

Stochastic Enforced Hill-Climbing

Online Appendix 1

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Per-Problem Results

We present below the per-problem results for the planners $SEH(F)$, $SEH^+(F)$, $Greedy(F)$, FF - $Replan$, RFF - BG , $SEH(L)$ and $Greedy(L)$ on the problems used in the pairwise aggregate comparisons between these planners. The results represent the average success ratio **SR**, average successful solution length **SLEN** and average successful solution time **STIME** (in seconds) taken over 150 runs, with each run being allotted 30 minutes for completion.

| Problem | SEH(F) | SEH ⁺ (F) | Greedy(F) | FF-Replan | RFF-BG | SEH(L) | Greedy(L) |
|-----------|---------------------|--------------------------|-------------------|----------------------|--------------------|------------------|--------------------|
| IPPC1 P5 | 1.00 / 14 / 0.6 | 1.00 / 13 / 0.6 | 0.57 / 15 / 0.6 | 1.00 / 9 / 0.3 | 1.00 / 11 / 0.0 | 1.00 / 9 / 0.4 | 1.00 / 36 / 1.5 |
| IPPC1 P8 | 1.00 / 28 / 2.6 | 1.00 / 25 / 1.2 | 0.57 / 37 / 1.6 | 0.99 / 19 / 0.8 | 1.00 / 17 / 0.1 | 1.00 / 18 / 0.8 | 1.00 / 76 / 3.1 |
| IPPC1 P11 | 1.00 / 61 / 15.6 | 1.00 / 52 / 4.9 | 0.00 / - / - | 1.00 / 37 / 2.5 | 1.00 / 33 / 0.6 | 1.00 / 36 / 1.6 | 1.00 / 178 / 7.5 |
| IPPC1 P15 | 0.63 / 206 / 409.8 | 1.00 / 88 / 28.8 | 0.00 / - / - | 1.00 / 55 / 23.7 | 1.00 / 53 / 46.5 | 1.00 / 57 / 5.6 | 1.00 / 750 / 31.6 |
| IPPC1 P18 | 0.05 / 436 / 1316.5 | 1.00 / 134 / 238.4 | 0.00 / - / - | 0.00 / - / - | 1.00 / 63 / 493.7 | 1.00 / 69 / 16.2 | 0.97 / 1010 / 43.2 |
| IPPC1 P21 | 0.30 / 381 / 1121.0 | 1.00 / 129 / 178.9 | 0.00 / - / - | 1.00 / 77 / 103.8 | 1.00 / 73 / 30.4 | 1.00 / 80 / 12.5 | 1.00 / 701 / 30.3 |
| IPPC2 P1 | 1.00 / 32 / 1.3 | 1.00 / 33 / 1.4 | 1.00 / 50 / 2.1 | 0.99 / 49 / 0.9 | 1.00 / 37 / 0.2 | - / - / - | - / - / - |
| IPPC2 P3 | 1.00 / 36 / 1.5 | 1.00 / 37 / 1.5 | 0.54 / 29 / 1.2 | 1.00 / 40 / 0.9 | 1.00 / 14 / 0.1 | - / - / - | - / - / - |
| IPPC2 P5 | 1.00 / 26 / 1.1 | 1.00 / 27 / 1.1 | 0.52 / 106 / 4.4 | 1.00 / 52 / 0.9 | 1.00 / 25 / 0.1 | - / - / - | - / - / - |
| IPPC2 P7 | 1.00 / 81 / 19.6 | 1.00 / 138 / 50.8 | 1.00 / 164 / 10.2 | 1.00 / 187 / 14.8 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P9 | 1.00 / 53 / 3.7 | 0.66 / 68 / 68.3 | 1.00 / 89 / 4.8 | 1.00 / 64 / 6.0 | 1.00 / 70 / 2.0 | - / - / - | - / - / - |
| IPPC2 P11 | 0.29 / 310 / 877.1 | 0.60 / 141 / 126.3 | 1.00 / 253 / 91.8 | 1.00 / 194 / 849.8 | 0.01 / 537 / 0.0 | - / - / - | - / - / - |
| IPPC2 P13 | 0.57 / 170 / 287.7 | 0.89 / 130 / 120.6 | 0.91 / 189 / 69.6 | 0.05 / 201 / 1037.3 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P15 | 0.86 / 207 / 598.5 | 0.33 / 177 / 539.6 | 0.65 / 253 / 73.9 | 1.00 / 126 / 399.2 | 1.00 / 102 / 260.6 | - / - / - | - / - / - |
| IPPC3 P1 | 1.00 / 64 / 2.7 | 1.00 / 16 / 0.7 | 0.00 / - / - | 1.00 / 20 / 0.5 | 1.00 / 22 / 0.1 | - / - / - | - / - / - |
| IPPC3 P3 | 1.00 / 70 / 3.0 | 1.00 / 16 / 0.7 | 0.00 / - / - | 1.00 / 20 / 0.5 | 1.00 / 21 / 0.1 | - / - / - | - / - / - |
| IPPC3 P5 | 1.00 / 112 / 106.9 | 1.00 / 47 / 3.5 | 0.00 / - / - | 1.00 / 66 / 4.2 | 1.00 / 66 / 3.3 | - / - / - | - / - / - |
| IPPC3 P7 | 1.00 / 114 / 104.8 | 1.00 / 50 / 3.6 | 0.00 / - / - | 1.00 / 70 / 4.4 | 1.00 / 63 / 3.3 | - / - / - | - / - / - |
| IPPC3 P9 | 0.47 / 189 / 433.0 | 1.00 / 74 / 12.5 | 0.02 / 60 / 5.9 | 1.00 / 112 / 69.9 | 1.00 / 41 / 3.4 | - / - / - | - / - / - |
| IPPC3 P11 | 0.55 / 177 / 413.2 | 1.00 / 75 / 12.4 | 0.00 / - / - | 1.00 / 114 / 69.1 | 1.00 / 42 / 3.4 | - / - / - | - / - / - |
| IPPC3 P13 | 0.05 / 394 / 947.5 | 1.00 / 110 / 153.5 | 0.00 / - / - | 0.60 / 938 / 1557.8 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P15 | 0.05 / 391 / 964.6 | 1.00 / 112 / 162.1 | 0.00 / - / - | 0.55 / 1052 / 1599.0 | 0.00 / - / - | - / - / - | - / - / - |

Table 1: Per-problem SR / SLEN / STIME(sec) results for the BLOCKSWORLD category. Since IPPC1 did not provide problem numbers, we identify these problems by the number of blocks. No results are available for SEH(L) and Greedy(L) on IPPC2 and IPPC3 since the learned heuristic is not available for these problems.

| Problem | SEH(F) | SEH ⁺ (F) | Greedy(F) | FF-Replan | RFF-BG | SEH(L) | Greedy(L) |
|-------------------|--------------------|--------------------------|-----------------|----------------------|-------------------|--------------------|-------------------|
| IPPC1 size(5,10) | 1.00 / 29 / 1.4 | 1.00 / 29 / 1.4 | 0.44 / 35 / 1.6 | 1.00 / 51 / 2.5 | 1.00 / 30 / 1.7 | 1.00 / 31 / 2.1 | 1.00 / 76 / 3.4 |
| IPPC1 size(10,10) | 1.00 / 43 / 2.8 | 1.00 / 43 / 2.8 | 0.00 / - / - | 0.96 / 196 / 7.4 | 1.00 / 45 / 14.5 | 1.00 / 39 / 6.4 | 1.00 / 218 / 9.7 |
| IPPC1 size(15,10) | 1.00 / 56 / 3.2 | 1.00 / 56 / 3.3 | 0.00 / - / - | 0.69 / 1017 / 10.3 | 1.00 / 62 / 26.6 | 0.00 / - / - | 0.00 / - / - |
| IPPC3 P1 | 1.00 / 30 / 1.4 | 1.00 / 30 / 1.4 | 0.00 / - / - | 1.00 / 45 / 1.9 | 1.00 / 29 / 1.8 | 1.00 / 30 / 1.9 | 1.00 / 69 / 3.0 |
| IPPC3 P4 | 1.00 / 37 / 2.3 | 1.00 / 38 / 2.4 | 0.00 / - / - | 1.00 / 228 / 5.0 | 1.00 / 39 / 8.5 | 1.00 / 37 / 11.0 | 1.00 / 233 / 10.4 |
| IPPC3 P6 | 1.00 / 57 / 5.9 | 1.00 / 57 / 5.9 | 0.00 / - / - | 0.99 / 184 / 8.3 | 1.00 / 64 / 62.4 | 1.00 / 60 / 142.2 | 1.00 / 574 / 25.7 |
| IPPC3 P8 | 1.00 / 62 / 6.2 | 1.00 / 61 / 6.4 | 0.00 / - / - | 0.99 / 292 / 11.6 | 1.00 / 65 / 36.0 | 1.00 / 52 / 15.6 | 1.00 / 273 / 12.2 |
| IPPC3 P10 | 1.00 / 86 / 48.7 | 1.00 / 87 / 49.5 | 0.00 / - / - | 1.00 / 292 / 23.4 | 1.00 / 77 / 120.4 | 1.00 / 87 / 220.3 | 1.00 / 626 / 28.3 |
| IPPC3 P13 | 0.90 / 272 / 869.2 | 0.94 / 285 / 949.0 | 0.00 / - / - | 0.28 / 1397 / 1215.4 | 0.00 / - / - | 1.00 / 125 / 341.3 | 1.00 / 754 / 34.9 |

Table 2: Per-problem SR / SLEN / STIME(sec) results for the BOXWORLD category. Since IPPC1 did not provide problem numbers, we identify these problems by **size(n,m)** where **n** is the number of cities and **m** is the number of boxes to be delivered.

| Problem | SEH(F) | SEH ⁺ (F) | Greedy(F) | FF-Replan | RFF-BG | SEH(L) | Greedy(L) |
|-----------|-----------------|--------------------------|-----------------|------------------|------------------|------------|---------------|
| IPPC2 P1 | 0.86 / 6 / 0.3 | 0.86 / 6 / 0.2 | 0.87 / 6 / 0.2 | 0.85 / 6 / 0.4 | 0.84 / 6 / 0.1 | - / - / - | - / - / - |
| IPPC2 P2 | 0.87 / 11 / 0.4 | 0.79 / 13 / 0.5 | 0.77 / 25 / 1.0 | 0.77 / 13 / 0.8 | 0.83 / 13 / 0.2 | - / - / - | - / - / - |
| IPPC2 P3 | 0.75 / 11 / 0.5 | 0.78 / 11 / 0.5 | 0.73 / 24 / 1.0 | 0.70 / 16 / 0.8 | 0.81 / 12 / 0.3 | - / - / - | - / - / - |
| IPPC2 P4 | 0.83 / 12 / 0.5 | 0.82 / 12 / 0.5 | 0.71 / 17 / 0.7 | 0.89 / 12 / 1.0 | 0.75 / 10 / 0.3 | - / - / - | - / - / - |
| IPPC2 P5 | 0.85 / 11 / 0.5 | 0.84 / 10 / 0.4 | 0.39 / 17 / 0.7 | 0.79 / 11 / 1.0 | 0.73 / 13 / 0.3 | - / - / - | - / - / - |
| IPPC2 P6 | 0.74 / 19 / 0.8 | 0.79 / 19 / 0.8 | 0.00 / - / - | 0.62 / 25 / 2.0 | 0.74 / 19 / 0.5 | - / - / - | - / - / - |
| IPPC2 P7 | 0.67 / 16 / 0.7 | 0.64 / 16 / 0.7 | 0.36 / 51 / 2.1 | 0.54 / 26 / 2.3 | 0.70 / 16 / 1.4 | - / - / - | - / - / - |
| IPPC2 P8 | 0.72 / 21 / 0.9 | 0.75 / 20 / 0.9 | 0.00 / - / - | 0.49 / 44 / 2.7 | 0.77 / 21 / 0.8 | - / - / - | - / - / - |
| IPPC2 P9 | 0.69 / 31 / 1.4 | 0.63 / 31 / 1.4 | 0.59 / 39 / 1.7 | 0.55 / 37 / 3.6 | 0.58 / 36 / 2.2 | - / - / - | - / - / - |
| IPPC2 P10 | 0.61 / 29 / 1.4 | 0.61 / 31 / 1.4 | 0.00 / - / - | 0.42 / 43 / 4.4 | 0.57 / 39 / 2.0 | - / - / - | - / - / - |
| IPPC2 P11 | 0.61 / 36 / 1.9 | 0.69 / 35 / 1.8 | 0.20 / 60 / 2.6 | 0.50 / 38 / 5.3 | 0.47 / 39 / 4.4 | - / - / - | - / - / - |
| IPPC2 P12 | 0.57 / 40 / 2.0 | 0.54 / 37 / 1.9 | 0.27 / 61 / 2.6 | 0.43 / 45 / 5.7 | 0.40 / 42 / 4.6 | - / - / - | - / - / - |
| IPPC2 P13 | 0.43 / 44 / 2.6 | 0.43 / 44 / 2.6 | 0.00 / - / - | 0.25 / 59 / 8.1 | 0.25 / 61 / 18.6 | - / - / - | - / - / - |
| IPPC2 P14 | 0.53 / 50 / 3.6 | 0.59 / 49 / 3.6 | 0.19 / 83 / 3.7 | 0.20 / 75 / 11.2 | 0.45 / 59 / 9.8 | - / - / - | - / - / - |
| IPPC2 P15 | 0.45 / 59 / 5.1 | 0.54 / 60 / 5.2 | 0.24 / 84 / 3.9 | 0.13 / 92 / 14.0 | 0.25 / 66 / 51.4 | - / - / - | - / - / - |

Table 3: Per-problems SR / SLEN / STIME(sec) results for the DRIVE category. Results are not available for SEH(L) and Greedy(L) since the learned heuristic L is not available for this category.

| Problem | SEH(F) | SEH ⁺ (F) | Greedy(F) | FF-Replan | RFF-BG | SEH(L) | Greedy(L) |
|-----------|------------------|--------------------------|-----------------|------------------|------------------|------------|---------------|
| IPPC2 P1 | 1.00 / 13 / 0.5 | 1.00 / 13 / 0.5 | 1.00 / 31 / 1.3 | 0.37 / 80 / 3.6 | 1.00 / 13 / 0.0 | - / - / - | - / - / - |
| IPPC2 P2 | 1.00 / 8 / 0.3 | 1.00 / 8 / 0.3 | 1.00 / 8 / 0.3 | 0.97 / 63 / 2.5 | 1.00 / 8 / 0.0 | - / - / - | - / - / - |
| IPPC2 P3 | 1.00 / 15 / 0.6 | 1.00 / 15 / 0.6 | 1.00 / 34 / 1.4 | 1.00 / 14 / 0.6 | 1.00 / 15 / 0.0 | - / - / - | - / - / - |
| IPPC2 P4 | 1.00 / 13 / 0.5 | 1.00 / 13 / 0.5 | 1.00 / 24 / 1.0 | 0.99 / 11 / 0.5 | 1.00 / 13 / 0.0 | - / - / - | - / - / - |
| IPPC2 P5 | 1.00 / 11 / 0.5 | 1.00 / 11 / 0.5 | 1.00 / 13 / 0.6 | 0.99 / 14 / 0.6 | 1.00 / 11 / 0.0 | - / - / - | - / - / - |
| IPPC2 P6 | 1.00 / 25 / 1.0 | 1.00 / 25 / 1.0 | 0.00 / - / - | 0.99 / 13 / 0.6 | 1.00 / 36 / 0.2 | - / - / - | - / - / - |
| IPPC2 P7 | 1.00 / 25 / 1.0 | 1.00 / 25 / 1.1 | 1.00 / 83 / 3.4 | 1.00 / 15 / 0.8 | 1.00 / 25 / 0.1 | - / - / - | - / - / - |
| IPPC2 P8 | 1.00 / 41 / 1.7 | 1.00 / 41 / 1.7 | 0.00 / - / - | 1.00 / 24 / 1.2 | 1.00 / 42 / 0.2 | - / - / - | - / - / - |
| IPPC2 P9 | 1.00 / 37 / 1.5 | 1.00 / 37 / 1.5 | 0.00 / - / - | 1.00 / 34 / 1.5 | 1.00 / 85 / 0.8 | - / - / - | - / - / - |
| IPPC2 P10 | 1.00 / 72 / 3.0 | 1.00 / 72 / 3.0 | 0.00 / - / - | 1.00 / 49 / 2.2 | 1.00 / 71 / 0.5 | - / - / - | - / - / - |
| IPPC2 P11 | 1.00 / 101 / 4.3 | 1.00 / 96 / 4.1 | 0.00 / - / - | 1.00 / 53 / 2.0 | 1.00 / 324 / 1.9 | - / - / - | - / - / - |
| IPPC2 P12 | 1.00 / 50 / 2.1 | 1.00 / 49 / 2.1 | 0.00 / - / - | 1.00 / 63 / 2.3 | 1.00 / 48 / 0.7 | - / - / - | - / - / - |
| IPPC2 P13 | 1.00 / 204 / 9.5 | 1.00 / 194 / 9.3 | 0.00 / - / - | 1.00 / 82 / 3.0 | 1.00 / 225 / 3.1 | - / - / - | - / - / - |
| IPPC2 P14 | 1.00 / 53 / 2.2 | 1.00 / 53 / 2.2 | 0.00 / - / - | 0.97 / 93 / 3.3 | 1.00 / 49 / 0.5 | - / - / - | - / - / - |
| IPPC2 P15 | 1.00 / 75 / 3.3 | 1.00 / 79 / 3.4 | 0.00 / - / - | 0.73 / 178 / 5.3 | 1.00 / 252 / 1.8 | - / - / - | - / - / - |

Table 4: Per-problem SR / SLEN / STIME(sec) results for the ELEVATOR category. Results are not available for SEH(L) and Greedy(L) since the learned heuristic L is not available for this category.

| Problem | SEH(F) | SEH ⁺ (F) | Greedy(F) | FF-Replan | RFF-BG | SEH(L) | Greedy(L) |
|-----------|-------------------|--------------------------|-----------------|-------------------|------------------|-----------------|-----------------|
| IPPC1 P1 | 0.04 / 42 / 175.9 | 0.03 / 40 / 186.4 | 0.00 / - / - | 0.12 / 12 / 1.2 | 0.25 / 12 / 1.3 | - / - / - | - / - / - |
| IPPC2 P1 | 0.58 / 8 / 0.3 | 0.56 / 8 / 0.3 | 0.00 / - / - | 0.97 / 9 / 0.4 | 0.95 / 9 / 0.1 | 0.00 / - / - | 0.05 / 9 / 0.4 |
| IPPC2 P3 | 1.00 / 6 / 0.3 | 0.97 / 6 / 0.3 | 0.86 / 7 / 0.3 | 1.00 / 6 / 0.3 | 1.00 / 6 / 0.1 | 0.96 / 7 / 0.3 | 0.03 / 10 / 0.5 |
| IPPC2 P6 | 0.13 / 40 / 29.4 | 0.17 / 30 / 21.9 | 0.00 / - / - | 0.21 / 17 / 1.0 | 0.31 / 16 / 1.4 | 0.00 / - / - | 0.00 / - / - |
| IPPC2 P7 | 0.49 / 22 / 1.9 | 0.38 / 22 / 2.8 | 0.00 / - / - | 0.90 / 20 / 1.1 | 0.75 / 27 / 9.0 | 0.00 / - / - | 0.00 / - / - |
| IPPC2 P9 | 1.00 / 38 / 1.8 | 0.96 / 40 / 1.8 | 0.27 / 42 / 1.8 | 0.25 / 16 / 1.0 | 0.20 / 17 / 2.7 | 0.07 / 18 / 1.9 | 0.00 / - / - |
| IPPC2 P11 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.12 / 59 / 21.6 | 0.11 / 52 / 28.3 | 0.00 / - / - | 0.00 / - / - |
| IPPC2 P13 | 1.00 / 31 / 3.8 | 0.99 / 30 / 3.5 | 0.00 / - / - | 0.09 / 26 / 4.2 | 0.23 / 29 / 28.1 | 0.00 / - / - | 0.00 / - / - |
| IPPC2 P15 | 0.24 / 45 / 18.6 | 0.27 / 46 / 18.5 | 0.00 / - / - | 0.76 / 40 / 7.5 | 0.58 / 39 / 51.9 | 0.00 / - / - | 0.00 / - / - |
| IPPC3 P1 | 0.88 / 8 / 0.4 | 0.94 / 11 / 0.8 | 0.65 / 8 / 0.3 | 0.34 / 8 / 0.4 | 0.65 / 8 / 0.2 | 0.28 / 15 / 0.7 | 0.17 / 14 / 0.6 |
| IPPC3 P3 | 0.50 / 10 / 2.9 | 0.64 / 11 / 3.2 | 0.00 / - / - | 0.33 / 10 / 0.6 | 0.37 / 10 / 0.5 | 0.23 / 21 / 1.0 | 0.06 / 22 / 0.9 |
| IPPC3 P5 | 1.00 / 6 / 0.3 | 0.96 / 6 / 0.4 | 0.79 / 7 / 0.3 | 1.00 / 7 / 0.4 | 1.00 / 6 / 0.1 | 0.00 / - / - | 0.00 / - / - |
| IPPC3 P7 | 0.64 / 18 / 6.3 | 0.53 / 19 / 9.0 | 0.41 / 21 / 0.9 | 1.00 / 16 / 1.1 | 0.62 / 12 / 0.6 | 0.00 / - / - | 0.00 / - / - |
| IPPC3 P9 | 0.00 / - / - | 0.01 / 110 / 126.6 | 0.00 / - / - | 0.06 / 26 / 2.2 | 0.14 / 25 / 4.6 | 0.00 / - / - | 0.00 / - / - |
| IPPC3 P11 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.09 / 30 / 16.2 | 0.07 / 32 / 6.9 | 0.00 / - / - | 0.00 / - / - |
| IPPC3 P13 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.08 / 43 / 553.0 | 0.08 / 59 / 34.2 | 0.00 / - / - | 0.00 / - / - |
| IPPC3 P15 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.10 / 43 / 29.8 | 0.05 / 44 / 48.0 | 0.00 / - / - | 0.00 / - / - |

Table 5: Per-problem SR / SLEN / STIME(sec) results for the EXPLODING BLOCKSWORLD category. **IPPC1 P1** refers to the single problem from IPPC1, **exploding-blocks-prob-pre**. Results are not available for SEH(L) and Greedy(L) on **IPPC1 P1** since the learned heuristic L is not available for this problem.

| Problem | SEH(F) | SEH ⁺ (F) | Greedy(F) | FF-Replan | RFF-BG | SEH(L) | Greedy(L) |
|-----------|--------------------|--------------------------|---------------|-------------------|--------------|------------|---------------|
| IPPC2 P1 | 0.93 / 31 / 1.2 | 0.89 / 30 / 1.2 | 0.00 / - / - | 0.90 / 35 / 0.2 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P2 | 0.87 / 36 / 1.4 | 0.89 / 40 / 1.6 | 0.00 / - / - | 0.88 / 43 / 0.2 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P3 | 0.91 / 38 / 1.5 | 0.95 / 30 / 1.2 | 0.00 / - / - | 0.95 / 35 / 0.2 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P4 | 0.90 / 108 / 4.6 | 0.87 / 128 / 5.4 | 0.00 / - / - | 0.97 / 435 / 1.0 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P5 | 0.90 / 99 / 4.2 | 0.87 / 99 / 4.2 | 0.00 / - / - | 0.97 / 397 / 0.9 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P6 | 0.78 / 135 / 7.5 | 0.73 / 121 / 7.0 | 0.00 / - / - | 0.87 / 713 / 1.7 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P7 | 0.67 / 160 / 8.6 | 0.61 / 143 / 8.1 | 0.00 / - / - | 0.87 / 859 / 1.8 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P8 | 0.87 / 206 / 10.5 | 0.89 / 185 / 9.7 | 0.00 / - / - | 0.86 / 823 / 1.9 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P9 | 0.01 / 249 / 271.8 | 0.01 / 514 / 719.6 | 0.00 / - / - | 0.25 / 1245 / 4.3 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P10 | 0.00 / - / - | 0.01 / 301 / 292.0 | 0.00 / - / - | 0.05 / 1526 / 4.7 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P11 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.01 / 1607 / 5.2 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P12 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P13 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.07 / 1438 / 6.4 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P14 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P15 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.01 / 1859 / 8.3 | 0.00 / - / - | - / - / - | - / - / - |

Table 6: Per-problem SR / SLEN / STIME(sec) results for the PITCHCATCH category. Results are not available for SEH(L) and Greedy(L) since the learned heuristic L is not available for this category.

| Problem | SEH(F) | SEH ⁺ (F) | Greedy(F) | FF-Replan | RFF-BG | SEH(L) | Greedy(L) |
|-----------|-------------------|--------------------------|--------------------|------------------|------------------|------------|---------------|
| IPPC2 P1 | 1.00 / 19 / 50.5 | 1.00 / 23 / 66.2 | 0.20 / 22 / 1.9 | 1.00 / 15 / 0.9 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P2 | 1.00 / 3 / 0.8 | 1.00 / 3 / 0.8 | 1.00 / 22 / 1.1 | 1.00 / 4 / 0.2 | 1.00 / 3 / 0.5 | - / - / - | - / - / - |
| IPPC2 P3 | 1.00 / 5 / 0.2 | 1.00 / 5 / 0.2 | 1.00 / 4 / 0.2 | 1.00 / 5 / 0.2 | 1.00 / 6 / 0.2 | - / - / - | - / - / - |
| IPPC2 P4 | 1.00 / 10 / 0.6 | 1.00 / 8 / 0.6 | 1.00 / 8 / 0.6 | 1.00 / 9 / 0.1 | 0.11 / 47 / 0.2 | - / - / - | - / - / - |
| IPPC2 P5 | 1.00 / 4 / 10.5 | 1.00 / 4 / 10.7 | 1.00 / 17 / 3.1 | 1.00 / 4 / 0.2 | 0.01 / 7 / 0.2 | - / - / - | - / - / - |
| IPPC2 P6 | 1.00 / 16 / 0.9 | 1.00 / 16 / 0.9 | 1.00 / 16 / 0.9 | 1.00 / 16 / 1.0 | 1.00 / 17 / 0.6 | - / - / - | - / - / - |
| IPPC2 P7 | 1.00 / 3 / 0.2 | 1.00 / 3 / 0.2 | 1.00 / 3 / 0.2 | 0.99 / 5 / 0.3 | 1.00 / 5 / 0.8 | - / - / - | - / - / - |
| IPPC2 P8 | 1.00 / 14 / 1.0 | 1.00 / 14 / 1.0 | 1.00 / 14 / 1.0 | 1.00 / 46 / 1.4 | 1.00 / 17 / 0.7 | - / - / - | - / - / - |
| IPPC2 P9 | 1.00 / 3 / 1.1 | 1.00 / 3 / 1.1 | 1.00 / 3 / 1.1 | 1.00 / 8 / 0.4 | 1.00 / 4 / 0.5 | - / - / - | - / - / - |
| IPPC2 P10 | 1.00 / 15 / 4.4 | 1.00 / 15 / 4.5 | 1.00 / 23 / 2.7 | 1.00 / 24 / 4.0 | 1.00 / 41 / 5.0 | - / - / - | - / - / - |
| IPPC2 P11 | 0.98 / 20 / 189.8 | 0.94 / 27 / 421.2 | 0.93 / 449 / 185.3 | 0.47 / 12 / 9.9 | 0.00 / - / - | - / - / - | - / - / - |
| IPPC2 P12 | 1.00 / 27 / 14.0 | 1.00 / 29 / 104.4 | 1.00 / 26 / 24.6 | 1.00 / 68 / 3.0 | 1.00 / 12 / 5.0 | - / - / - | - / - / - |
| IPPC2 P13 | 1.00 / 3 / 3.3 | 1.00 / 4 / 3.5 | 1.00 / 3 / 3.3 | 1.00 / 8 / 0.8 | 1.00 / 5 / 3.0 | - / - / - | - / - / - |
| IPPC2 P14 | 1.00 / 25 / 7.9 | 1.00 / 26 / 8.2 | 1.00 / 53 / 6.6 | 1.00 / 31 / 3.2 | 1.00 / 44 / 17.0 | - / - / - | - / - / - |
| IPPC2 P15 | 0.90 / 36 / 578.3 | 0.90 / 32 / 585.3 | 1.00 / 163 / 126.7 | 1.00 / 76 / 13.2 | 1.00 / 39 / 28.3 | - / - / - | - / - / - |

Table 7: Per-problem SR / SLEN / STIME(sec) results for the RANDOM category. Results are not available for SEH(L) and Greedy(L) since the learned heuristic L is not available for this category.

| Problem | SEH(F) | SEH ⁺ (F) | Greedy(F) | FF-Replan | RFF-BG | SEH(L) | Greedy(L) |
|-----------|--------------------|--------------------------|--------------------|-------------------|--------------------|------------|---------------|
| IPPC2 P1 | 1.00 / 32 / 1.3 | 1.00 / 30 / 1.2 | 1.00 / 30 / 1.2 | 1.00 / 27 / 0.2 | 1.00 / 29 / 0.1 | - / - / - | - / - / - |
| IPPC2 P3 | 1.00 / 103 / 4.2 | 1.00 / 95 / 3.9 | 1.00 / 89 / 3.7 | 1.00 / 101 / 0.3 | 1.00 / 94 / 0.2 | - / - / - | - / - / - |
| IPPC2 P5 | 1.00 / 106 / 4.8 | 1.00 / 100 / 4.6 | 0.97 / 89 / 3.8 | 1.00 / 94 / 0.6 | 0.87 / 120 / 0.4 | - / - / - | - / - / - |
| IPPC2 P7 | 0.74 / 412 / 112.0 | 0.73 / 360 / 110.4 | 0.69 / 372 / 15.9 | 0.84 / 393 / 6.4 | 0.34 / 320 / 3.8 | - / - / - | - / - / - |
| IPPC2 P9 | 0.40 / 429 / 583.8 | 0.37 / 235 / 356.5 | 0.54 / 473 / 23.7 | 0.00 / - / - | 0.09 / 437 / 66.0 | - / - / - | - / - / - |
| IPPC2 P11 | 0.13 / 478 / 580.5 | 0.16 / 316 / 433.2 | 0.19 / 515 / 24.2 | 0.00 / - / - | 0.07 / 474 / 171.8 | - / - / - | - / - / - |
| IPPC2 P13 | 0.13 / 361 / 575.4 | 0.08 / 327 / 573.4 | 0.19 / 737 / 38.2 | 0.00 / - / - | 0.08 / 684 / 267.5 | - / - / - | - / - / - |
| IPPC2 P15 | 0.00 / - / - | 0.00 / - / - | 0.21 / 627 / 206.1 | 0.00 / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P1 | 1.00 / 29 / 1.2 | 1.00 / 30 / 1.2 | 1.00 / 31 / 1.3 | 1.00 / 31 / 0.2 | 1.00 / 36 / 0.1 | - / - / - | - / - / - |
| IPPC3 P3 | 1.00 / 91 / 3.7 | 1.00 / 103 / 4.2 | 1.00 / 85 / 3.5 | 0.99 / 104 / 0.3 | 1.00 / 103 / 0.3 | - / - / - | - / - / - |
| IPPC3 P5 | 1.00 / 97 / 4.9 | 1.00 / 87 / 4.5 | 0.96 / 98 / 4.2 | 1.00 / 101 / 0.6 | 0.85 / 121 / 0.5 | - / - / - | - / - / - |
| IPPC3 P7 | 0.73 / 389 / 131.3 | 0.83 / 387 / 155.8 | 0.70 / 402 / 17.6 | 0.88 / 428 / 13.9 | 0.38 / 409 / 10.1 | - / - / - | - / - / - |
| IPPC3 P9 | 0.47 / 301 / 526.9 | 0.31 / 220 / 433.6 | 0.54 / 488 / 26.7 | 0.00 / - / - | 0.06 / 412 / 55.7 | - / - / - | - / - / - |
| IPPC3 P11 | 0.16 / 393 / 648.4 | 0.13 / 328 / 574.5 | 0.22 / 357 / 18.5 | 0.00 / - / - | 0.08 / 739 / 201.0 | - / - / - | - / - / - |
| IPPC3 P13 | 0.17 / 321 / 653.3 | 0.07 / 262 / 578.5 | 0.18 / 503 / 29.4 | 0.00 / - / - | 0.05 / 609 / 224.1 | - / - / - | - / - / - |
| IPPC3 P15 | 0.00 / - / - | 0.00 / - / - | 0.22 / 758 / 420.9 | 0.00 / - / - | 0.00 / - / - | - / - / - | - / - / - |

Table 8: Per-problem SR / SLEN / STIME(sec) results for the SCHEDULE category. Results are not available for SEH(L) and Greedy(L) since the learned heuristic L is not available for this category.

| Problem | SEH(F) | SEH ⁺ (F) | Greedy(F) | FF-Replan | RFF-BG | SEH(L) | Greedy(L) |
|-----------|----------------|--------------------------|-----------------|-----------|-----------------|------------|---------------|
| IPPC3 P1 | 1.00 / 8 / 0.3 | 1.00 / 8 / 0.3 | 1.00 / 10 / 0.4 | - / - / - | 0.05 / 40 / 0.2 | - / - / - | - / - / - |
| IPPC3 P2 | 1.00 / 8 / 0.3 | 1.00 / 8 / 0.3 | 1.00 / 10 / 0.4 | - / - / - | 0.03 / 25 / 0.2 | - / - / - | - / - / - |
| IPPC3 P3 | 1.00 / 8 / 0.3 | 1.00 / 8 / 0.3 | 1.00 / 10 / 0.4 | - / - / - | 0.01 / 67 / 0.2 | - / - / - | - / - / - |
| IPPC3 P4 | 1.00 / 8 / 0.3 | 1.00 / 8 / 0.4 | 1.00 / 10 / 0.4 | - / - / - | 0.03 / 35 / 0.3 | - / - / - | - / - / - |
| IPPC3 P5 | 1.00 / 8 / 0.4 | 1.00 / 8 / 0.4 | 1.00 / 10 / 0.4 | - / - / - | 0.02 / 13 / 0.4 | - / - / - | - / - / - |
| IPPC3 P6 | 1.00 / 8 / 0.4 | 1.00 / 8 / 0.4 | 1.00 / 10 / 0.4 | - / - / - | 0.01 / 26 / 0.3 | - / - / - | - / - / - |
| IPPC3 P7 | 1.00 / 8 / 0.4 | 0.99 / 8 / 0.4 | 1.00 / 10 / 0.4 | - / - / - | 0.01 / 37 / 0.2 | - / - / - | - / - / - |
| IPPC3 P8 | 1.00 / 8 / 0.4 | 0.99 / 8 / 0.4 | 1.00 / 10 / 0.4 | - / - / - | 0.01 / 46 / 0.3 | - / - / - | - / - / - |
| IPPC3 P9 | 1.00 / 8 / 0.4 | 0.99 / 8 / 0.4 | 1.00 / 10 / 0.5 | - / - / - | 0.04 / 30 / 0.5 | - / - / - | - / - / - |
| IPPC3 P10 | 1.00 / 8 / 0.5 | 1.00 / 8 / 0.5 | 1.00 / 10 / 0.5 | - / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P11 | 1.00 / 8 / 0.6 | 1.00 / 8 / 0.6 | 1.00 / 10 / 0.6 | - / - / - | 0.01 / 70 / 1.2 | - / - / - | - / - / - |
| IPPC3 P12 | 1.00 / 8 / 0.7 | 1.00 / 8 / 0.7 | 1.00 / 10 / 0.7 | - / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P13 | 1.00 / 8 / 1.0 | 1.00 / 8 / 1.0 | 1.00 / 10 / 0.9 | - / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P14 | 1.00 / 8 / 1.4 | 1.00 / 8 / 1.5 | 1.00 / 11 / 1.2 | - / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P15 | 1.00 / 8 / 2.1 | 1.00 / 8 / 2.1 | 1.00 / 10 / 1.6 | - / - / - | 0.00 / - / - | - / - / - | - / - / - |

Table 9: Per-problem SR / SLEN / STIME(sec) results for the SEARCH AND RESCUE category. Results are not available for SEH(L) and Greedy(L) since the learned heuristic L is not available for this category. Results are not available for FF-Replan since it cannot parse this category.

| Problem | SEH(F) | SEH ⁺ (F) | Greedy(F) | FF-Replan | RFF-BG | SEH(L) | Greedy(L) |
|-----------|------------------|--------------------------|------------------|-----------|--------------------|------------|---------------|
| IPPC3 P1 | 1.00 / 6 / 0.3 | 1.00 / 6 / 0.3 | 1.00 / 6 / 0.3 | - / - / - | 1.00 / 7 / 0.3 | - / - / - | - / - / - |
| IPPC3 P2 | 1.00 / 9 / 0.4 | 1.00 / 8 / 0.4 | 1.00 / 9 / 0.4 | - / - / - | 1.00 / 9 / 2.5 | - / - / - | - / - / - |
| IPPC3 P3 | 1.00 / 13 / 1.3 | 1.00 / 11 / 0.9 | 1.00 / 13 / 1.3 | - / - / - | 1.00 / 12 / 20.9 | - / - / - | - / - / - |
| IPPC3 P4 | 1.00 / 24 / 45.5 | 1.00 / 16 / 30.4 | 1.00 / 25 / 47.2 | - / - / - | 1.00 / 18 / 1268.8 | - / - / - | - / - / - |
| IPPC3 P5 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | - / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P6 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | - / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P7 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | - / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P8 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | - / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P9 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | - / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P10 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | - / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P11 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | - / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P12 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | - / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P13 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | - / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P14 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | - / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P15 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | - / - / - | 0.00 / - / - | - / - / - | - / - / - |

Table 10: Per-problem SR / SLEN / STIME(sec) results for the SYSADMIN category. Results are not available for SEH(L) and Greedy(L) since the learned heuristic L is not available for this category. Results are not available for FF-Replan since it cannot parse this category.

| Problem | SEH(F) | SEH ⁺ (F) | Greedy(F) | FF-Replan | RFF-BG | SEH(L) | Greedy(L) |
|--------------|-----------------|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| IPPC1 g-tire | 0.57 / 18 / 0.7 | 0.55 / 18 / 0.7 | 0.24 / 9 / 0.4 | 0.26 / 9 / 0.5 | 0.33 / 9 / 0.2 | - / - / - | - / - / - |
| IPPC1 r-tire | 1.00 / 10 / 0.4 | 1.00 / 10 / 0.4 | 1.00 / 10 / 0.4 | 1.00 / 10 / 0.5 | 1.00 / 10 / 0.2 | - / - / - | - / - / - |
| IPPC2 P1 | 0.28 / 10 / 3.1 | 0.32 / 10 / 3.0 | 0.22 / 10 / 0.4 | 0.25 / 6 / 0.3 | 0.27 / 6 / 0.1 | 0.25 / 10 / 4.6 | 0.08 / 13 / 0.6 |
| IPPC2 P2 | 1.00 / 1 / 0.1 | 1.00 / 1 / 0.0 | 1.00 / 1 / 0.0 | 1.00 / 1 / 0.0 | 1.00 / 1 / 0.0 | 1.00 / 1 / 0.0 | 1.00 / 1 / 0.0 |
| IPPC2 P3 | 1.00 / 4 / 0.2 | 0.98 / 4 / 0.2 | 1.00 / 4 / 0.2 | 0.61 / 2 / 0.1 | 0.68 / 2 / 0.0 | 1.00 / 4 / 0.2 | 1.00 / 4 / 0.2 |
| IPPC2 P4 | 1.00 / 5 / 0.2 | 1.00 / 6 / 0.0 | 1.00 / 5 / 0.0 | 1.00 / 5 / 0.2 | 1.00 / 5 / 0.0 | 1.00 / 6 / 0.0 | 1.00 / 6 / 0.0 |
| IPPC2 P5 | 1.00 / 3 / 0.1 | 1.00 / 3 / 0.1 | 1.00 / 3 / 0.1 | 0.59 / 2 / 0.1 | 0.55 / 2 / 0.0 | 1.00 / 3 / 0.1 | 1.00 / 3 / 0.2 |
| IPPC2 P6 | 1.00 / 3 / 0.1 | 1.00 / 3 / 0.0 | 1.00 / 3 / 0.0 | 0.63 / 2 / 0.1 | 0.58 / 2 / 0.0 | 1.00 / 3 / 0.0 | 1.00 / 3 / 0.0 |
| IPPC2 P7 | 1.00 / 6 / 0.3 | 1.00 / 6 / 0.2 | 1.00 / 6 / 0.2 | 0.53 / 4 / 0.2 | 0.59 / 4 / 0.1 | 1.00 / 6 / 0.2 | 1.00 / 6 / 0.3 |
| IPPC2 P8 | 1.00 / 5 / 0.2 | 1.00 / 6 / 0.0 | 1.00 / 6 / 0.0 | 0.55 / 2 / 0.1 | 0.66 / 2 / 0.0 | 1.00 / 7 / 0.0 | 0.99 / 7 / 0.0 |
| IPPC2 P9 | 0.79 / 7 / 2.2 | 0.73 / 6 / 1.7 | 0.86 / 5 / 0.2 | 0.62 / 4 / 0.2 | 0.60 / 4 / 0.1 | 0.57 / 7 / 6.6 | 0.70 / 7 / 0.4 |
| IPPC2 P10 | 1.00 / 1 / 0.1 | 1.00 / 1 / 0.0 | 1.00 / 1 / 0.0 | 1.00 / 1 / 0.0 | 1.00 / 1 / 0.0 | 1.00 / 1 / 0.0 | 1.00 / 1 / 0.0 |
| IPPC2 P11 | 1.00 / 3 / 0.1 | 1.00 / 3 / 0.1 | 1.00 / 3 / 0.2 | 0.98 / 3 / 0.2 | 1.00 / 3 / 0.1 | 1.00 / 3 / 0.1 | 1.00 / 3 / 0.2 |
| IPPC2 P12 | 1.00 / 1 / 0.1 | 1.00 / 1 / 0.0 | 1.00 / 1 / 0.0 | 1.00 / 1 / 0.0 | 1.00 / 1 / 0.0 | 1.00 / 1 / 0.0 | 1.00 / 1 / 0.0 |
| IPPC2 P13 | 1.00 / 3 / 0.2 | 1.00 / 3 / 0.2 | 1.00 / 3 / 0.2 | 0.62 / 2 / 0.1 | 0.61 / 2 / 0.0 | 1.00 / 3 / 0.2 | 1.00 / 3 / 0.2 |
| IPPC2 P14 | 1.00 / 7 / 0.3 | 1.00 / 7 / 0.0 | 1.00 / 7 / 0.0 | 0.57 / 2 / 0.1 | 0.57 / 2 / 0.0 | 0.97 / 7 / 0.0 | 0.91 / 10 / 0.0 |
| IPPC2 P15 | 0.90 / 7 / 0.6 | 0.89 / 6 / 0.9 | 0.95 / 6 / 0.3 | 0.59 / 4 / 0.2 | 0.58 / 4 / 0.1 | 0.78 / 8 / 7.2 | 0.73 / 10 / 0.5 |

Table 11: Per-problem SR / SLEN / STIME(sec) results for the TIREWORLD category. Results are not available for SEH(L) and Greedy(L) for the IPPC1 problems **g-tire** and **r-tire** since the learned heuristic L is not available for these problems.

| Problem | SEH(F) | SEH ⁺ (F) | Greedy(F) | FF-Replan | RFF-BG | SEH(L) | Greedy(L) |
|-------------|------------------|--------------------------|-----------------|-----------------|--------------------|-------------------|-----------------|
| IPPC3 P1 | 1.00 / 6 / 0.2 | 0.99 / 6 / 0.3 | 1.00 / 6 / 0.3 | 0.50 / 2 / 0.1 | 1.00 / 7 / 0.1 | 1.00 / 7 / 0.4 | 0.58 / 5 / 0.3 |
| IPPC3 P3 | 0.71 / 18 / 0.8 | 0.66 / 17 / 0.7 | 0.65 / 17 / 0.7 | 0.01 / 6 / 0.3 | 1.00 / 28 / 5.6 | 0.71 / 17 / 7.6 | 0.11 / 17 / 0.9 |
| IPPC3 P5 | 0.37 / 30 / 9.3 | 0.33 / 29 / 5.0 | 0.30 / 27 / 1.2 | 0.00 / - / - | 1.00 / 48 / 266.0 | 0.00 / - / - | 0.00 / - / - |
| IPPC3 P7 | 0.17 / 39 / 12.7 | 0.19 / 41 / 19.3 | 0.21 / 35 / 1.7 | 0.00 / - / - | 1.00 / 70 / 1712.6 | 0.01 / 36 / 241.6 | 0.01 / 37 / 3.4 |
| IPPC3 P9 | 0.10 / 51 / 25.7 | 0.17 / 50 / 26.2 | 0.09 / 46 / 2.5 | 0.00 / - / - | 0.97 / 92 / 1714.4 | 0.01 / 58 / 292.0 | 0.00 / - / - |
| IPPC3 P11 | 1.00 / 42 / 62.0 | 1.00 / 42 / 120.3 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | - / - / - | - / - / - |
| IPPC3 P13 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.01 / 36 / 542.4 | - / - / - | - / - / - |
| IPPC3 P15 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | - / - / - | - / - / - |
| tri-tire-1 | 1.00 / 5 / 0.2 | 1.00 / 5 / 0.2 | 1.00 / 6 / 0.2 | 0.61 / 2 / 0.1 | 0.57 / 2 / 0.0 | - / - / - | - / - / - |
| tri-tire-2 | 0.56 / 11 / 0.5 | 0.54 / 11 / 0.5 | 0.45 / 12 / 0.5 | 0.18 / 4 / 0.2 | 1.00 / 13 / 1.1 | - / - / - | - / - / - |
| tri-tire-3 | 0.19 / 17 / 0.7 | 0.19 / 17 / 0.7 | 0.07 / 19 / 0.8 | 0.01 / 6 / 0.2 | 1.00 / 22 / 2.8 | - / - / - | - / - / - |
| tri-tire-4 | 0.11 / 22 / 2.4 | 0.11 / 22 / 2.7 | 0.05 / 24 / 1.0 | 0.00 / - / - | 1.00 / 30 / 7.0 | - / - / - | - / - / - |
| tri-tire-5 | 0.06 / 28 / 24.9 | 0.05 / 27 / 29.7 | 0.01 / 31 / 1.3 | 0.00 / - / - | 1.00 / 38 / 16.7 | - / - / - | - / - / - |
| tri-tire-6 | 0.03 / 31 / 42.3 | 0.01 / 32 / 67.3 | 0.00 / - / - | 0.01 / 12 / 1.1 | 1.00 / 46 / 34.5 | - / - / - | - / - / - |
| tri-tire-7 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 1.00 / 46 / 25.0 | - / - / - | - / - / - |
| tri-tire-8 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 1.00 / 61 / 134.3 | - / - / - | - / - / - |
| tri-tire-9 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 1.00 / 70 / 228.4 | - / - / - | - / - / - |
| tri-tire-10 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - | 1.00 / 77 / 392.8 | - / - / - | - / - / - |

Table 12: Per-problem SR / SLEN / STIME(sec) results for the SYSTEMATIC TIREWORLD category. The problems **IPPC3 P1** through **IPPC3 P15** are from the IPPC3 2-TIREWORLDS domain. The problems **tri-tire-1** through **tri-tire-10** are from the set of “probabilistically interesting problems” from the work of Little and Thiebaut (2007). The results for SEH(L) and Greedy(L) are not available on the problems **IPPC3 P11** through **IPPC3 P15** and **tri-tire-1** through **tri-tire-10** since the learned heuristic L is not available for these problems.

| Problem | SEH(F) | SEH ⁺ (F) | Greedy(F) | FF-Replan | RFF-BG | SEH(L) | Greedy(L) |
|-------------|---------------------|--------------------------|--------------------|--------------------|------------------|---------------------|--------------------|
| ztravel-1-2 | 1.00 / 157 / 6.4 | 1.00 / 155 / 6.3 | 1.00 / 163 / 6.7 | 1.00 / 155 / 0.2 | 0.36 / 308 / 0.4 | - / - / - | - / - / - |
| IPPC2 P2 | 1.00 / 112 / 10.3 | 1.00 / 107 / 9.9 | 0.27 / 291 / 12.3 | 1.00 / 87 / 1.1 | 0.00 / - / - | 1.00 / 117 / 7.3 | 0.13 / 1319 / 54.2 |
| IPPC2 P3 | 1.00 / 126 / 13.1 | 1.00 / 128 / 13.7 | 0.53 / 259 / 11.0 | 1.00 / 111 / 1.2 | 0.00 / - / - | 1.00 / 110 / 10.7 | 0.12 / 1436 / 59.0 |
| IPPC2 P4 | 1.00 / 57 / 2.5 | 1.00 / 59 / 2.5 | 1.00 / 58 / 2.7 | 1.00 / 48 / 0.8 | 0.00 / - / - | 1.00 / 45 / 10.0 | 0.08 / 1446 / 59.4 |
| IPPC2 P5 | 1.00 / 126 / 39.4 | 1.00 / 128 / 40.2 | 0.10 / 92 / 4.0 | 1.00 / 92 / 1.1 | 0.00 / - / - | 1.00 / 123 / 12.3 | 0.10 / 1344 / 55.3 |
| IPPC2 P6 | 1.00 / 365 / 141.9 | 1.00 / 329 / 110.4 | 0.01 / 438 / 22.4 | 1.00 / 229 / 4.5 | 0.00 / - / - | 1.00 / 428 / 444.2 | 0.00 / - / - |
| IPPC2 P7 | 1.00 / 420 / 224.0 | 1.00 / 421 / 236.3 | 0.00 / - / - | 1.00 / 225 / 7.2 | 0.00 / - / - | 0.99 / 492 / 642.3 | 0.00 / - / - |
| IPPC2 P8 | 1.00 / 411 / 238.1 | 1.00 / 446 / 266.5 | 0.03 / 1193 / 76.5 | 1.00 / 355 / 9.7 | 0.00 / - / - | 0.84 / 758 / 975.3 | 0.00 / - / - |
| IPPC2 P9 | 1.00 / 289 / 95.5 | 1.00 / 303 / 114.0 | 0.01 / 1306 / 79.8 | 1.00 / 216 / 5.6 | 0.00 / - / - | 0.59 / 740 / 1078.9 | 0.00 / - / - |
| IPPC2 P10 | 0.99 / 517 / 471.4 | 1.00 / 512 / 508.0 | 0.00 / - / - | 1.00 / 248 / 10.0 | 0.00 / - / - | 0.71 / 666 / 1002.1 | 0.00 / - / - |
| IPPC2 P11 | 0.64 / 678 / 904.3 | 0.67 / 675 / 937.5 | 0.00 / - / - | 1.00 / 432 / 454.3 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - |
| IPPC2 P12 | 0.65 / 644 / 1013.7 | 0.74 / 638 / 1088.7 | 0.00 / - / - | 1.00 / 440 / 851.9 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - |
| IPPC2 P13 | 0.79 / 584 / 806.0 | 0.79 / 573 / 783.9 | 0.00 / - / - | 1.00 / 350 / 264.9 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - |
| IPPC2 P14 | 0.58 / 596 / 1265.5 | 0.59 / 621 / 1283.7 | 0.00 / - / - | 1.00 / 386 / 175.3 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - |
| IPPC2 P15 | 0.74 / 599 / 1155.9 | 0.69 / 598 / 1155.5 | 0.00 / - / - | 1.00 / 419 / 564.2 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - |

Table 13: Per-problem SR / SLEN / STIME(sec) results for the ZENOTRAVEL category. Results are not available for SEH(L) and Greedy(L) on the IPPC1 problem **ztravel-1-2** since the learned heuristic L is not available for this problem.

| Problem | SEH(F) | SEH ⁺ (F) | Greedy(F) | FF-Replan | RFF-BG | SEH(L) | Greedy(L) |
|------------------|-------------------|--------------------------|-------------------|-----------------|----------------|-----------------|---------------|
| bus-fare-problem | 1.00 / 279 / 11.3 | 1.00 / 319 / 12.8 | 0.99 / 282 / 11.5 | 0.01 / 2 / 0.1 | - / - / - | - / - / - | - / - / - |
| file-prob-pre | 1.00 / 72 / 13.5 | 1.00 / 73 / 15.1 | 0.21 / 75 / 3.8 | 1.00 / 71 / 7.8 | - / - / - | - / - / - | - / - / - |
| river-problem | 0.66 / 2 / 0.1 | 0.63 / 2 / 0.1 | 0.65 / 2 / 0.1 | 0.60 / 2 / 0.1 | 0.51 / 1 / 0.0 | - / - / - | - / - / - |
| toh-prob-pre | 0.60 / 11 / 39.1 | 0.53 / 11 / 80.2 | 0.00 / - / - | 0.42 / 7 / 4.8 | 0.52 / 7 / 1.1 | 0.60 / 11 / 1.0 | 0.00 / - / - |

Table 14: Per-problem SR / SLEN / STIME(sec) results on the FILEWORLD and TOWERS OF HANOI problems from IPPC1 and the “probabilistically interesting” BUSFARE and RIVER problems from the work of Little and Thiebaut (2007). Results are not available for SEH(L) and Greedy(L) on the FILEWORLD, BUSFARE and RIVER problems since the learned heuristic L is not available for these problems. Results are not available for RFF-BG on the FILEWORLD and BUSFARE problems since it cannot parse these problems.

| Problem | SEH ⁺ (<i>F</i>) | FF-Replan | RFF-BG |
|-----------|-------------------------------|---------------------|--------------------|
| BW-25 P1 | 0.97 / 220 / 543.1 | 0.99 / 100 / 559.4 | 1.00 / 101 / 104.3 |
| BW-25 P2 | 1.00 / 196 / 445.1 | 1.00 / 98 / 582.5 | 0.00 / - / - |
| BW-25 P3 | 0.93 / 249 / 759.7 | 0.99 / 103 / 523.2 | 0.00 / - / - |
| BW-25 P4 | 0.81 / 296 / 1021.3 | 0.00 / - / - | 0.00 / - / - |
| BW-25 P5 | 0.75 / 330 / 1105.4 | 1.00 / 100 / 689.5 | 0.00 / - / - |
| BW-25 P6 | 0.99 / 236 / 595.4 | 1.00 / 92 / 460.1 | 1.00 / 90 / 172.7 |
| BW-25 P7 | 0.90 / 230 / 627.4 | 1.00 / 94 / 872.1 | 1.00 / 93 / 197.8 |
| BW-25 P8 | 0.89 / 295 / 913.0 | 0.00 / - / - | 0.00 / - / - |
| BW-25 P9 | 0.99 / 225 / 663.5 | 0.98 / 92 / 869.2 | 0.00 / - / - |
| BW-25 P10 | 0.83 / 317 / 1028.2 | 0.00 / - / - | 0.00 / - / - |
| BW-25 P11 | 1.00 / 156 / 301.0 | 1.00 / 91 / 95.4 | 1.00 / 86 / 20.7 |
| BW-25 P12 | 0.97 / 223 / 534.7 | 1.00 / 105 / 60.3 | 1.00 / 105 / 9.3 |
| BW-25 P13 | 0.70 / 339 / 1182.8 | 0.00 / - / - | 0.00 / - / - |
| BW-25 P14 | 0.76 / 284 / 989.7 | 0.00 / - / - | 0.00 / - / - |
| BW-25 P15 | 0.31 / 353 / 1278.5 | 0.00 / - / - | 0.00 / - / - |
| BW-30 P1 | 0.22 / 346 / 1438.3 | 0.00 / - / - | 0.00 / - / - |
| BW-30 P2 | 1.00 / 209 / 778.5 | 0.01 / 115 / 0.0 | 1.00 / 110 / 45.6 |
| BW-30 P3 | 0.17 / 364 / 1493.6 | 0.00 / - / - | 0.00 / - / - |
| BW-30 P4 | 0.75 / 300 / 1083.7 | 0.00 / - / - | 1.00 / 120 / 716.8 |
| BW-30 P5 | 0.68 / 313 / 1182.3 | 0.02 / 122 / 0.0 | 1.00 / 118 / 367.6 |
| BW-30 P6 | 0.90 / 213 / 820.4 | 0.03 / 109 / 0.0 | 1.00 / 105 / 65.0 |
| BW-30 P7 | 0.43 / 324 / 1335.5 | 0.00 / - / - | 0.00 / - / - |
| BW-30 P8 | 0.47 / 308 / 1256.4 | 0.00 / - / - | 0.00 / - / - |
| BW-30 P9 | 0.64 / 271 / 1202.4 | 0.00 / - / - | 0.00 / - / - |
| BW-30 P10 | 0.31 / 333 / 1425.4 | 0.00 / - / - | 0.00 / - / - |
| BW-30 P11 | 0.97 / 242 / 801.1 | 1.00 / 116 / 531.0 | 0.00 / - / - |
| BW-30 P12 | 0.01 / 427 / 1740.7 | 0.00 / - / - | 0.00 / - / - |
| BW-30 P13 | 0.57 / 337 / 1267.3 | 1.00 / 108 / 1191.1 | 0.00 / - / - |
| BW-30 P14 | 0.95 / 213 / 733.0 | 0.02 / 109 / 0.0 | 1.00 / 109 / 64.4 |
| BW-30 P15 | 0.06 / 358 / 1539.0 | 0.00 / - / - | 0.00 / - / - |

Table 15: Per-problem SR / SLEN / STIME(sec) results on the additionally generated BLOCKSWORLD problems with 25 and 30 blocks.

| Problem | SEH ⁺ (F) | FF-Replan | RFF-BG |
|--------------|--------------------------|----------------------|--------------------|
| BX-20-20 P1 | 0.69 / 275 / 945.9 | 0.36 / 1162 / 1332.7 | 0.00 / - / - |
| BX-20-20 P2 | 0.53 / 322 / 1161.1 | 0.35 / 1336 / 1055.0 | 0.00 / - / - |
| BX-20-20 P3 | 0.77 / 266 / 1158.1 | 0.75 / 787 / 664.8 | 0.00 / - / - |
| BX-20-20 P4 | 0.30 / 311 / 1290.5 | 0.21 / 1499 / 899 | 0.00 / - / - |
| BX-20-20 P5 | 0.97 / 255 / 750.0 | 0.01 / 1956 / 1035.5 | 0.00 / - / - |
| BX-20-20 P6 | 1.00 / 122 / 26.2 | 1.00 / 633 / 31.0 | 0.01 / 109 / 269.9 |
| BX-20-20 P7 | 0.64 / 275 / 933.7 | 0.87 / 952 / 1014.6 | 0.00 / - / - |
| BX-20-20 P8 | 1.00 / 142 / 148.1 | 0.27 / 1492 / 130 | 0.00 / - / - |
| BX-20-20 P9 | 0.97 / 188 / 613.6 | 0.55 / 1243 / 1205.8 | 0.00 / - / - |
| BX-20-20 P10 | 0.02 / 378 / 1468.5 | 0.03 / 1105 / 1429 | 0.00 / - / - |
| BX-20-20 P11 | 0.00 / - / - | 0.00 / - / - | 0.00 / - / - |
| BX-20-20 P12 | 0.76 / 296 / 1201.5 | 0.17 / 1383 / 1414.6 | 0.00 / - / - |
| BX-20-20 P13 | 0.98 / 212 / 614.5 | 0.34 / 1195 / 460 | 0.00 / - / - |
| BX-20-20 P14 | 0.97 / 180 / 403.4 | 0.11 / 1506 / 537 | 0.00 / - / - |
| BX-20-20 P15 | 0.42 / 235 / 873.9 | 0.14 / 1428 / 548 | 0.00 / - / - |

Table 16: Per-problem SR / SLEN / STIME(sec) results on the additionally generated BOXWORLD problems with 20 cities and 20 boxes.

References

Little, I., & Thiebaux, S. (2007). Probabilistic planning vs replanning. In *Workshop on International Planning Competition: Past, Present and Future (ICAPS)*.