049_10	581	j12054_10	916	j12059_10	1212
j12045_1	392	j12050_1	794	j12055_1	1152	j12060_1	1342
j12045_2	336	j12050_2	771	j12055_2	962	j12060_2	1048
j12045_3	373	j12050_3	784	j12055_3	1130	j12060_3	1258
j12045_4	355	j12050_4	688	j12055_4	1073	j12060_4	1135
j12045_5	345	j12050_5	761	j12055_5	1103	j12060_5	1241
j12045_6	410	j12050_6	724	j12055_6	1017	j12060_6	1478
j12045_7	331	j12050_7	793	j12055_7	1036	j12060_7	1086
j12045_8	351	j12050_8	846	j12055_8	1109	j12060_8	1368
j12045_9	407	j12050_9	737	j12055_9	1025	j12060_9	1501
j12045_10	339	j12050_10	814	j12055_10	1101	j12060_10	1110

Table XLVI: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the Gfresource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	Gf	Project	Gf	Project	Gf	Project	Gf
j1201_1	75	j1206_1	197	j12011_1	235	j12016_1	277
j1201_2	76	j1206_2	155	j12011_2	222	j12016_2	299
j1201_3	77	j1206_3	146	j12011_3	221	j12016_3	301
j1201_4	66	j1206_4	136	j12011_4	171	j12016_4	283
j1201_5	62	j1206_5	160	j12011_5	229	j12016_5	247
j1201_6	90	j1206_6	148	j12011_6	223	j12016_6	347
j1201_7	63	j1206_7	134	j12011_7	184	j12016_7	251
j1201_8	76	j1206_8	121	j12011_8	232	j12016_8	329
j1201_9	79	j1206_9	176	j12011_9	225	j12016_9	304
j1201_10	69	j1206_10	185	j12011_10	212	j12016_10	251
j1202_1	95	j1207_1	151	j12012_1	221	j12017_1	262
j1202_2	90	j1207_2	124	j12012_2	244	j12017_2	308
j1202_3	88	j1207_3	140	j12012_3	246	j12017_3	342
j1202_4	68	j1207_4	127	j12012_4	180	j12017_4	254
j1202_5	83	j1207_5	161	j12012_5	193	j12017_5	275
j1202_6	88	j1207_6	146	j12012_6	210	j12017_6	332
j1202_7	70	j1207_7	132	j12012_7	230	j12017_7	291
j1202_8	80	j1207_8	174	j12012_8	254	j12017_8	329
j1202_9	83	j1207_9	147	j12012_9	214	j12017_9	280
j1202_10	97	j1207_10	160	j12012_10	248	j12017_10	328
j1203_1	100	j1208_1	137	j12013_1	200	j12018_1	259
j1203_2	67	j1208_2	158	j12013_2	260	j12018_2	236
j1203_3	61	j1208_3	175	j12013_3	196	j12018_3	347
j1203_4	82	j1208_4	133	j12013_4	235	j12018_4	326
j1203_5	73	j1208_5	182	j12013_5	218	j12018_5	272
j1203_6	67	j1208_6	138	j12013_6	181	j12018_6	203
j1203_7	73	j1208_7	155	j12013_7	195	j12018_7	285
j1203_8	78	j1208_8	151	j12013_8	199	j12018_8	250
j1203_9	65	j1208_9	164	j12013_9	209	j12018_9	325
j1203_10	64	j1208_10	191	j12013_10	275	j12018_10	276
j1204_1	83	j1209_1	153	j12014_1	248	j12019_1	287
j1204_2	64	j1209_2	127	j12014_2	236	j12019_2	339
j1204_3	78	j1209_3	136	j12014_3	230	j12019_3	401
j1204_4	78	j1209_4	156	j12014_4	202	j12019_4	262
j1204_5	90	j1209_5	143	j12014_5	200	j12019_5	293
j1204_6	71	j1209_6	140	j12014_6	193	j12019_6	240
j1204_7	65	j1209_7	143	j12014_7	235	j12019_7	236
j1204_8	80	j1209_8	141	j12014_8	240	j12019_8	252
j1204_9	83	j1209_9	147	j12014_9	226	j12019_9	302
j1204_10	69	j1209_10	180	j12014_10	229	j12019_10	288
j1205_1	71	j12010_1	122	j12015_1	209	j12020_1	248
j1205_2	78	j12010_2	131	j12015_2	275	j12020_2	296
j1205_3	79	j12010_3	150	j12015_3	220	j12020_3	335
j1205_4	65	j12010_4	163	j12015_4	253	j12020_4	257
j1205_5	74	j12010_5	135	j12015_5	256	j12020_5	298
j1205_6	76	j12010_6	141	j12015_6	183	j12020_6	231
j1205_7	80	j12010_7	162	j12015_7	235	j12020_7	310
j1205_8	84	j12010_8	104	j12015_8	154	j12020_8	261
j1205_9	65	j12010_9	149	j12015_9	193	j12020_9	301
j1205_10	69	j12010_10	193	j12015_10	196	j12020_10	326

Table XLVII: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the Gfresource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	Gf	Project	Gf	Project	Gf	Project	Gf
j12021_1	65	j12026_1	155	j12031_1	191	j12036_1	275
j12021_2	76	j12026_2	112	j12031_2	203	j12036_2	275
j12021_3	57	j12026_3	137	j12031_3	189	j12036_3	270
j12021_4	62	j12026_4	112	j12031_4	182	j12036_4	251
j12021_5	70	j12026_5	149	j12031_5	185	j12036_5	239
j12021_6	66	j12026_6	95	j12031_6	183	j12036_6	239
j12021_7	75	j12026_7	130	j12031_7	168	j12036_7	205
j12021_8	51	j12026_8	128	j12031_8	176	j12036_8	208
j12021_9	64	j12026_9	112	j12031_9	183	j12036_9	189
j12021_10	72	j12026_10	109	j12031_10	198	j12036_10	234
j12022_1	70	j12027_1	155	j12032_1	191	j12037_1	233
j12022_2	65	j12027_2	138	j12032_2	191	j12037_2	257
j12022_3	84	j12027_3	144	j12032_3	213	j12037_3	230
j12022_4	86	j12027_4	120	j12032_4	153	j12037_4	297
j12022_5	70	j12027_5	144	j12032_5	173	j12037_5	263
j12022_6	75	j12027_6	134	j12032_6	182	j12037_6	235
j12022_7	65	j12027_7	103	j12032_7	186	j12037_7	304
j12022_8	78	j12027_8	139	j12032_8	227	j12037_8	199
j12022_9	76	j12027_9	138	j12032_9	215	j12037_9	283
j12022_10	83	j12027_10	112	j12032_10	215	j12037_10	256
j12023_1	75	j12028_1	133	j12033_1	150	j12038_1	233
j12023_2	60	j12028_2	126	j12033_2	228	j12038_2	224
j12023_3	65	j12028_3	106	j12033_3	198	j12038_3	259
j12023_4	56	j12028_4	139	j12033_4	172	j12038_4	209
j12023_5	65	j12028_5	124	j12033_5	210	j12038_5	263
j12023_6	59	j12028_6	144	j12033_6	167	j12038_6	245
j12023_7	61	j12028_7	168	j12033_7	237	j12038_7	284
j12023_8	64	j12028_8	131	j12033_8	217	j12038_8	284
j12023_9	56	j12028_9	129	j12033_9	196	j12038_9	186
j12023_10	73	j12028_10	131	j12033_10	204	j12038_10	317
j12024_1	61	j12029_1	109	j12034_1	239	j12039_1	218
j12024_2	70	j12029_2	133	j12034_2	174	j12039_2	191
j12024_3	75	j12029_3	179	j12034_3	189	j12039_3	234
j12024_4	64	j12029_4	166	j12034_4	198	j12039_4	314
j12024_5	76	j12029_5	124	j12034_5	183	j12039_5	234
j12024_6	63	j12029_6	166	j12034_6	174	j12039_6	217
j12024_7	68	j12029_7	130	j12034_7	154	j12039_7	252
j12024_8	75	j12029_8	164	j12034_8	197	j12039_8	250
j12024_9	78	j12029_9	128	j12034_9	201	j12039_9	298
j12024_10	82	j12029_10	110	j12034_10	207	j12039_10	255
j12025_1	69	j12030_1	120	j12035_1	190	j12040_1	263
j12025_2	63	j12030_2	114	j12035_2	169	j12040_2	289
j12025_3	72	j12030_3	119	j12035_3	228	j12040_3	228
j12025_4	62	j12030_4	138	j12035_4	171	j12040_4	239
j12025_5	75	j12030_5	138	j12035_5	170	j12040_5	206
j12025_6	63	j12030_6	150	j12035_6	200	j12040_6	283
j12025_7	75	j12030_7	145	j12035_7	147	j12040_7	227
j12025_8	78	j12030_8	142	j12035_8	165	j12040_8	233
j12025_9	68	j12030_9	123	j12035_9	189	j12040_9	251
j12025_10	62	j12030_10	135	j12035_10	208	j12040_10	296

Table XLVIII: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the Gfresource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9041_1 έως j9060_10)

Project	Gf	Project	Gf	Project	Gf	Project	Gf
j12041_1	63	j12046_1	116	j12051_1	196	j12056_1	241
j12041_2	77	j12046_2	140	j12051_2	195	j12056_2	226
j12041_3	54	j12046_3	133	j12051_3	175	j12056_3	216
j12041_4	65	j12046_4	125	j12051_4	166	j12056_4	217
j12041_5	52	j12046_5	129	j12051_5	166	j12056_5	222
j12041_6	64	j12046_6	117	j12051_6	160	j12056_6	231
j12041_7	73	j12046_7	106	j12051_7	161	j12056_7	200
j12041_8	54	j12046_8	140	j12051_8	191	j12056_8	253
j12041_9	69	j12046_9	117	j12051_9	165	j12056_9	254
j12041_10	65	j12046_10	126	j12051_10	168	j12056_10	214
j12042_1	70	j12047_1	122	j12052_1	163	j12057_1	227
j12042_2	45	j12047_2	128	j12052_2	183	j12057_2	244
j12042_3	56	j12047_3	128	j12052_3	151	j12057_3	213
j12042_4	64	j12047_4	121	j12052_4	166	j12057_4	232
j12042_5	59	j12047_5	116	j12052_5	142	j12057_5	296
j12042_6	70	j12047_6	117	j12052_6	184	j12057_6	276
j12042_7	53	j12047_7	200	j12052_7	183	j12057_7	202
j12042_8	63	j12047_8	150	j12052_8	143	j12057_8	281
j12042_9	52	j12047_9	114	j12052_9	168	j12057_9	217
j12042_10	73	j12047_10	117	j12052_10	181	j12057_10	173
j12043_1	66	j12048_1	142	j12053_1	150	j12058_1	193
j12043_2	50	j12048_2	136	j12053_2	170	j12058_2	224
j12043_3	55	j12048_3	111	j12053_3	147	j12058_3	273
j12043_4	67	j12048_4	117	j12053_4	180	j12058_4	244
j12043_5	64	j12048_5	130	j12053_5	164	j12058_5	218
j12043_6	67	j12048_6	142	j12053_6	164	j12058_6	242
j12043_7	61	j12048_7	135	j12053_7	151	j12058_7	225
j12043_8	53	j12048_8	133	j12053_8	184	j12058_8	225
j12043_9	62	j12048_9	111	j12053_9	158	j12058_9	255
j12043_10	60	j12048_10	135	j12053_10	158	j12058_10	228
j12044_1	52	j12049_1	110	j12054_1	153	j12059_1	254
j12044_2	57	j12049_2	128	j12054_2	154	j12059_2	207
j12044_3	59	j12049_3	132	j12054_3	169	j12059_3	193
j12044_4	65	j12049_4	132	j12054_4	169	j12059_4	198
j12044_5	69	j12049_5	130	j12054_5	197	j12059_5	221
j12044_6	70	j12049_6	123	j12054_6	196	j12059_6	196
j12044_7	65	j12049_7	141	j12054_7	169	j12059_7	247
j12044_8	49	j12049_8	117	j12054_8	196	j12059_8	255
j12044_9	57	j12049_9	141	j12054_9	190	j12059_9	172
j12044_10	72	j12049_10	106	j12054_10	170	j12059_10	220
j12045_1	57	j12050_1	135	j12055_1	195	j12060_1	227
j12045_2	61	j12050_2	142	j12055_2	172	j12060_2	263
j12045_3	73	j12050_3	105	j12055_3	140	j12060_3	247
j12045_4	49	j12050_4	147	j12055_4	188	j12060_4	234
j12045_5	70	j12050_5	123	j12055_5	170	j12060_5	213
j12045_6	55	j12050_6	132	j12055_6	192	j12060_6	219
j12045_7	57	j12050_7	109	j12055_7	158	j12060_7	268
j12045_8	58	j12050_8	111	j12055_8	169	j12060_8	264
j12045_9	58	j12050_9	132	j12055_9	189	j12060_9	227
j12045_10	62	j12050_10	112	j12055_10	177	j12060_10	279

Table XLIX: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the StD resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	StD	Project	StD	Project	StD	Project	StD
j1201_1	19,5951	j1206_1	54,5269	j12011_1	62,3305	j12016_1	61,4668
j1201_2	17,8020	j1206_2	34,4081	j12011_2	57,0584	j12016_2	82,5401
j1201_3	18,0996	j1206_3	31,4572	j12011_3	56,1733	j12016_3	74,0340
j1201_4	11,6278	j1206_4	28,9237	j12011_4	36,3841	j12016_4	70,3754
j1201_5	13,8129	j1206_5	47,3061	j12011_5	62,8549	j12016_5	57,2504
j1201_6	24,2415	j1206_6	28,5230	j12011_6	66,0534	j12016_6	99,6870
j1201_7	15,4694	j1206_7	31,0889	j12011_7	42,1487	j12016_7	51,2439
j1201_8	22,0668	j1206_8	29,6227	j12011_8	60,3428	j12016_8	83,8934
j1201_9	18,7289	j1206_9	48,7296	j12011_9	59,7404	j12016_9	76,8828
j1201_10	13,1956	j1206_10	49,8207	j12011_10	56,8065	j12016_10	67,1511
j1202_1	21,3769	j1207_1	37,3659	j12012_1	57,1772	j12017_1	59,7189
j1202_2	22,6838	j1207_2	34,9601	j12012_2	62,6758	j12017_2	71,9134
j1202_3	20,6131	j1207_3	33,5749	j12012_3	72,1173	j12017_3	98,0520
j1202_4	18,0624	j1207_4	30,3986	j12012_4	41,7103	j12017_4	56,6117
j1202_5	19,5511	j1207_5	40,2031	j12012_5	45,9529	j12017_5	67,3744
j1202_6	20,7130	j1207_6	35,7412	j12012_6	50,9636	j12017_6	72,4620
j1202_7	11,9245	j1207_7	27,5865	j12012_7	63,0169	j12017_7	70,8067
j1202_8	16,8229	j1207_8	39,7614	j12012_8	72,1213	j12017_8	85,7953
j1202_9	20,9785	j1207_9	42,6527	j12012_9	50,6784	j12017_9	61,5233
j1202_10	25,1789	j1207_10	41,5318	j12012_10	66,1970	j12017_10	83,7572
j1203_1	26,3144	j1208_1	26,0335	j12013_1	49,9277	j12018_1	65,0744
j1203_2	17,8657	j1208_2	41,0640	j12013_2	73,7332	j12018_2	55,4037
j1203_3	13,1289	j1208_3	40,1564	j12013_3	47,9698	j12018_3	84,8184
j1203_4	20,9295	j1208_4	32,8183	j12013_4	62,3129	j12018_4	83,1969
j1203_5	16,1730	j1208_5	53,6566	j12013_5	65,2320	j12018_5	52,9333
j1203_6	15,0422	j1208_6	36,4954	j12013_6	35,3244	j12018_6	45,9554
j1203_7	15,3246	j1208_7	40,0103	j12013_7	44,1036	j12018_7	69,0866
j1203_8	20,5770	j1208_8	36,3227	j12013_8	43,5023	j12018_8	62,8244
j1203_9	15,9057	j1208_9	42,9808	j12013_9	48,6564	j12018_9	82,1011
j1203_10	13,3983	j1208_10	50,0426	j12013_10	69,8200	j12018_10	70,2150
j1204_1	19,1223	j1209_1	39,9883	j12014_1	70,8953	j12019_1	74,0779
j1204_2	15,5041	j1209_2	29,0982	j12014_2	62,9791	j12019_2	88,8027
j1204_3	18,6168	j1209_3	31,4966	j12014_3	66,5877	j12019_3	104,2603
j1204_4	16,8819	j1209_4	40,8454	j12014_4	53,4255	j12019_4	71,6681
j1204_5	22,3850	j1209_5	33,1061	j12014_5	50,3317	j12019_5	85,1155
j1204_6	15,5276	j1209_6	28,1008	j12014_6	45,5089	j12019_6	43,6170
j1204_7	11,9633	j1209_7	28,3310	j12014_7	66,5578	j12019_7	47,8999
j1204_8	20,9112	j1209_8	33,2881	j12014_8	70,0835	j12019_8	61,8314
j1204_9	20,4200	j1209_9	43,4885	j12014_9	56,9150	j12019_9	74,9088
j1204_10	14,3349	j1209_10	47,8517	j12014_10	63,3391	j12019_10	78,5805
j1205_1	18,7887	j12010_1	26,9976	j12015_1	50,7421	j12020_1	56,7463
j1205_2	15,0155	j12010_2	30,5417	j12015_2	73,7575	j12020_2	80,3577
j1205_3	16,7476	j12010_3	39,5135	j12015_3	61,2117	j12020_3	77,3782
j1205_4	12,9663	j12010_4	47,6349	j12015_4	62,1964	j12020_4	56,5446
j1205_5	15,1290	j12010_5	31,9714	j12015_5	63,0765	j12020_5	74,2910
j1205_6	20,1171	j12010_6	38,8505	j12015_6	47,1416	j12020_6	47,9581
j1205_7	20,1111	j12010_7	41,0072	j12015_7	63,9532	j12020_7	82,7037
j1205_8	19,2382	j12010_8	23,3069	j12015_8	35,0350	j12020_8	68,2144
j1205_9	15,2284	j12010_9	37,3333	j12015_9	49,1685	j12020_9	80,4967
j1205_10	16,5864	j12010_10	55,6777	j12015_10	45,7134	j12020_10	92,7497

Table L: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the StD resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	StD	Project	StD	Project	StD	Project	StD
j12021_1	14,5268	j12026_1	38,6672	j12031_1	44,3195	j12036_1	67,3707
j12021_2	20,2545	j12026_2	22,0199	j12031_2	51,7562	j12036_2	59,1400
j12021_3	10,4434	j12026_3	33,9531	j12031_3	44,3600	j12036_3	67,4446
j12021_4	14,6293	j12026_4	24,2259	j12031_4	45,0850	j12036_4	51,3475
j12021_5	17,2692	j12026_5	36,1152	j12031_5	43,8533	j12036_5	58,4436
j12021_6	14,0670	j12026_6	18,2014	j12031_6	47,9095	j12036_6	51,2069
j12021_7	15,8850	j12026_7	32,0430	j12031_7	42,9987	j12036_7	35,8068
j12021_8	10,2066	j12026_8	25,7514	j12031_8	44,2102	j12036_8	37,9324
j12021_9	11,2476	j12026_9	23,8560	j12031_9	51,1956	j12036_9	41,3559
j12021_10	19,2464	j12026_10	26,5602	j12031_10	47,2792	j12036_10	52,1954
j12022_1	15,4568	j12027_1	37,5803	j12032_1	53,5368	j12037_1	43,2761
j12022_2	15,4457	j12027_2	39,4655	j12032_2	44,8761	j12037_2	70,4439
j12022_3	20,2063	j12027_3	36,6614	j12032_3	51,9241	j12037_3	60,3100
j12022_4	21,3317	j12027_4	26,3992	j12032_4	34,0420	j12037_4	73,1647
j12022_5	13,9553	j12027_5	37,2862	j12032_5	43,1551	j12037_5	60,9028
j12022_6	21,7801	j12027_6	30,3276	j12032_6	49,3811	j12037_6	55,4067
j12022_7	16,9457	j12027_7	18,1620	j12032_7	46,3424	j12037_7	75,9216
j12022_8	17,8819	j12027_8	37,3347	j12032_8	59,5424	j12037_8	47,0109
j12022_9	19,6589	j12027_9	34,8140	j12032_9	53,5885	j12037_9	68,5362
j12022_10	18,4428	j12027_10	21,3890	j12032_10	47,9524	j12037_10	61,8078
j12023_1	20,3435	j12028_1	28,3855	j12033_1	32,3787	j12038_1	49,2795
j12023_2	13,0713	j12028_2	30,4342	j12033_2	54,4319	j12038_2	41,9425
j12023_3	16,8447	j12028_3	16,3508	j12033_3	45,8082	j12038_3	77,1365
j12023_4	11,7397	j12028_4	34,2028	j12033_4	36,5821	j12038_4	51,0957
j12023_5	15,9610	j12028_5	26,0807	j12033_5	51,9862	j12038_5	67,3715
j12023_6	12,9085	j12028_6	35,4703	j12033_6	44,3050	j12038_6	56,1476
j12023_7	13,2526	j12028_7	36,8394	j12033_7	65,3836	j12038_7	68,9816
j12023_8	15,1432	j12028_8	30,3314	j12033_8	48,4427	j12038_8	65,1868
j12023_9	9,8830	j12028_9	32,1069	j12033_9	49,5902	j12038_9	46,3667
j12023_10	16,3561	j12028_10	30,3641	j12033_10	51,0392	j12038_10	83,9276
j12024_1	11,5433	j12029_1	21,4966	j12034_1	51,4200	j12039_1	40,9394
j12024_2	16,8080	j12029_2	30,2171	j12034_2	39,9122	j12039_2	38,6611
j12024_3	21,9944	j12029_3	42,0609	j12034_3	46,7537	j12039_3	48,0172
j12024_4	12,4257	j12029_4	38,4111	j12034_4	38,3536	j12039_4	78,2970
j12024_5	19,8888	j12029_5	28,2809	j12034_5	43,1923	j12039_5	56,0836
j12024_6	14,2038	j12029_6	44,8357	j12034_6	33,2917	j12039_6	45,0830
j12024_7	15,0711	j12029_7	32,8411	j12034_7	32,6087	j12039_7	54,0958
j12024_8	19,8933	j12029_8	37,4268	j12034_8	40,9894	j12039_8	60,0734
j12024_9	18,1401	j12029_9	33,9847	j12034_9	46,8107	j12039_9	75,6370
j12024_10	18,8170	j12029_10	18,4919	j12034_10	46,9360	j12039_10	57,5194
j12025_1	16,0463	j12030_1	24,8571	j12035_1	48,2433	j12040_1	75,6702
j12025_2	15,6689	j12030_2	23,9356	j12035_2	38,1675	j12040_2	73,7993
j12025_3	16,9180	j12030_3	26,5726	j12035_3	58,5463	j12040_3	54,8343
j12025_4	13,1346	j12030_4	27,6801	j12035_4	31,3273	j12040_4	52,0509
j12025_5	19,4759	j12030_5	28,4472	j12035_5	29,4124	j12040_5	45,6899
j12025_6	14,5984	j12030_6	37,5002	j12035_6	40,4598	j12040_6	72,0181
j12025_7	18,0618	j12030_7	33,9779	j12035_7	28,3441	j12040_7	54,1244
j12025_8	16,4867	j12030_8	31,6874	j12035_8	35,6307	j12040_8	54,0897
j12025_9	17,2417	j12030_9	24,3737	j12035_9	41,4629	j12040_9	66,4820
j12025_10	15,6932	j12030_10	31,8874	j12035_10	53,2044	j12040_10	64,7811

Table LI: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the StD resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9041_1 έως j9060_10)

Project	StD	Project	StD	Project	StD	Project	StD
j12041_1	14,6137	j12046_1	24,2690	j12051_1	46,9635	j12056_1	64,6808
j12041_2	16,0477	j12046_2	33,0612	j12051_2	46,5109	j12056_2	51,0388
j12041_3	11,1114	j12046_3	29,8733	j12051_3	30,7093	j12056_3	40,2722
j12041_4	13,9458	j12046_4	27,6854	j12051_4	35,5031	j12056_4	38,4610
j12041_5	11,0009	j12046_5	29,5388	j12051_5	39,4175	j12056_5	54,0170
j12041_6	11,1836	j12046_6	31,1776	j12051_6	37,7104	j12056_6	53,8591
j12041_7	18,1251	j12046_7	21,9030	j12051_7	28,9840	j12056_7	43,0142
j12041_8	9,2205	j12046_8	35,7023	j12051_8	43,7121	j12056_8	63,3198
j12041_9	17,7574	j12046_9	20,5056	j12051_9	33,8636	j12056_9	59,3591
j12041_10	16,2577	j12046_10	25,1929	j12051_10	41,1978	j12056_10	49,0182
j12042_1	15,3653	j12047_1	27,2810	j12052_1	35,0940	j12057_1	47,8784
j12042_2	8,9097	j12047_2	29,0716	j12052_2	42,1765	j12057_2	60,5695
j12042_3	10,5786	j12047_3	27,4190	j12052_3	35,9734	j12057_3	50,1518
j12042_4	15,5487	j12047_4	28,0837	j12052_4	43,3023	j12057_4	55,2575
j12042_5	12,0546	j12047_5	20,6450	j12052_5	26,4265	j12057_5	78,2150
j12042_6	15,0444	j12047_6	22,8378	j12052_6	45,4140	j12057_6	69,6232
j12042_7	10,0451	j12047_7	46,4199	j12052_7	35,6279	j12057_7	41,2244
j12042_8	13,2246	j12047_8	32,5619	j12052_8	30,5159	j12057_8	74,4359
j12042_9	8,7658	j12047_9	26,8663	j12052_9	29,6141	j12057_9	53,0290
j12042_10	16,9038	j12047_10	25,9179	j12052_10	42,4599	j12057_10	26,1239
j12043_1	18,3630	j12048_1	32,8769	j12053_1	29,3968	j12058_1	38,6968
j12043_2	10,6746	j12048_2	36,7581	j12053_2	38,7485	j12058_2	44,3480
j12043_3	11,3554	j12048_3	15,6256	j12053_3	26,5980	j12058_3	71,3773
j12043_4	17,5878	j12048_4	25,9793	j12053_4	45,4941	j12058_4	47,5221
j12043_5	16,2652	j12048_5	30,4933	j12053_5	30,8459	j12058_5	51,5439
j12043_6	13,8645	j12048_6	41,6674	j12053_6	26,2176	j12058_6	57,9705
j12043_7	13,1296	j12048_7	35,3392	j12053_7	27,5037	j12058_7	44,2291
j12043_8	11,7066	j12048_8	34,6663	j12053_8	39,5266	j12058_8	44,4800
j12043_9	13,1887	j12048_9	21,7922	j12053_9	40,1655	j12058_9	54,6581
j12043_10	14,8283	j12048_10	35,1278	j12053_10	29,7140	j12058_10	55,3969
j12044_1	9,4084	j12049_1	18,0564	j12054_1	26,2094	j12059_1	71,5150
j12044_2	13,0167	j12049_2	29,8932	j12054_2	34,7989	j12059_2	39,0143
j12044_3	14,0803	j12049_3	32,1584	j12054_3	26,7871	j12059_3	39,9529
j12044_4	14,6485	j12049_4	25,9304	j12054_4	39,5492	j12059_4	38,2813
j12044_5	16,7058	j12049_5	32,5089	j12054_5	46,7875	j12059_5	48,1636
j12044_6	16,9686	j12049_6	30,2637	j12054_6	46,3741	j12059_6	37,3345
j12044_7	14,8525	j12049_7	34,3444	j12054_7	30,5445	j12059_7	62,7519
j12044_8	9,4780	j12049_8	22,7131	j12054_8	46,7093	j12059_8	60,3451
j12044_9	14,8133	j12049_9	32,1875	j12054_9	40,8570	j12059_9	32,8695
j12044_10	16,1545	j12049_10	19,4349	j12054_10	36,2104	j12059_10	58,5143
j12045_1	12,5301	j12050_1	35,1046	j12055_1	39,9252	j12060_1	50,0553
j12045_2	11,7342	j12050_2	34,3531	j12055_2	35,4215	j12060_2	65,9049
j12045_3	17,3570	j12050_3	20,4071	j12055_3	27,9275	j12060_3	50,2834
j12045_4	8,7307	j12050_4	31,0679	j12055_4	34,0598	j12060_4	53,1268
j12045_5	16,2815	j12050_5	25,6206	j12055_5	36,4029	j12060_5	40,5757
j12045_6	13,8228	j12050_6	29,6432	j12055_6	39,7482	j12060_6	45,0212
j12045_7	12,7488	j12050_7	26,9592	j12055_7	30,8174	j12060_7	63,4477
j12045_8	13,2861	j12050_8	20,4366	j12055_8	40,3521	j12060_8	58,3692
j12045_9	10,8716	j12050_9	27,0415	j12055_9	40,8303	j12060_9	45,4635
j12045_10	14,0114	j12050_10	28,5131	j12055_10	37,0406	j12060_10	66,9173

Table LII: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the Step resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j901_1 έως j9020_10)

Project	Step	Project	Step	Project	Step	Project	Step
j1201_1	371	j1206_1	586	j12011_1	915	j12016_1	1091
j1201_2	285	j1206_2	621	j12011_2	960	j12016_2	1089
j1201_3	244	j1206_3	703	j12011_3	976	j12016_3	1366
j1201_4	306	j1206_4	668	j12011_4	996	j12016_4	1063
j1201_5	325	j1206_5	527	j12011_5	994	j12016_5	1153
j1201_6	243	j1206_6	682	j12011_6	1003	j12016_6	1225
j1201_7	261	j1206_7	899	j12011_7	917	j12016_7	1255
j1201_8	286	j1206_8	660	j12011_8	997	j12016_8	1204
j1201_9	259	j1206_9	750	j12011_9	889	j12016_9	1334
j1201_10	253	j1206_10	655	j12011_10	1033	j12016_10	1213
j1202_1	209	j1207_1	674	j12012_1	932	j12017_1	1231
j1202_2	230	j1207_2	731	j12012_2	919	j12017_2	1166
j1202_3	273	j1207_3	723	j12012_3	953	j12017_3	1257
j1202_4	231	j1207_4	574	j12012_4	980	j12017_4	1317
j1202_5	277	j1207_5	670	j12012_5	1077	j12017_5	1284
j1202_6	263	j1207_6	730	j12012_6	1075	j12017_6	1099
j1202_7	298	j1207_7	727	j12012_7	916	j12017_7	1347
j1202_8	313	j1207_8	518	j12012_8	923	j12017_8	1057
j1202_9	301	j1207_9	533	j12012_9	874	j12017_9	1171
j1202_10	235	j1207_10	671	j12012_10	945	j12017_10	1239
j1203_1	320	j1208_1	790	j12013_1	1056	j12018_1	1220
j1203_2	199	j1208_2	682	j12013_2	801	j12018_2	1374
j1203_3	328	j1208_3	706	j12013_3	1077	j12018_3	1027
j1203_4	239	j1208_4	713	j12013_4	1038	j12018_4	1185
j1203_5	298	j1208_5	736	j12013_5	770	j12018_5	1229
j1203_6	298	j1208_6	635	j12013_6	891	j12018_6	1191
j1203_7	342	j1208_7	654	j12013_7	1121	j12018_7	1283
j1203_8	189	j1208_8	679	j12013_8	943	j12018_8	1141
j1203_9	241	j1208_9	605	j12013_9	895	j12018_9	1073
j1203_10	307	j1208_10	619	j12013_10	973	j12018_10	1153
j1204_1	292	j1209_1	633	j12014_1	908	j12019_1	1292
j1204_2	319	j1209_2	749	j12014_2	984	j12019_2	1182
j1204_3	299	j1209_3	735	j12014_3	992	j12019_3	1268
j1204_4	228	j1209_4	644	j12014_4	1039	j12019_4	1196
j1204_5	262	j1209_5	754	j12014_5	909	j12019_5	1227
j1204_6	249	j1209_6	690	j12014_6	1006	j12019_6	1157
j1204_7	283	j1209_7	630	j12014_7	991	j12019_7	1349
j1204_8	266	j1209_8	610	j12014_8	1073	j12019_8	1254
j1204_9	277	j1209_9	505	j12014_9	1036	j12019_9	1144
j1204_10	228	j1209_10	782	j12014_10	845	j12019_10	1149
j1205_1	295	j12010_1	774	j12015_1	959	j12020_1	1209
j1205_2	239	j12010_2	729	j12015_2	907	j12020_2	1291
j1205_3	190	j12010_3	859	j12015_3	1012	j12020_3	1118
j1205_4	325	j12010_4	641	j12015_4	1006	j12020_4	1330
j1205_5	280	j12010_5	705	j12015_5	969	j12020_5	889
j1205_6	249	j12010_6	615	j12015_6	1063	j12020_6	1094
j1205_7	230	j12010_7	535	j12015_7	924	j12020_7	1157
j1205_8	234	j12010_8	775	j12015_8	1244	j12020_8	1380
j1205_9	290	j12010_9	642	j12015_9	958	j12020_9	1156
j1205_10	287	j12010_10	615	j12015_10	1013	j12020_10	1198

Table LIII: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the Step resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9021_1 έως j9040_10)

Project	Step	Project	Step	Project	Step	Project	Step
j12021_1	300	j12026_1	720	j12031_1	863	j12036_1	1314
j12021_2	219	j12026_2	613	j12031_2	961	j12036_2	1073
j12021_3	304	j12026_3	630	j12031_3	922	j12036_3	1202
j12021_4	341	j12026_4	791	j12031_4	1133	j12036_4	1302
j12021_5	293	j12026_5	710	j12031_5	1095	j12036_5	1168
j12021_6	325	j12026_6	780	j12031_6	976	j12036_6	1452
j12021_7	267	j12026_7	578	j12031_7	1075	j12036_7	1289
j12021_8	281	j12026_8	606	j12031_8	931	j12036_8	1157
j12021_9	263	j12026_9	873	j12031_9	1079	j12036_9	1214
j12021_10	215	j12026_10	881	j12031_10	961	j12036_10	1107
j12022_1	225	j12027_1	627	j12032_1	866	j12037_1	1290
j12022_2	291	j12027_2	641	j12032_2	1060	j12037_2	1058
j12022_3	247	j12027_3	709	j12032_3	1014	j12037_3	1341
j12022_4	261	j12027_4	530	j12032_4	1098	j12037_4	1307
j12022_5	331	j12027_5	620	j12032_5	991	j12037_5	1352
j12022_6	274	j12027_6	717	j12032_6	993	j12037_6	1406
j12022_7	331	j12027_7	691	j12032_7	1125	j12037_7	1219
j12022_8	327	j12027_8	878	j12032_8	938	j12037_8	1431
j12022_9	277	j12027_9	682	j12032_9	1020	j12037_9	1296
j12022_10	257	j12027_10	728	j12032_10	1011	j12037_10	1149
j12023_1	298	j12028_1	750	j12033_1	930	j12038_1	1378
j12023_2	348	j12028_2	726	j12033_2	988	j12038_2	1233
j12023_3	247	j12028_3	689	j12033_3	927	j12038_3	1235
j12023_4	261	j12028_4	682	j12033_4	1106	j12038_4	1409
j12023_5	245	j12028_5	806	j12033_5	1192	j12038_5	1238
j12023_6	279	j12028_6	710	j12033_6	1088	j12038_6	1390
j12023_7	310	j12028_7	768	j12033_7	1019	j12038_7	1303
j12023_8	302	j12028_8	602	j12033_8	929	j12038_8	1267
j12023_9	283	j12028_9	643	j12033_9	1066	j12038_9	1505
j12023_10	278	j12028_10	674	j12033_10	993	j12038_10	1203
j12024_1	258	j12029_1	754	j12034_1	846	j12039_1	1185
j12024_2	297	j12029_2	727	j12034_2	992	j12039_2	1384
j12024_3	215	j12029_3	565	j12034_3	877	j12039_3	1327
j12024_4	279	j12029_4	604	j12034_4	1099	j12039_4	1219
j12024_5	241	j12029_5	776	j12034_5	1086	j12039_5	1337
j12024_6	300	j12029_6	716	j12034_6	1049	j12039_6	1338
j12024_7	294	j12029_7	696	j12034_7	870	j12039_7	1341
j12024_8	294	j12029_8	630	j12034_8	869	j12039_8	1309
j12024_9	253	j12029_9	712	j12034_9	955	j12039_9	1117
j12024_10	294	j12029_10	645	j12034_10	1029	j12039_10	1278
j12025_1	215	j12030_1	702	j12035_1	868	j12040_1	1155
j12025_2	312	j12030_2	737	j12035_2	1197	j12040_2	1342
j12025_3	248	j12030_3	719	j12035_3	876	j12040_3	1230
j12025_4	309	j12030_4	667	j12035_4	1030	j12040_4	1288
j12025_5	290	j12030_5	623	j12035_5	1033	j12040_5	1294
j12025_6	252	j12030_6	606	j12035_6	1100	j12040_6	1138
j12025_7	270	j12030_7	574	j12035_7	1003	j12040_7	1159
j12025_8	216	j12030_8	549	j12035_8	928	j12040_8	1232
j12025_9	271	j12030_9	586	j12035_9	928	j12040_9	1284
j12025_10	255	j12030_10	684	j12035_10	1105	j12040_10	1349

Table LIV: Best scores obtained after repeated experiments with the ant colony optimization approach (ACO) using the Step resource profile evaluation function in the 120-activities projects of the PSP-Lib collection (j9041_1 έως j9060_10)

Project	Step	Project	Step	Project	Step	Project	Step
j12041_1	225	j12046_1	718	j12051_1	883	j12056_1	1082
j12041_2	287	j12046_2	714	j12051_2	938	j12056_2	1012
j12041_3	288	j12046_3	677	j12051_3	866	j12056_3	1213
j12041_4	216	j12046_4	693	j12051_4	872	j12056_4	1265
j12041_5	328	j12046_5	712	j12051_5	900	j12056_5	1259
j12041_6	202	j12046_6	633	j12051_6	1061	j12056_6	1348
j12041_7	260	j12046_7	813	j12051_7	905	j12056_7	1426
j12041_8	287	j12046_8	695	j12051_8	944	j12056_8	1117
j12041_9	283	j12046_9	699	j12051_9	1060	j12056_9	1238
j12041_10	286	j12046_10	647	j12051_10	1021	j12056_10	1308
j12042_1	265	j12047_1	767	j12052_1	1054	j12057_1	1121
j12042_2	326	j12047_2	737	j12052_2	959	j12057_2	1342
j12042_3	253	j12047_3	608	j12052_3	1083	j12057_3	1319
j12042_4	254	j12047_4	691	j12052_4	1088	j12057_4	1416
j12042_5	311	j12047_5	722	j12052_5	940	j12057_5	1070
j12042_6	215	j12047_6	713	j12052_6	924	j12057_6	1180
j12042_7	310	j12047_7	716	j12052_7	1009	j12057_7	1515
j12042_8	264	j12047_8	667	j12052_8	1090	j12057_8	1197
j12042_9	219	j12047_9	740	j12052_9	846	j12057_9	1307
j12042_10	338	j12047_10	740	j12052_10	969	j12057_10	1441
j12043_1	215	j12048_1	634	j12053_1	1268	j12058_1	1332
j12043_2	279	j12048_2	541	j12053_2	1003	j12058_2	1356
j12043_3	254	j12048_3	731	j12053_3	970	j12058_3	1190
j12043_4	273	j12048_4	697	j12053_4	1085	j12058_4	1208
j12043_5	251	j12048_5	546	j12053_5	987	j12058_5	1261
j12043_6	228	j12048_6	655	j12053_6	906	j12058_6	1344
j12043_7	224	j12048_7	708	j12053_7	1159	j12058_7	1362
j12043_8	373	j12048_8	728	j12053_8	1158	j12058_8	1116
j12043_9	314	j12048_9	685	j12053_9	1076	j12058_9	1283
j12043_10	297	j12048_10	656	j12053_10	1054	j12058_10	1092
j12044_1	295	j12049_1	650	j12054_1	1124	j12059_1	1245
j12044_2	265	j12049_2	649	j12054_2	1156	j12059_2	1145
j12044_3	317	j12049_3	712	j12054_3	1262	j12059_3	1413
j12044_4	199	j12049_4	644	j12054_4	1132	j12059_4	1226
j12044_5	244	j12049_5	530	j12054_5	929	j12059_5	1210
j12044_6	259	j12049_6	734	j12054_6	967	j12059_6	1303
j12044_7	320	j12049_7	654	j12054_7	1009	j12059_7	1136
j12044_8	287	j12049_8	743	j12054_8	890	j12059_8	1228
j12044_9	217	j12049_9	701	j12054_9	892	j12059_9	1452
j12044_10	233	j12049_10	508	j12054_10	965	j12059_10	1223
j12045_1	319	j12050_1	795	j12055_1	1069	j12060_1	1354
j12045_2	235	j12050_2	782	j12055_2	913	j12060_2	912
j12045_3	243	j12050_3	656	j12055_3	1142	j12060_3	1259
j12045_4	253	j12050_4	662	j12055_4	1004	j12060_4	1245
j12045_5	306	j12050_5	687	j12055_5	971	j12060_5	1240
j12045_6	313	j12050_6	646	j12055_6	934	j12060_6	1450
j12045_7	243	j12050_7	853	j12055_7	1076	j12060_7	1178
j12045_8	237	j12050_8	800	j12055_8	1149	j12060_8	1269
j12045_9	333	j12050_9	794	j12055_9	1033	j12060_9	1518
j12045_10	351	j12050_10	720	j12055_10	1049	j12060_10	1065

Table LV: Best scores obtained after repeated experiments with the standard genetic algorithm (GA V1 and V2) and hybrid genetic algorithm approach (HGA) using Gf, StD and the Step resource profile evaluation functions- shipbuilding project of a 50000 DWT ship.

Method	Objective function		
	GF	StD	Step
<i>ES Resource Profile</i>	904	274.6104	2653
<i>LS Resource Profile</i>	751	241.2962	2827
<i>GA_v01</i>	637	<u>214.8358</u>	2412
<i>GA_v02</i>	650	217.4943	2235
<i>Hybrid strategy</i>	<u>635</u>	216.2698	<u>2217</u>

Table LVI: Descriptive statistics on independent simulations - shipbuilding project of a 50000 DWT ship.

GF	<i>Average value</i>	<i>Standard deviation</i>	<i>Skewness</i>	<i>Kurtosis</i>
<i>GA_ver01</i>	655.496	5.0336	-0.5392	3.2775
<i>GA_ver02</i>	670.168	5.0610	-0.3116	3.2848
<i>Hybrid scheme</i>	644.799	2.1316	-0.7093	3.6764
StD	<i>Average value</i>	<i>Standard deviation</i>	<i>Skewness</i>	<i>Kurtosis</i>
<i>GA_ver01</i>	217.344	0.6416	-0.4128	3.1890
<i>GA_ver02</i>	219.647	0.6041	-0.3531	3.2686
<i>Hybrid scheme</i>	217.095	0.1996	-0.6912	3.6358
Step	<i>Average value</i>	<i>Standard deviation</i>	<i>Skewness</i>	<i>Kurtosis</i>
<i>GA_ver01</i>	2509.6	26.447	-0.4889	3.4029
<i>GA_ver02</i>	2385.3	34.692	0.3747	5.2089
<i>Hybrid scheme</i>	2321.7	24.201	-0.6582	3.6554

Table LVII: Distance of best score from average value (improvement) - shipbuilding project of a 50000 DWT ship.

Gf			
	<i>GA_ver01</i>	<i>GA_ver02</i>	<i>Hybrid scheme</i>
<i>Distance (%)</i>	2.82% (18.496)	3.01% (20.1683)	1.52% (9.799)
StD			
<i>Distance (%)</i>	1.15% (2.5084)	0.98% (2.1527)	0.38% (0.8247)
Step			
<i>Distance (%)</i>	3.89% (97.628)	6.30% (150.2817)	4.51% (104.6683)

Table LVIII: Sequential Function Evaluation: G_f , PeNum and StD application - the construction of a boiler for a power plant.

Sequential Function Evaluation in 100.000 Resource Profiles	
Gf=69	21 Resource Profiles
PeNum=3	3 Resource Profiles
StD=23,88	1 Resource Profile

Table LIX: Performance comparison of different resource profile evaluation functions for: 1) Proposed Resource profile, 2) ES Resource Profile and 3) LS Resource Profile - the construction of a boiler for a power plant.

	EVALUATION FUNCTIONS				
	G_f	RLI	StD	R²	STEP
PROPOSED RESOURCE PROFILE	69	6.796	23,9209	567.011	189
ES RESOURCE PROFILE	78	7.637	26,7809	618.647	189
LS RESOURCE PROFILE	80	7.697	27,32	627.775	167