

A Coverage Results

Domain	h^{gc} (least informative)				h^{add} (informative)				h^{ff} (most informative)			
	Base	at	wl	at;wl	Base	at	wl	at;wl	Base	at	wl	at;wl
agricola	0	3	0	0	11	4	0	3	6	5	0	3
assembly	0	0	10	7	11	30	27	23	30	30	25	27
barman	4	0	5	0	0	0	1	0	2	11	4	4
blocks	35	33	34	35	35	35	35	35	35	35	35	35
caldera	16	13	14	10	18	18	17	16	12	16	12	17
cavediving	7	7	7	7	7	6	7	7	7	7	7	7
childsack	0	0	0	0	2	1	1	4	0	0	1	3
citycar	0	0	5	8	20	15	20	20	0	8	19	19
data	1	1	4	3	1	3	3	3	4	3	2	4
depot	14	16	13	17	13	19	21	21	15	17	19	21
driverlog	19	19	18	19	18	19	17	19	17	19	18	20
elevators	33	39	24	29	15	30	30	30	11	8	16	19
floortile	0	0	4	3	10	9	8	8	10	6	10	10
folding	8	9	6	6	0	0	3	3	0	2	3	3
freecell	46	57	43	53	80	77	75	79	79	79	76	77
ged	20	20	19	19	0	11	8	9	0	0	3	1
grid	3	3	3	3	3	5	2	5	4	5	2	5
gripper	20	20	20	20	20	20	20	20	20	20	20	20
hiking	2	2	2	2	19	18	20	19	20	20	20	20
labyrinth	4	2	3	2	0	0	0	0	0	0	0	0
logistics	35	36	34	36	53	48	51	52	55	50	53	52
maintenance	14	16	7	9	16	17	10	13	11	7	6	6
miconic	371	371	364	363	439	436	427	439	437	439	439	436
movie	30	30	30	30	30	30	30	30	30	30	30	30
mprime	21	22	21	21	31	35	35	35	30	35	35	35
mystery	15	15	14	16	18	19	19	19	17	19	19	19
nomystery	6	10	9	8	6	12	6	11	9	17	8	15
nurikabe	13	13	12	12	9	7	8	10	7	11	7	9
openstacks	40	34	33	28	29	28	34	34	36	36	38	38
optical	5	4	18	18	6	21	16	15	4	13	10	7
parking	0	0	0	0	10	16	21	23	23	5	29	31
pegsol	50	46	44	44	50	44	46	48	50	46	48	48
philosophers	20	26	11	12	47	28	24	22	48	48	17	24
pipeworld	61	65	52	60	43	80	76	84	50	81	74	84
psr	92	79	69	69	82	78	69	69	58	56	73	73
recharging	12	11	8	7	9	10	8	7	8	11	8	7
ricochet	4	0	2	0	4	3	0	1	12	5	2	1
rovers	21	21	17	19	26	30	26	28	24	31	30	29
rubiks	4	6	4	4	4	8	5	5	20	9	6	6
satellite	14	18	13	14	30	26	28	27	27	22	26	25
scanalyzer	50	48	36	48	50	48	48	46	46	46	44	46
schedule	78	63	106	98	19	77	128	123	31	77	143	140
settlrs	0	0	0	0	5	3	3	4	0	0	1	2
slitherlink	0	0	0	0	0	0	0	0	0	0	0	0
snake	4	6	3	2	3	4	11	9	5	6	9	10
sokoban	36	28	15	15	46	45	23	38	46	42	22	34
spider	11	12	10	9	7	2	12	11	12	14	14	18
storage	18	20	16	20	16	26	18	27	18	26	18	24
termes	9	1	0	0	4	0	1	1	12	1	0	1
tetris	19	16	16	13	16	14	10	12	4	13	4	15
thoughtful	5	5	5	5	13	19	15	16	8	17	13	19
tidybot	19	20	19	20	17	17	18	17	16	17	18	18
tpp	13	15	15	15	21	28	20	21	19	28	20	19
transport	41	27	27	26	36	25	40	36	12	27	21	34
trucks	9	12	16	13	15	14	20	21	14	18	20	23
visitall	40	21	37	12	3	7	5	10	3	16	1	14
woodworking	15	25	19	17	35	48	48	49	41	46	50	50
zenotravel	20	20	20	20	20	20	20	20	20	20	20	20
Σ IPC	1447	1406	1356	1346	1551	1693	1694	1757	1535	1676	1668	1777
blocksworld	9	2	15	13	0	1	3	3	2	1	3	2
childsack	19	2	17	14	23	23	64	62	23	23	62	65
genome	312	252	260	261	100	106	89	81	45	43	63	57
labyrinth	40	40	40	40	40	40	40	40	40	40	40	40
logistics	3	1	31	3	1	0	0	0	0	0	0	2
organic	44	47	45	45	31	32	30	34	33	34	32	32
pipeworld	23	31	23	34	19	28	27	26	17	30	22	29
rovers	0	0	2	1	7	0	3	3	11	0	3	3
visitall	62	111	69	67	96	69	85	90	94	74	84	87
Σ HTG	512	486	502	478	317	299	341	339	265	245	309	317
Σ	1959	1892	1858	1824	1868	1992	2035	2096	1800	1921	1977	2094

Table 2: Coverage ($\uparrow$) of heuristics for single-queue GBFS across different domains. Green/red cells indicate that a novelty heuristic (at, wl, at;wl) performs better/worse than their base heuristic (h^{gc} , h^{add} , h^{ff}). Blue cells indicate the best value per row. Bold font indicates the best score in each local heuristic group.

Domain	h^{gc} (least informative)				h^{add} (informative)				h^{ff} (most informative)			
	Base	at	wl	at;wl	Base	at	wl	at;wl	Base	at	wl	at;wl
agricola	0.00	0.23	0.00	0.00	0.85	0.31	0.00	0.23	0.46	0.38	0.00	0.23
assembly	0.00	0.00	0.33	0.23	0.37	1.00	0.90	0.77	1.00	1.00	0.83	0.90
barman	0.25	0.00	0.31	0.00	0.00	0.00	0.06	0.00	0.12	0.69	0.25	0.25
blocks	1.00	0.94	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
caldera	0.70	0.57	0.61	0.43	0.78	0.78	0.74	0.70	0.52	0.70	0.52	0.74
cavediving	1.00	1.00	1.00	1.00	1.00	0.86	1.00	1.00	1.00	1.00	1.00	1.00
childsnack	0.00	0.00	0.00	0.00	0.50	0.25	0.25	1.00	0.00	0.00	0.25	0.75
citycar	0.00	0.00	0.25	0.40	1.00	0.75	1.00	1.00	0.00	0.40	0.95	0.95
data	0.17	0.17	0.67	0.50	0.17	0.50	0.50	0.50	0.67	0.50	0.33	0.67
depot	0.67	0.76	0.62	0.81	0.62	0.90	1.00	1.00	0.71	0.81	0.90	1.00
driverlog	0.95	0.95	0.90	0.95	0.90	0.95	0.85	0.95	0.85	0.95	0.90	1.00
elevators	0.85	1.00	0.62	0.74	0.38	0.77	0.77	0.77	0.28	0.21	0.41	0.49
floortile	0.00	0.00	0.27	0.20	0.67	0.60	0.53	0.53	0.67	0.40	0.67	0.67
folding	0.73	0.82	0.55	0.55	0.00	0.00	0.27	0.27	0.00	0.18	0.27	0.27
freecell	0.58	0.71	0.54	0.66	1.00	0.96	0.94	0.99	0.99	0.99	0.95	0.96
ged	1.00	1.00	0.95	0.95	0.00	0.55	0.40	0.45	0.00	0.00	0.15	0.05
grid	0.60	0.60	0.60	0.60	0.60	1.00	0.40	1.00	0.80	1.00	0.40	1.00
gripper	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
hiking	0.10	0.10	0.10	0.10	0.95	0.90	1.00	0.95	1.00	1.00	1.00	1.00
labyrinth	1.00	0.50	0.75	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
logistics	0.61	0.63	0.60	0.63	0.93	0.84	0.89	0.91	0.96	0.88	0.93	0.91
maintenance	0.82	0.94	0.41	0.53	0.94	1.00	0.59	0.76	0.65	0.41	0.35	0.35
micronic	0.85	0.85	0.83	0.83	1.00	0.99	0.97	1.00	1.00	1.00	1.00	0.99
movie	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
mprime	0.60	0.63	0.60	0.60	0.89	1.00	1.00	1.00	0.86	1.00	1.00	1.00
mystery	0.79	0.79	0.74	0.84	0.95	1.00	1.00	1.00	0.89	1.00	1.00	1.00
nomystery	0.33	0.56	0.50	0.44	0.33	0.67	0.33	0.61	0.50	0.94	0.44	0.83
nurikabe	0.93	0.93	0.86	0.86	0.64	0.50	0.57	0.71	0.50	0.79	0.50	0.64
openstacks	0.70	0.60	0.58	0.49	0.51	0.49	0.60	0.60	0.63	0.63	0.67	0.67
optical	0.24	0.19	0.86	0.86	0.29	1.00	0.76	0.71	0.19	0.62	0.48	0.33
parking	0.00	0.00	0.00	0.00	0.28	0.44	0.58	0.64	0.64	0.14	0.81	0.86
pegsol	1.00	0.92	0.88	0.88	1.00	0.88	0.92	0.96	1.00	0.92	0.96	0.96
philosophers	0.42	0.54	0.23	0.25	0.98	0.58	0.50	0.46	1.00	1.00	0.35	0.50
pipesworld	0.71	0.76	0.60	0.70	0.50	0.93	0.88	0.98	0.58	0.94	0.86	0.98
psr	1.00	0.86	0.75	0.75	0.89	0.85	0.75	0.75	0.63	0.61	0.79	0.79
recharging	0.86	0.79	0.57	0.50	0.64	0.71	0.57	0.50	0.57	0.79	0.57	0.50
ricochet	0.29	0.00	0.14	0.00	0.29	0.21	0.00	0.07	0.86	0.36	0.14	0.07
rovers	0.66	0.66	0.53	0.59	0.81	0.94	0.81	0.88	0.75	0.97	0.94	0.91
rubiks	0.20	0.30	0.20	0.20	0.20	0.40	0.25	0.25	1.00	0.45	0.30	0.30
satellite	0.47	0.60	0.43	0.47	1.00	0.87	0.93	0.90	0.90	0.73	0.87	0.83
scanalyzer	1.00	0.96	0.72	0.96	1.00	0.96	0.96	0.92	0.92	0.92	0.88	0.92
schedule	0.52	0.42	0.71	0.66	0.13	0.52	0.86	0.83	0.21	0.52	0.96	0.94
settlers	0.00	0.00	0.00	0.00	0.71	0.43	0.43	0.57	0.00	0.00	0.14	0.29
slitherlink	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
snake	0.36	0.55	0.27	0.18	0.27	0.36	1.00	0.82	0.45	0.55	0.82	0.91
sokoban	0.75	0.58	0.31	0.31	0.96	0.94	0.48	0.79	0.96	0.88	0.46	0.71
spider	0.58	0.63	0.53	0.47	0.37	0.11	0.63	0.58	0.63	0.74	0.74	0.95
storage	0.64	0.71	0.57	0.71	0.57	0.93	0.64	0.96	0.64	0.93	0.64	0.86
termes	0.75	0.08	0.00	0.00	0.33	0.00	0.08	0.08	1.00	0.08	0.00	0.08
tetris	0.95	0.80	0.80	0.65	0.80	0.70	0.50	0.60	0.20	0.65	0.20	0.75
thoughtful	0.25	0.25	0.25	0.25	0.65	0.95	0.75	0.80	0.40	0.85	0.65	0.95
tidybot	0.95	1.00	0.95	1.00	0.85	0.85	0.90	0.85	0.80	0.85	0.90	0.90
tpp	0.46	0.54	0.54	0.54	0.75	1.00	0.71	0.75	0.68	1.00	0.71	0.68
transport	0.87	0.57	0.57	0.55	0.77	0.53	0.85	0.77	0.26	0.57	0.45	0.72
trucks	0.36	0.48	0.64	0.52	0.60	0.56	0.80	0.84	0.56	0.72	0.80	0.92
visitall	1.00	0.53	0.93	0.30	0.08	0.18	0.12	0.25	0.08	0.40	0.03	0.35
woodworking	0.30	0.50	0.38	0.34	0.70	0.96	0.96	0.98	0.82	0.92	1.00	1.00
zenotravel	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Σ IPC	33.80	32.48	31.51	30.50	36.38	39.36	38.22	41.19	35.79	38.95	36.13	41.29
blocksworld	0.60	0.13	1.00	0.87	0.00	0.07	0.20	0.20	0.13	0.07	0.20	0.13
childsnack	0.29	0.03	0.26	0.22	0.35	0.35	0.98	0.95	0.35	0.35	0.95	1.00
genome	1.00	0.81	0.83	0.84	0.32	0.34	0.29	0.26	0.14	0.14	0.20	0.18
labyrinth	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
logistics	0.09	0.03	0.97	0.09	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.06
organic	0.92	0.98	0.94	0.94	0.65	0.67	0.62	0.71	0.69	0.71	0.67	0.67
pipesworld	0.55	0.74	0.55	0.81	0.45	0.67	0.64	0.62	0.40	0.71	0.52	0.69
rovers	0.00	0.00	0.18	0.09	0.64	0.00	0.27	0.27	1.00	0.00	0.27	0.27
visitall	0.48	0.87	0.54	0.52	0.75	0.54	0.66	0.70	0.73	0.58	0.66	0.68
Σ HTG	4.93	4.59	6.27	5.37	4.19	3.63	4.67	4.72	4.46	3.56	4.48	4.69
Σ	38.73	37.07	37.78	35.87	40.57	43.00	42.90	45.91	40.25	42.51	40.61	45.97

Table 3: Normalised coverage ($\uparrow$) of heuristics for single-queue GBFS across different domains. Green/red cells indicate that a novelty heuristic (at, wl, at;wl) performs better/worse than their base heuristic (h^{gc} , h^{add} , h^{ff}). Blue cells indicate the best value per row. Bold font indicates the best score in each local heuristic group.

B Expansion Results

Domain	Base	at	Base	wl	Base	at;wl	at	wl
agricola	2	5	6	0	3	3	5	0
assembly	30	0	29	1	29	1	25	5
barman	1	11	2	4	2	4	9	4
blocks	15	20	12	23	11	23	9	24
caldera	8	9	7	7	6	10	6	10
cavediving	0	7	0	7	0	7	0	7
childsnaek	0	0	0	1	0	3	0	1
citycar	0	8	0	19	0	19	1	18
data	1	3	2	2	1	4	3	0
depot	8	10	5	15	3	18	3	17
driverlog	16	3	17	3	16	4	5	15
elevators	5	6	0	16	1	18	2	14
floortile	10	0	4	7	5	5	0	10
folding	0	2	0	3	0	3	2	2
freecell	61	17	62	17	57	22	48	32
ged	0	0	0	3	0	1	0	3
grid	2	3	4	0	2	3	4	1
gripper	20	0	0	20	0	20	0	20
hiking	10	10	2	18	2	18	4	16
labyrinth	0	0	0	0	0	0	0	0
logistics	53	1	54	2	53	2	1	51
maintenance	11	3	11	2	11	2	1	6
miconic	404	17	397	20	402	19	138	280
movie	30	0	30	0	30	0	0	0
mprime	6	15	9	13	9	13	11	5
mystery	4	4	5	3	4	3	4	1
nomystery	4	13	6	4	5	10	14	3
nurikabe	2	9	5	3	3	6	8	3
openstacks	2	34	0	38	0	38	8	29
optical	0	13	0	10	0	7	10	2
parking	22	1	9	26	5	26	1	29
pegsol	45	5	33	17	36	14	15	32
philosophers	18	30	48	0	48	0	47	1
pipesworld	18	60	14	56	15	65	29	50
psr	38	21	24	47	27	46	22	51
recharging	5	6	4	6	4	5	7	5
ricochet	10	2	11	2	11	1	5	1
rovers	16	14	16	12	13	15	8	23
rubiks	14	2	19	1	15	1	9	0
satellite	25	3	19	8	22	5	1	25
scanalyzer	37	10	27	23	23	24	19	27
schedule	8	65	3	134	3	131	24	113
settlers	0	0	0	1	0	2	0	1
snake	2	5	0	9	0	10	2	7
sokoban	41	7	43	1	43	5	37	5
spider	9	7	7	10	6	13	5	12
storage	8	14	12	3	7	13	18	4
termes	11	1	12	0	11	1	1	0
tetris	1	13	4	2	1	14	13	0
thoughtful	8	9	8	6	8	11	14	3
tidybot	12	5	13	5	12	6	6	12
tpp	3	20	5	11	5	11	21	3
transport	5	21	2	18	1	32	12	14
trucks	9	10	6	14	5	18	4	18
visitall	0	16	3	0	0	14	16	0
woodworking	35	12	33	15	33	15	6	39
zenotravel	17	0	14	5	11	6	3	16
Σ IPC	1122	582	1058	693	1020	790	666	1070
blocksworld	2	0	1	1	1	0	0	3
childsnaek	9	18	1	61	1	64	0	62
genome	28	16	24	50	23	45	21	52
labyrinth	2	7	31	9	0	9	31	9
logistics	0	0	0	0	0	2	0	0
organic	3	1	4	1	4	1	2	1
pipesworld	10	19	10	12	9	20	13	17
rovers	11	0	9	0	10	0	0	3
visitall	46	10	31	28	24	33	11	41
Σ HTG	111	71	111	162	72	174	78	188
Σ	1233	653	1169	855	1092	964	744	1258

Table 4: Problems per domain where a column expands fewer nodes than its paired column. The higher value in each pair is indicated in bold. The (non-)novelty extensions are over the h^{ff} heuristic.

Domain	Base	at	Base	wl	Base	at;wl	at	wl
agricola	0.10	0.25	0.30	0.00	0.15	0.15	0.25	0.00
assembly	1.00	0.00	0.97	0.03	0.97	0.03	0.83	0.17
barman	0.03	0.28	0.05	0.10	0.05	0.10	0.23	0.10
blocks	0.43	0.57	0.34	0.66	0.31	0.66	0.26	0.69
caldera	0.20	0.23	0.17	0.17	0.15	0.25	0.15	0.25
cavediving	0.00	0.35	0.00	0.35	0.00	0.35	0.00	0.35
childsnaek	0.00	0.00	0.00	0.05	0.00	0.15	0.00	0.05
citycar	0.00	0.40	0.00	0.95	0.00	0.95	0.05	0.90
data	0.05	0.15	0.10	0.10	0.05	0.20	0.15	0.00
depot	0.36	0.45	0.23	0.68	0.14	0.82	0.14	0.77
driverlog	0.80	0.15	0.85	0.15	0.80	0.20	0.25	0.75
elevators	0.10	0.12	0.00	0.32	0.02	0.36	0.04	0.28
floortile	0.25	0.00	0.10	0.17	0.12	0.12	0.00	0.25
folding	0.00	0.10	0.00	0.15	0.00	0.15	0.10	0.10
freecell	0.76	0.21	0.78	0.21	0.71	0.28	0.60	0.40
ged	0.00	0.00	0.00	0.15	0.00	0.05	0.00	0.15
grid	0.40	0.60	0.80	0.00	0.40	0.60	0.80	0.20
gripper	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00
hiking	0.50	0.50	0.10	0.90	0.10	0.90	0.20	0.80
labyrinth	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
logistics	0.84	0.02	0.86	0.02	0.84	0.03	0.02	0.81
maintenance	0.55	0.15	0.55	0.10	0.55	0.10	0.05	0.30
miconic	0.90	0.04	0.88	0.04	0.89	0.04	0.31	0.62
movie	1.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00
mprime	0.17	0.43	0.26	0.37	0.26	0.37	0.31	0.14
mystery	0.13	0.13	0.17	0.10	0.13	0.10	0.13	0.03
nomystery	0.20	0.65	0.30	0.20	0.25	0.50	0.70	0.15
nurikabe	0.10	0.45	0.25	0.15	0.15	0.30	0.40	0.15
openstacks	0.03	0.57	0.00	0.63	0.00	0.63	0.13	0.48
optical	0.00	0.27	0.00	0.21	0.00	0.15	0.21	0.04
parking	0.55	0.03	0.23	0.65	0.12	0.65	0.03	0.72
pegasol	0.90	0.10	0.66	0.34	0.72	0.28	0.30	0.64
philosophers	0.38	0.62	1.00	0.00	1.00	0.00	0.98	0.02
pipesworld	0.18	0.59	0.14	0.55	0.15	0.64	0.29	0.50
psr	0.38	0.21	0.24	0.47	0.27	0.46	0.22	0.51
recharging	0.25	0.30	0.20	0.30	0.20	0.25	0.35	0.25
ricochet	0.50	0.10	0.55	0.10	0.55	0.05	0.25	0.05
rovers	0.40	0.35	0.40	0.30	0.33	0.38	0.20	0.57
rubiks	0.70	0.10	0.95	0.05	0.75	0.05	0.45	0.00
satellite	0.69	0.08	0.53	0.22	0.61	0.14	0.03	0.69
scanalyzer	0.74	0.20	0.54	0.46	0.46	0.48	0.38	0.54
schedule	0.05	0.43	0.02	0.89	0.02	0.87	0.16	0.75
settlars	0.00	0.00	0.00	0.05	0.00	0.10	0.00	0.05
snake	0.10	0.25	0.00	0.45	0.00	0.50	0.10	0.35
sokoban	0.82	0.14	0.86	0.02	0.86	0.10	0.74	0.10
spider	0.45	0.35	0.35	0.50	0.30	0.65	0.25	0.60
storage	0.27	0.47	0.40	0.23	0.43	0.60	0.60	0.13
termes	0.55	0.05	0.60	0.00	0.55	0.05	0.05	0.00
tetris	0.05	0.65	0.20	0.10	0.05	0.70	0.65	0.00
thoughtful	0.40	0.45	0.40	0.30	0.40	0.55	0.70	0.15
tidybot	0.60	0.25	0.65	0.25	0.60	0.30	0.30	0.60
tpp	0.10	0.67	0.17	0.37	0.17	0.37	0.70	0.10
transport	0.07	0.30	0.03	0.26	0.01	0.46	0.17	0.20
trucks	0.30	0.33	0.20	0.47	0.17	0.60	0.13	0.60
visitall	0.00	0.40	0.07	0.00	0.00	0.35	0.40	0.00
woodworking	0.70	0.24	0.66	0.30	0.66	0.30	0.12	0.78
zenotravel	0.85	0.00	0.70	0.25	0.55	0.30	0.15	0.80
Σ IPC	20.88	14.73	19.79	15.74	17.78	19.55	15.00	19.65
blocksworld	0.05	0.00	0.03	0.03	0.03	0.00	0.00	0.07
childsnaek	0.06	0.12	0.01	0.42	0.01	0.44	0.00	0.43
genome	0.06	0.03	0.05	0.11	0.05	0.10	0.04	0.11
labyrinth	0.05	0.17	0.78	0.23	0.00	0.23	0.78	0.23
logistics	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00
organic	0.05	0.02	0.07	0.02	0.07	0.02	0.04	0.02
pipesworld	0.20	0.38	0.20	0.24	0.18	0.40	0.26	0.34
rovers	0.28	0.00	0.23	0.00	0.25	0.00	0.00	0.07
visitall	0.26	0.06	0.17	0.16	0.13	0.18	0.06	0.23
Σ HTG	1.01	0.79	1.53	1.19	0.72	1.42	1.18	1.50
Σ	21.89	15.52	21.32	16.93	18.50	20.97	16.18	21.15

Table 5: Percentage of problems per domain where a column expands fewer nodes than its paired column. The higher value in each pair is indicated in bold. The (non-)novelty extensions are over the h^{ff} heuristic.