Automatic Configuration of Sequential Planning Portfolios: Generated Portfolios

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This technical report lists the portfolios that we found for our AAAI 2015 paper "Automatic Configuration of Sequential Planning Portfolios" [1].

Portfolios

We report one portfolio for each of satisficing, optimal and agile planning and one portfolio for each of the nine domains in the IPC 2011 learning track.

Each portfolio is a sequence of ⟨configuration, runtime⟩ pairs, and our textual description in this report lists each such pair in its one paragraph. Each paragraph states the runtime (in seconds), followed by the configuration (in the form of Fast Downward command line options). The configurations are specified in the syntax of Fast Downward revision 767b52f0c0ea (`http://fast-downward.org`)

For example, the portfolio for satisficing planning has 48 components, the first 4 of which are only run for one second each. The fourth configuration to be run uses enforced hill climbing search (`ehc`) with the STRIPS heuristic (`goalcount`) and assigns all operators their original costs (`cost_type=0`).

Satisficing Planning

```
1,
--heuristic hGoalCount=goalcount(cost_type=1)
--heuristic hFF=ff(cost_type=1)
--heuristic hAdd=add(cost_type=0)
--search lazy(alt([
    single(sum([g(),weight(hFF,2)])),
    single(sum([g(),weight(hFF,2)]),pref_only=true),
    single(sum([g(),weight(hAdd,2)])),
    single(sum([g(),weight(hAdd,2)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,2)])),
    single(sum([g(),weight(hGoalCount,2)]),pref_only=true)],boost=889),
    preferred=[hFF,hAdd],reopen_closed=false,cost_type=1)

1,
--heuristic hAdd=add(cost_type=2)
--heuristic hLMCut=lmcut(cost_type=0)
--heuristic hHMax=hmax()
--heuristic hGoalCount=goalcount(cost_type=2)
--heuristic hBlind=blind()
```

```
--search lazy(alt([
    single(hBlind),
    single(hLMCut),
    single(hHMax),
    single(hAdd),
    single(hGoalCount)],
    boost=3717),preferred=[],reopen_closed=true,cost_type=0)

1,
--landmarks lmg=lm_merged([lm_rhw(),lm_hm(m=1)],reasonable_orders=false,
    only_causal_landmarks=false,disjunctive_landmarks=true,
    conjunctive_landmarks=true,no_orders=false,cost_type=0)
--heuristic hGoalCount=goalcount(cost_type=1)
--heuristic hAdd=add(cost_type=2)
--heuristic hHMax=hmax()
--heuristic hLM=lmcount(lmg,admissible=false,pref=false,cost_type=0)
--search lazy(alt([
    single(sum([weight(g(),4),weight(hLM,5)])),
    single(sum([weight(g(),4),weight(hLM,5)]),pref_only=true),
    single(sum([weight(g(),4),weight(hHMax,5)])),
    single(sum([weight(g(),4),weight(hHMax,5)]),pref_only=true),
    single(sum([weight(g(),4),weight(hAdd,5)])),
    single(sum([weight(g(),4),weight(hAdd,5)]),pref_only=true),
    single(sum([weight(g(),4),weight(hGoalCount,5)])),
    single(sum([weight(g(),4),weight(hGoalCount,5)]),pref_only=true)],
    boost=294),preferred=[hAdd],reopen_closed=true,cost_type=0)

1,
--heuristic hGoalCount=goalcount(cost_type=0)
--search ehc(hGoalCount,cost_type=0)

3,
--heuristic hAdd=add(cost_type=1)
--heuristic hCg=cg(cost_type=1)
--search lazy(alt([
    single(sum([g(),weight(hAdd,3)])),
    single(sum([g(),weight(hCg,3)]))],boost=2849),preferred=[],
    reopen_closed=true,cost_type=1)

12,
--heuristic hFF=ff(cost_type=1)
--heuristic hCg=cg(cost_type=2)
--search lazy(alt([
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true),
    single(sum([g(),weight(hCg,10)])),
    single(sum([g(),weight(hCg,10)]),pref_only=true)],boost=2000),
    preferred=[hFF,hCg],reopen_closed=false,cost_type=1)

3,
--landmarks lmg=lm_rhw(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    lm_cost_type=2,cost_type=1)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search lazy(alt([
    single(sum([g(),weight(hLM,10)])),
    single(sum([g(),weight(hLM,10)]),pref_only=true),
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true)],boost=2000),
    preferred=[hLM,hFF],reopen_closed=false,cost_type=1)

1,
--heuristic hAdd=add(cost_type=2)
```

```
--heuristic hFF=ff(cost_type=0)
--heuristic hCg=cg(cost_type=1)
--heuristic hBlind=blind()
--heuristic hGoalCount=goalcount(cost_type=1)
--heuristic hCea=cea(cost_type=2)
--heuristic hHMax=hmax()
--search eager(alt([
    single(sum([weight(g(),4),weight(hBlind,5)])),
    single(sum([weight(g(),4),weight(hBlind,5)]),pref_only=true),
    single(sum([weight(g(),4),weight(hFF,5)])),
    single(sum([weight(g(),4),weight(hFF,5)]),pref_only=true),
    single(sum([weight(g(),4),weight(hHMax,5)])),
    single(sum([weight(g(),4),weight(hHMax,5)]),pref_only=true),
    single(sum([weight(g(),4),weight(hAdd,5)])),
    single(sum([weight(g(),4),weight(hAdd,5)]),pref_only=true),
    single(sum([weight(g(),4),weight(hCg,5)])),
    single(sum([weight(g(),4),weight(hCg,5)]),pref_only=true),
    single(sum([weight(g(),4),weight(hCea,5)])),
    single(sum([weight(g(),4),weight(hCea,5)]),pref_only=true),
    single(sum([weight(g(),4),weight(hGoalCount,5)])),
    single(sum([weight(g(),4),weight(hGoalCount,5)]),pref_only=true)],
    boost=3618),preferred=[hAdd,hCg,hGoalCount],reopen_closed=false,
    pathmax=false,cost_type=0)

2,
--heuristic hCea=cea(cost_type=2)
--search ehc(hCea,preferred=[hCea],preferred_usage=0,cost_type=0)

1,
--heuristic hLMCut=lmcut(cost_type=1)
--heuristic hFF=ff(cost_type=2)
--heuristic hBlind=blind()
--heuristic hHMax=hmax()
--search eager(alt([
    tiebreaking([sum([weight(g(),4),weight(hBlind,5)]),hBlind]),
    tiebreaking([sum([weight(g(),4),weight(hFF,5)]),hFF]),
    tiebreaking([sum([weight(g(),4),weight(hLMCut,5)]),hLMCut]),
    tiebreaking([sum([weight(g(),4),weight(hHMax,5)]),hHMax])],
    boost=1506),preferred=[],reopen_closed=true,pathmax=false,
    cost_type=0)

58,
--landmarks lmg=lm_rhw(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    lm_cost_type=2,cost_type=1)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search lazy(alt([
    single(sum([g(),weight(hLM,10)])),
    single(sum([g(),weight(hLM,10)]),pref_only=true),
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true)],boost=2000),
    preferred=[hLM,hFF],reopen_closed=false,cost_type=1)

3,
--landmarks lmg=lm_zg(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=true,
    cost_type=2)
--heuristic hLM=lmcount(lmg,admissible=false,pref=false,cost_type=2)
--search lazy(
    single(sum([weight(g(),2),weight(hLM,3)])),preferred=[],
    reopen_closed=false,cost_type=1)

4,
```

```
--landmarks lmg=lm_hm(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=false,no_orders=true,
    m=1,cost_type=0)
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=0)
--heuristic hAdd=add(cost_type=0)
--heuristic hBlind=blind()
--search eager(alt([
    tiebreaking([sum([weight(g(),8),weight(hBlind,9)]),hBlind]),
    tiebreaking([sum([weight(g(),8),weight(hLM,9)]),hLM]),
    tiebreaking([sum([weight(g(),8),weight(hAdd,9)]),hAdd])],
    boost=4475),preferred=[],reopen_closed=false,pathmax=true,
    cost_type=0)

10,
--landmarks lmg=lm_zg(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=true,
    cost_type=2)
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=2)
--heuristic hFF=ff(cost_type=0)
--search lazy(alt([
    tiebreaking([sum([weight(g(),8),weight(hFF,9)]),hFF]),
    tiebreaking([sum([weight(g(),8),weight(hFF,9)]),hFF],pref_only=true),
    tiebreaking([sum([weight(g(),8),weight(hLM,9)]),hLM]),
    tiebreaking([sum([weight(g(),8),weight(hLM,9)]),hLM],
    pref_only=true)],boost=33),preferred=[hFF],reopen_closed=false,
    cost_type=1)

60,
--heuristic hFF=ff(cost_type=1)
--search lazy(alt([
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true)],boost=2000),
    preferred=[hFF],reopen_closed=false,cost_type=1)

2,
--landmarks lmg=lm_merged([lm_rhw(),lm_hm(m=1)],reasonable_orders=true,
    only_causal_landmarks=true,disjunctive_landmarks=false,
    conjunctive_landmarks=true,no_orders=true,cost_type=2)
--heuristic hCg=cg(cost_type=0)
--heuristic hHMax=hmax()
--heuristic hGoalCount=goalcount(cost_type=0)
--heuristic hLM=lmcount(lmg,admissible=false,pref=false,cost_type=2)
--search eager(alt([
    single(hLM),
    single(hLM,pref_only=true),
    single(hHMax),
    single(hHMax,pref_only=true),
    single(hCg),
    single(hCg,pref_only=true),
    single(hGoalCount),
    single(hGoalCount,pref_only=true)],boost=182),preferred=[hCg,
    hGoalCount],reopen_closed=false,pathmax=true,cost_type=1)

23,
--heuristic hCea=cea(cost_type=0)
--heuristic hAdd=add(cost_type=1)
--search lazy(alt([
    tiebreaking([sum([weight(g(),8),weight(hAdd,9)]),hAdd]),
    tiebreaking([sum([weight(g(),8),weight(hAdd,9)]),hAdd],pref_only=true),
    tiebreaking([sum([weight(g(),8),weight(hCea,9)]),hCea]),
    tiebreaking([sum([weight(g(),8),weight(hCea,9)]),hCea],
    pref_only=true)],boost=2739),preferred=[hAdd],reopen_closed=false,
    cost_type=0)
```

```
1,
--heuristic hAdd=add(cost_type=0)
--search ehc(hAdd,cost_type=1)

1,
--heuristic hHMax=hmax()
--heuristic hCea=cea(cost_type=1)
--heuristic hCg=cg(cost_type=1)
--heuristic hAdd=add(cost_type=0)
--heuristic hGoalCount=goalcount(cost_type=1)
--search eager(alt([
    tiebreaking([sum([g(),hHMax]),hHMax]),
    tiebreaking([sum([g(),hHMax]),hHMax],pref_only=true),
    tiebreaking([sum([g(),hAdd]),hAdd]),
    tiebreaking([sum([g(),hAdd]),hAdd],pref_only=true),
    tiebreaking([sum([g(),hCg]),hCg]),
    tiebreaking([sum([g(),hCg]),hCg],pref_only=true),
    tiebreaking([sum([g(),hCea]),hCea]),
    tiebreaking([sum([g(),hCea]),hCea],pref_only=true),
    tiebreaking([sum([g(),hGoalCount]),hGoalCount]),
    tiebreaking([sum([g(),hGoalCount]),hGoalCount],pref_only=true)],
    boost=3541),preferred=[hAdd,hGoalCount],reopen_closed=false,
    pathmax=false,cost_type=1)

93,
--landmarks lmg=lm_merged([lm_rhw(),lm_hm(m=1)],reasonable_orders=true,
    only_causal_landmarks=false,disjunctive_landmarks=false,
    conjunctive_landmarks=true,no_orders=false,lm_cost_type=1,
    cost_type=2)
--heuristic hAdd=add(cost_type=0)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--heuristic hGoalCount=goalcount(cost_type=2)
--heuristic hCea=cea(cost_type=1)
--heuristic hCg=cg(cost_type=1)
--heuristic hBlind=blind()
--search lazy(alt([
    single(sum([g(),hBlind])),
    single(sum([g(),hBlind]),pref_only=true),
    single(sum([g(),hLM])),
    single(sum([g(),hLM]),pref_only=true),
    single(sum([g(),hFF])),
    single(sum([g(),hFF]),pref_only=true),
    single(sum([g(),hAdd])),
    single(sum([g(),hAdd]),pref_only=true),
    single(sum([g(),hCg])),
    single(sum([g(),hCg]),pref_only=true),
    single(sum([g(),hCea])),
    single(sum([g(),hCea]),pref_only=true),
    single(sum([g(),hGoalCount])),
    single(sum([g(),hGoalCount]),pref_only=true)],boost=3367),
    preferred=[hLM,hCg,hGoalCount],reopen_closed=true,cost_type=1)

106,
--heuristic hGoalCount=goalcount(cost_type=2)
--search lazy(alt([
    single(sum([g(),weight(hGoalCount,7)])),
    single(sum([g(),weight(hGoalCount,7)]),pref_only=true)],boost=2691),
    preferred=[hGoalCount],reopen_closed=true,cost_type=0)

64,
--landmarks lmg=lm_zg(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
```

```
    cost_type=1)
--heuristic hCea=cea(cost_type=2)
--heuristic hBlind=blind()
--heuristic hAdd=add(cost_type=1)
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=1)
--heuristic hFF=ff(cost_type=2)
--search lazy(alt([
    tiebreaking([sum([g(),weight(hBlind,10)]),hBlind]),
    tiebreaking([sum([g(),weight(hBlind,10)]),hBlind],pref_only=true),
    tiebreaking([sum([g(),weight(hFF,10)]),hFF]),
    tiebreaking([sum([g(),weight(hFF,10)]),hFF],pref_only=true),
    tiebreaking([sum([g(),weight(hLM,10)]),hLM]),
    tiebreaking([sum([g(),weight(hLM,10)]),hLM],pref_only=true),
    tiebreaking([sum([g(),weight(hAdd,10)]),hAdd]),
    tiebreaking([sum([g(),weight(hAdd,10)]),hAdd],pref_only=true),
    tiebreaking([sum([g(),weight(hCea,10)]),hCea]),
    tiebreaking([sum([g(),weight(hCea,10)]),hCea],pref_only=true)],
    boost=1795),preferred=[hFF,hCea],reopen_closed=false,cost_type=0)

47,
--heuristic hGoalCount=goalcount(cost_type=0)
--heuristic hFF=ff(cost_type=0)
--heuristic hCea=cea(cost_type=2)
--heuristic hCg=cg(cost_type=2)
--search eager(alt([
    single(sum([weight(g(),4),weight(hFF,5)])),
    single(sum([weight(g(),4),weight(hCg,5)])),
    single(sum([weight(g(),4),weight(hCea,5)])),
    single(sum([weight(g(),4),weight(hGoalCount,5)]))],boost=4352),
    preferred=[],reopen_closed=true,pathmax=false,cost_type=1)

42,
--heuristic hFF=ff(cost_type=2)
--search ehc(hFF,preferred=[hFF],preferred_usage=1,cost_type=1)

1,
--landmarks lmg=lm_hm(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=false,
    no_orders=false,m=2,cost_type=0)
--heuristic hAdd=add(cost_type=1)
--heuristic hLM=lmcount(lmg,admissible=false,pref=true,cost_type=0)
--heuristic hHMax=hmax()
--search lazy(alt([
    single(sum([weight(g(),2),weight(hLM,3)])),
    single(sum([weight(g(),2),weight(hHMax,3)])),
    single(sum([weight(g(),2),weight(hAdd,3)]))],boost=4853),
    preferred=[],reopen_closed=true,cost_type=0)

2,
--landmarks lmg=lm_rhw(reasonable_orders=false,only_causal_landmarks=true,
    disjunctive_landmarks=false,conjunctive_landmarks=true,
    no_orders=false,lm_cost_type=0,cost_type=2)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=true)
--heuristic hGoalCount=goalcount(cost_type=2)
--heuristic hCea=cea(cost_type=0)
--heuristic hHMax=hmax()
--heuristic hAdd=add(cost_type=0)
--search lazy(alt([
    single(sum([weight(g(),8),weight(hLM,9)])),
    single(sum([weight(g(),8),weight(hLM,9)]),pref_only=true),
    single(sum([weight(g(),8),weight(hFF,9)])),
    single(sum([weight(g(),8),weight(hFF,9)]),pref_only=true),
    single(sum([weight(g(),8),weight(hHMax,9)])),
```

```
    single(sum([weight(g(),8),weight(hHMax,9)]),pref_only=true),
    single(sum([weight(g(),8),weight(hAdd,9)])),
    single(sum([weight(g(),8),weight(hAdd,9)]),pref_only=true),
    single(sum([weight(g(),8),weight(hCea,9)])),
    single(sum([weight(g(),8),weight(hCea,9)]),pref_only=true),
    single(sum([weight(g(),8),weight(hGoalCount,9)])),
    single(sum([weight(g(),8),weight(hGoalCount,9)]),pref_only=true)],
    boost=4192),preferred=[hFF,hAdd],reopen_closed=false,cost_type=1)

21,
--heuristic hCea=cea(cost_type=2)
--heuristic hAdd=add(cost_type=2)
--heuristic hCg=cg(cost_type=2)
--heuristic hHMax=hmax()
--heuristic hGoalCount=goalcount(cost_type=0)
--search eager(alt([
    single(sum([g(),weight(hHMax,5)])),
    single(sum([g(),weight(hHMax,5)]),pref_only=true),
    single(sum([g(),weight(hAdd,5)])),
    single(sum([g(),weight(hAdd,5)]),pref_only=true),
    single(sum([g(),weight(hCg,5)])),
    single(sum([g(),weight(hCg,5)]),pref_only=true),
    single(sum([g(),weight(hCea,5)])),
    single(sum([g(),weight(hCea,5)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,5)])),
    single(sum([g(),weight(hGoalCount,5)]),pref_only=true)],boost=597),
    preferred=[hAdd,hCg,hCea,hGoalCount],reopen_closed=true,
    pathmax=false,cost_type=1)

109,
--heuristic hHMax=hmax()
--heuristic hBlind=blind()
--heuristic hGoalCount=goalcount(cost_type=1)
--heuristic hCea=cea(cost_type=0)
--search eager(alt([
    tiebreaking([sum([g(),weight(hBlind,7)]),hBlind]),
    tiebreaking([sum([g(),weight(hHMax,7)]),hHMax]),
    tiebreaking([sum([g(),weight(hCea,7)]),hCea]),
    tiebreaking([sum([g(),weight(hGoalCount,7)]),hGoalCount])],
    boost=1941),preferred=[],reopen_closed=true,pathmax=true,
    cost_type=0)

167,
--landmarks lmg=lm_merged([lm_rhw(),lm_hm(m=1)],reasonable_orders=false,
    only_causal_landmarks=false,disjunctive_landmarks=true,
    conjunctive_landmarks=true,no_orders=false,cost_type=1)
--heuristic hHMax=hmax()
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=1)
--heuristic hGoalCount=goalcount(cost_type=0)
--search lazy(alt([
    single(sum([g(),weight(hLM,5)])),
    single(sum([g(),weight(hHMax,5)])),
    single(sum([g(),weight(hGoalCount,5)]))],boost=1908),preferred=[],
    reopen_closed=false,cost_type=0)

1,
--heuristic hHMax=hmax()
--heuristic hGoalCount=goalcount(cost_type=2)
--heuristic hAdd=add(cost_type=2)
--search lazy(alt([
    single(sum([weight(g(),4),weight(hHMax,5)])),
    single(sum([weight(g(),4),weight(hHMax,5)]),pref_only=true),
    single(sum([weight(g(),4),weight(hAdd,5)])),
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    single(sum([weight(g(),4),weight(hAdd,5)]),pref_only=true),
    single(sum([weight(g(),4),weight(hGoalCount,5)])),
    single(sum([weight(g(),4),weight(hGoalCount,5)]),pref_only=true)],
    boost=1003),preferred=[hAdd,hGoalCount],reopen_closed=false,
    cost_type=0)

115,
--heuristic hBlind=blind()
--heuristic hHMax=hmax()
--search eager(alt([
    single(hBlind),
    single(hHMax)],boost=4157),preferred=[],reopen_closed=true,
    pathmax=false,cost_type=1)

33,
--landmarks lmg=lm_zg(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    cost_type=0)
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=0)
--heuristic hFF=ff(cost_type=2)
--heuristic hCg=cg(cost_type=2)
--heuristic hCea=cea(cost_type=2)
--heuristic hAdd=add(cost_type=0)
--search eager(alt([
    single(sum([g(),hFF])),
    single(sum([g(),hFF]),pref_only=true),
    single(sum([g(),hLM])),
    single(sum([g(),hLM]),pref_only=true),
    single(sum([g(),hAdd])),
    single(sum([g(),hAdd]),pref_only=true),
    single(sum([g(),hCg])),
    single(sum([g(),hCg]),pref_only=true),
    single(sum([g(),hCea])),
    single(sum([g(),hCea]),pref_only=true)],boost=512),preferred=[hFF,
    hAdd,hCg],reopen_closed=false,pathmax=true,cost_type=0)

115,
--heuristic hCg=cg(cost_type=2)
--heuristic hHMax=hmax()
--heuristic hBlind=blind()
--search eager(alt([
    single(hBlind),
    single(hHMax),
    single(hCg)],boost=4157),preferred=[],reopen_closed=true,
    pathmax=false,cost_type=1)

25,
--heuristic hAdd=add(cost_type=2)
--heuristic hFF=ff(cost_type=2)
--search eager(alt([
    single(sum([weight(g(),2),weight(hFF,3)])),
    single(sum([weight(g(),2),weight(hFF,3)]),pref_only=true),
    single(sum([weight(g(),2),weight(hAdd,3)])),
    single(sum([weight(g(),2),weight(hAdd,3)]),pref_only=true)],
    boost=2764),preferred=[hFF,hAdd],reopen_closed=true,pathmax=false,
    cost_type=0)

17,
--heuristic hCea=cea(cost_type=1)
--search ehc(hCea,preferred=[hCea],preferred_usage=0,cost_type=0)

60,
--heuristic hFF=ff(cost_type=1)
```

```
--heuristic hCg=cg(cost_type=2)
--heuristic hBlind=blind()
--heuristic hHMax=hmax()
--search lazy(alt([
    single(sum([g(),weight(hBlind,10)])),
    single(sum([g(),weight(hBlind,10)]),pref_only=true),
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true),
    single(sum([g(),weight(hHMax,10)])),
    single(sum([g(),weight(hHMax,10)]),pref_only=true),
    single(sum([g(),weight(hCg,10)])),
    single(sum([g(),weight(hCg,10)]),pref_only=true)],boost=2000),
    preferred=[hFF,hCg],reopen_closed=false,cost_type=1)

25,
--landmarks lmg=lm_rhw(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=false,conjunctive_landmarks=true,
    no_orders=false,cost_type=2)
--heuristic hAdd=add(cost_type=1)
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=2)
--heuristic hFF=ff(cost_type=0)
--heuristic hCg=cg(cost_type=0)
--heuristic hCea=cea(cost_type=2)
--heuristic hBlind=blind()
--search lazy(alt([
    single(sum([g(),weight(hBlind,3)])),
    single(sum([g(),weight(hBlind,3)]),pref_only=true),
    single(sum([g(),weight(hFF,3)])),
    single(sum([g(),weight(hFF,3)]),pref_only=true),
    single(sum([g(),weight(hLM,3)])),
    single(sum([g(),weight(hLM,3)]),pref_only=true),
    single(sum([g(),weight(hAdd,3)])),
    single(sum([g(),weight(hAdd,3)]),pref_only=true),
    single(sum([g(),weight(hCg,3)])),
    single(sum([g(),weight(hCg,3)]),pref_only=true),
    single(sum([g(),weight(hCea,3)])),
    single(sum([g(),weight(hCea,3)]),pref_only=true)],boost=223),
    preferred=[hCg,hCea],reopen_closed=false,cost_type=0)

223,
--heuristic hBlind=blind()
--heuristic hFF=ff(cost_type=2)
--heuristic hCg=cg(cost_type=0)
--heuristic hHMax=hmax()
--heuristic hGoalCount=goalcount(cost_type=0)
--search eager(alt([
    single(sum([g(),weight(hBlind,5)])),
    single(sum([g(),weight(hBlind,5)]),pref_only=true),
    single(sum([g(),weight(hFF,5)])),
    single(sum([g(),weight(hFF,5)]),pref_only=true),
    single(sum([g(),weight(hHMax,5)])),
    single(sum([g(),weight(hHMax,5)]),pref_only=true),
    single(sum([g(),weight(hCg,5)])),
    single(sum([g(),weight(hCg,5)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,5)])),
    single(sum([g(),weight(hGoalCount,5)]),pref_only=true)],boost=893),
    preferred=[hFF,hGoalCount],reopen_closed=true,pathmax=true,
    cost_type=0)

10,
--heuristic hFF=ff(cost_type=0)
--heuristic hLMCut=lmcut(cost_type=1)
--search lazy(alt([
```

```
    single(sum([weight(g(),4),weight(hFF,5)])),
    single(sum([weight(g(),4),weight(hFF,5)]),pref_only=true),
    single(sum([weight(g(),4),weight(hLMCut,5)])),
    single(sum([weight(g(),4),weight(hLMCut,5)]),pref_only=true)],
    boost=207),preferred=[hFF],reopen_closed=true,cost_type=1)

258,
--heuristic hCea=cea(cost_type=1)
--heuristic hFF=ff(cost_type=2)
--heuristic hBlind=blind()
--search lazy(alt([
    single(sum([g(),weight(hBlind,10)])),
    single(sum([g(),weight(hBlind,10)]),pref_only=true),
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true),
    single(sum([g(),weight(hCea,10)])),
    single(sum([g(),weight(hCea,10)]),pref_only=true)],boost=3434),
    preferred=[hCea],reopen_closed=false,cost_type=0)

2,
--landmarks lmg=lm_rhw(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=false,conjunctive_landmarks=true,
    no_orders=false,cost_type=1)
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=1)
--search lazy(
    tiebreaking([sum([g(),weight(hLM,2)]),hLM]),preferred=[],
    reopen_closed=false,cost_type=1)

18,
--landmarks lmg=lm_merged([lm_rhw(),lm_hm(m=1)],reasonable_orders=true,
    only_causal_landmarks=false,disjunctive_landmarks=true,
    conjunctive_landmarks=true,no_orders=true,lm_cost_type=2,cost_type=1)
--heuristic hBlind=blind()
--heuristic hHMax=hmax()
--heuristic hCea=cea(cost_type=0)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search lazy(alt([
    single(sum([weight(g(),8),weight(hBlind,9)])),
    single(sum([weight(g(),8),weight(hBlind,9)]),pref_only=true),
    single(sum([weight(g(),8),weight(hLM,9)])),
    single(sum([weight(g(),8),weight(hLM,9)]),pref_only=true),
    single(sum([weight(g(),8),weight(hFF,9)])),
    single(sum([weight(g(),8),weight(hFF,9)]),pref_only=true),
    single(sum([weight(g(),8),weight(hHMax,9)])),
    single(sum([weight(g(),8),weight(hHMax,9)]),pref_only=true),
    single(sum([weight(g(),8),weight(hCea,9)])),
    single(sum([weight(g(),8),weight(hCea,9)]),pref_only=true)],
    boost=3112),preferred=[hLM,hFF],reopen_closed=false,cost_type=1)

25,
--heuristic hHMax=hmax()
--heuristic hFF=ff(cost_type=0)
--search eager(alt([
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hHMax,10)]))],boost=1870),preferred=[],
    reopen_closed=true,pathmax=true,cost_type=0)

5,
--heuristic hCg=cg(cost_type=2)
--search lazy(alt([
    tiebreaking([sum([weight(g(),8),weight(hCg,9)]),hCg]),
    tiebreaking([sum([weight(g(),8),weight(hCg,9)]),hCg],
    pref_only=true)],boost=2029),preferred=[hCg],reopen_closed=false,
```

```
    cost_type=0)

2,
--landmarks lmg=lm_rhw(reasonable_orders=false,only_causal_landmarks=true,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    cost_type=1)
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=1)
--heuristic hLMCut=lmcut(cost_type=1)
--heuristic hGoalCount=goalcount(cost_type=1)
--search lazy(alt([
    single(sum([g(),weight(hLM,7)])),
    single(sum([g(),weight(hLM,7)]),pref_only=true),
    single(sum([g(),weight(hLMCut,7)])),
    single(sum([g(),weight(hLMCut,7)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,7)])),
    single(sum([g(),weight(hGoalCount,7)]),pref_only=true)],boost=904),
    preferred=[hGoalCount],reopen_closed=false,cost_type=1)

16,
--landmarks lmg=lm_merged([lm_rhw(),lm_hm(m=1)],reasonable_orders=false,
    only_causal_landmarks=true,disjunctive_landmarks=true,
    conjunctive_landmarks=true,no_orders=false,cost_type=1)
--heuristic hCea=cea(cost_type=1)
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=1)
--heuristic hCg=cg(cost_type=0)
--heuristic hAdd=add(cost_type=0)
--heuristic hFF=ff(cost_type=1)
--search lazy(alt([
    tiebreaking([sum([g(),weight(hFF,3)]),hFF]),
    tiebreaking([sum([g(),weight(hFF,3)]),hFF],pref_only=true),
    tiebreaking([sum([g(),weight(hLM,3)]),hLM]),
    tiebreaking([sum([g(),weight(hLM,3)]),hLM],pref_only=true),
    tiebreaking([sum([g(),weight(hAdd,3)]),hAdd]),
    tiebreaking([sum([g(),weight(hAdd,3)]),hAdd],pref_only=true),
    tiebreaking([sum([g(),weight(hCg,3)]),hCg]),
    tiebreaking([sum([g(),weight(hCg,3)]),hCg],pref_only=true),
    tiebreaking([sum([g(),weight(hCea,3)]),hCea]),
    tiebreaking([sum([g(),weight(hCea,3)]),hCea],pref_only=true)],
    boost=607),preferred=[hAdd],reopen_closed=true,cost_type=1)

4,
--heuristic hCg=cg(cost_type=0)
--search eager(
    single(hCg),preferred=[],reopen_closed=false,pathmax=false,cost_type=0)

6,
--heuristic hLMCut=lmcut(cost_type=2)
--heuristic hFF=ff(cost_type=1)
--heuristic hCg=cg(cost_type=0)
--search lazy(alt([
    single(sum([g(),hFF])),
    single(sum([g(),hLMCut])),
    single(sum([g(),hCg]))],boost=3166),preferred=[],
    reopen_closed=false,cost_type=0)
```

Optimal Planning

```
1,
--landmarks lmg=lm_hm(only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,
    no_orders=false,m=1)
--heuristic hBlind=blind()
--heuristic hLM=lmcount(lmg,admissible=true)
--heuristic hCombinedMax=max([hBlind,hLM])
```

```
--search astar(hCombinedMax,mpd=false,pathmax=true,cost_type=0)

1,
--heuristic hLMCut=lmcut()
--search astar(hLMCut,mpd=false,pathmax=false,cost_type=0)

2,
--heuristic hBlind=blind()
--search astar(hBlind,mpd=false,pathmax=true,cost_type=0)

5,
--heuristic hMas=merge_and_shrink(reduce_labels=true,
    merge_strategy=MERGE_LINEAR_CG_GOAL_LEVEL,
    shrink_strategy=shrink_bisimulation(max_states=1203,
    max_states_before_merge=-1,greedy=false,threshold=722,
    group_by_h=true,at_limit=RETURN))
--search astar(hMas,mpd=false,pathmax=true,cost_type=0)

5,
--heuristic hLMCut=lmcut()
--heuristic hBlind=blind()
--heuristic hCombinedMax=max([hBlind,hLMCut])
--search astar(hCombinedMax,mpd=false,pathmax=true,cost_type=0)

6,
--heuristic hHMax=hmax()
--heuristic hBlind=blind()
--heuristic hCombinedMax=max([hBlind,hHMax])
--search astar(hCombinedMax,mpd=false,pathmax=false,cost_type=0)

43,
--heuristic hBlind=blind()
--heuristic hLMCut=lmcut()
--heuristic hCombinedMax=max([hBlind,hLMCut])
--search astar(hCombinedMax,mpd=false,pathmax=false,cost_type=0)

73,
--heuristic hMas=merge_and_shrink(reduce_labels=true,
    merge_strategy=MERGE_LINEAR_CG_GOAL_LEVEL,
    shrink_strategy=shrink_bisimulation(max_states=2606,
    max_states_before_merge=-1,greedy=true,threshold=1538,
    group_by_h=false,at_limit=RETURN))
--heuristic hBlind=blind()
--heuristic hCombinedMax=max([hMas,hBlind])
--search astar(hCombinedMax,mpd=false,pathmax=false,cost_type=0)

109,
--heuristic hBlind=blind()
--heuristic hLMCut=lmcut()
--heuristic hCombinedMax=max([hBlind,hLMCut])
--search astar(hCombinedMax,mpd=false,pathmax=true,cost_type=0)

90,
--landmarks lmg=lm_merged([lm_rhw(),lm_hm(m=1)],only_causal_landmarks=true,
    disjunctive_landmarks=false,conjunctive_landmarks=true,no_orders=true)
--heuristic hLM=lmcount(lmg,admissible=true)
--search astar(hLM,mpd=true,pathmax=false,cost_type=0)

92,
--heuristic hMas=merge_and_shrink(reduce_labels=true,
    merge_strategy=MERGE_LINEAR_CG_GOAL_LEVEL,
    shrink_strategy=shrink_fh(max_states=2293743,
    max_states_before_merge=-1,shrink_f=HIGH,shrink_h=LOW))
```

```
--heuristic hBlind=blind()
--heuristic hCombinedMax=max([hMas,hBlind])
--search astar(hCombinedMax,mpd=false,pathmax=false,cost_type=0)

156,
--landmarks lmg=lm_zg(only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,
    no_orders=false)
--heuristic hMas=merge_and_shrink(reduce_labels=true,
    merge_strategy=MERGE_LINEAR_REVERSE_LEVEL,
    shrink_strategy=shrink_bisimulation(max_states=414896,
    max_states_before_merge=-1,greedy=false,threshold=74681,
    group_by_h=true,at_limit=USE_UP))
--heuristic hLM=lmcount(lmg,admissible=true)
--heuristic hCombinedMax=max([hMas,hLM])
--search astar(hCombinedMax,mpd=false,pathmax=false,cost_type=0)

155,
--heuristic hMas=merge_and_shrink(reduce_labels=true,
    merge_strategy=MERGE_LINEAR_CG_GOAL_LEVEL,
    shrink_strategy=shrink_bisimulation(max_states=1069414,
    max_states_before_merge=-1,greedy=false,threshold=85553,
    group_by_h=false,at_limit=RETURN))
--heuristic hBlind=blind()
--heuristic hCombinedMax=max([hMas,hBlind])
--search astar(hCombinedMax,mpd=false,pathmax=false,cost_type=0)

84,
--heuristic hBlind=blind()
--search astar(hBlind,mpd=false,pathmax=false,cost_type=0)

492,
--heuristic hLMCut=lmcut()
--heuristic hMas=merge_and_shrink(reduce_labels=true,
    merge_strategy=MERGE_LINEAR_REVERSE_LEVEL,
    shrink_strategy=shrink_bisimulation(max_states=288837,
    max_states_before_merge=-1,greedy=false,threshold=219516,
    group_by_h=false,at_limit=RETURN))
--heuristic hCombinedMax=max([hMas,hLMCut])
--search astar(hCombinedMax,mpd=false,pathmax=false,cost_type=0)
```

Agile Planning

```
1,
--landmarks lmg=lm_hm(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    m=1,cost_type=1)
--heuristic hLM=lmcount(lmg,admissible=false,pref=false,cost_type=1)
--heuristic hFF=ff(cost_type=1)
--heuristic hGoalCount=goalcount(cost_type=0)
--search lazy(alt([
    single(hFF),
    single(hFF,pref_only=true),
    single(hLM),
    single(hLM,pref_only=true),
    single(hGoalCount),
    single(hGoalCount,pref_only=true)],boost=893),preferred=[hFF],
    reopen_closed=false,cost_type=1)

1,
--heuristic hHMax=hmax()
--heuristic hAdd=add(cost_type=0)
--search lazy(alt([
    single(sum([g(),hHMax])),
```

```
    single(sum([g(),hAdd]))],boost=3695),preferred=[],
    reopen_closed=false,cost_type=0)

3,
--landmarks lmg=lm_zg(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=true,
    lm_cost_type=1,cost_type=1)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search lazy(alt([
    single(hLM),
    single(hLM,pref_only=true),
    single(hFF),
    single(hFF,pref_only=true)],boost=2081),preferred=[hLM],
    reopen_closed=true,cost_type=0)

1,
--heuristic hGoalCount=goalcount(cost_type=2)
--search lazy(alt([
    single(hGoalCount),
    single(hGoalCount,pref_only=true)],boost=3875),
    preferred=[hGoalCount],reopen_closed=false,cost_type=1)

1,
--heuristic hCea=cea(cost_type=0)
--search ehc(hCea,preferred=[hCea],preferred_usage=1,cost_type=1)

15,
--landmarks lmg=lm_hm(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    m=1,lm_cost_type=1,cost_type=1)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search lazy(alt([
    single(hLM),
    single(hLM,pref_only=true),
    single(hFF),
    single(hFF,pref_only=true)],boost=2530),preferred=[hLM,hFF],
    reopen_closed=false,cost_type=0)

1,
--heuristic hCg=cg(cost_type=0)
--heuristic hGoalCount=goalcount(cost_type=1)
--heuristic hAdd=add(cost_type=1)
--search lazy(alt([
    single(sum([g(),weight(hAdd,7)])),
    single(sum([g(),weight(hAdd,7)]),pref_only=true),
    single(sum([g(),weight(hCg,7)])),
    single(sum([g(),weight(hCg,7)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,7)])),
    single(sum([g(),weight(hGoalCount,7)]),pref_only=true)],boost=2639),
    preferred=[hGoalCount],reopen_closed=false,cost_type=0)

1,
--heuristic hFF=ff(cost_type=1)
--search lazy(alt([
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true)],boost=4917),
    preferred=[hFF],reopen_closed=true,cost_type=1)

33,
--landmarks lmg=lm_rhw(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=true,
    cost_type=1)
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=1)
```

```
--heuristic hFF=ff(cost_type=1)
--search lazy(alt([
    tiebreaking([sum([g(),weight(hFF,10)]),hFF]),
    tiebreaking([sum([g(),weight(hFF,10)]),hFF],pref_only=true),
    tiebreaking([sum([g(),weight(hLM,10)]),hLM]),
    tiebreaking([sum([g(),weight(hLM,10)]),hLM],pref_only=true)],
    boost=2094),preferred=[hFF],reopen_closed=false,cost_type=1)

1,
--landmarks lmg=lm_rhw(reasonable_orders=false,only_causal_landmarks=true,
    disjunctive_landmarks=false,conjunctive_landmarks=true,
    no_orders=false,cost_type=0)
--heuristic hLMCut=lmcut(cost_type=2)
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=0)
--heuristic hGoalCount=goalcount(cost_type=1)
--search lazy(alt([
    tiebreaking([sum([g(),weight(hLM,10)]),hLM]),
    tiebreaking([sum([g(),weight(hLMCut,10)]),hLMCut]),
    tiebreaking([sum([g(),weight(hGoalCount,10)]),hGoalCount])],
    boost=1179),preferred=[],reopen_closed=false,cost_type=1)
```

Learning Setting

- barman

```
26,
--heuristic hFF=ff(cost_type=2)
--heuristic hHMax=hmax()
--heuristic hGoalCount=goalcount(cost_type=1)
--heuristic hBlind=blind()
--search lazy(alt([
    single(hBlind),
    single(hBlind,pref_only=true),
    single(hFF),
    single(hFF,pref_only=true),
    single(hHMax),
    single(hHMax,pref_only=true),
    single(hGoalCount),
    single(hGoalCount,pref_only=true)],boost=2036),preferred=[hFF],
    reopen_closed=true,cost_type=1)

5,
--landmarks lmg=lm_merged([lm_rhw(),lm_hm(m=1)],reasonable_orders=true,
    only_causal_landmarks=false,disjunctive_landmarks=false,
    conjunctive_landmarks=true,no_orders=true,lm_cost_type=0,cost_type=1)
--heuristic hGoalCount=goalcount(cost_type=2)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search eager(alt([
    single(hLM),
    single(hLM,pref_only=true),
    single(hFF),
    single(hFF,pref_only=true),
    single(hGoalCount),
    single(hGoalCount,pref_only=true)],boost=3289),preferred=[hLM],
    reopen_closed=true,pathmax=false,cost_type=0)

5,
--landmarks lmg=lm_rhw(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=false,conjunctive_landmarks=true,no_orders=true,
    lm_cost_type=0,cost_type=0)
--heuristic hGoalCount=goalcount(cost_type=1)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search eager(alt([
    single(hLM),
```

```
    single(hLM,pref_only=true),
    single(hFF),
    single(hFF,pref_only=true),
    single(hGoalCount),
    single(hGoalCount,pref_only=true)],boost=1121),preferred=[hLM,hFF,
    hGoalCount],reopen_closed=false,pathmax=false,cost_type=1)

33,
--landmarks lmg=lm_rhw(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=false,conjunctive_landmarks=true,no_orders=true,
    lm_cost_type=0,cost_type=2)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=true)
--heuristic hAdd=add(cost_type=1)
--search eager(alt([
    single(sum([g(),weight(hLM,10)])),
    single(sum([g(),weight(hLM,10)]),pref_only=true),
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true),
    single(sum([g(),weight(hAdd,10)])),
    single(sum([g(),weight(hAdd,10)]),pref_only=true)],boost=4255),
    preferred=[hFF,hAdd],reopen_closed=false,pathmax=false,cost_type=0)

32,
--landmarks lmg=lm_zg(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=true,
    cost_type=0)
--heuristic hHMax=hmax()
--heuristic hLM=lmcount(lmg,admissible=false,pref=false,cost_type=0)
--heuristic hFF=ff(cost_type=2)
--heuristic hAdd=add(cost_type=2)
--search eager(alt([
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true),
    single(sum([g(),weight(hLM,10)])),
    single(sum([g(),weight(hLM,10)]),pref_only=true),
    single(sum([g(),weight(hHMax,10)])),
    single(sum([g(),weight(hHMax,10)]),pref_only=true),
    single(sum([g(),weight(hAdd,10)])),
    single(sum([g(),weight(hAdd,10)]),pref_only=true)],boost=4385),
    preferred=[hFF],reopen_closed=false,pathmax=false,cost_type=0)
```

- blocksworld

```
20,
--heuristic hFF=ff(cost_type=1)
--search lazy(alt([
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true)],boost=2629),
    preferred=[hFF],reopen_closed=false,cost_type=1)

60,
--landmarks lmg=lm_rhw(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    lm_cost_type=2,cost_type=1)
--heuristic hGoalCount=goalcount(cost_type=2)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search lazy(alt([
    single(hLM),
    single(hLM,pref_only=true),
    single(hFF),
    single(hFF,pref_only=true),
    single(hGoalCount),
    single(hGoalCount,pref_only=true)],boost=1853),preferred=[hLM,hFF,
    hGoalCount],reopen_closed=false,cost_type=0)
```

```
53,
--heuristic hAdd=add(cost_type=0)
--search lazy(alt([
    single(sum([g(),hAdd])),
    single(sum([g(),hAdd]),pref_only=true)],boost=2551),
    preferred=[hAdd],reopen_closed=true,cost_type=1)

36,
--heuristic hCg=cg(cost_type=1)
--heuristic hFF=ff(cost_type=1)
--heuristic hGoalCount=goalcount(cost_type=0)
--search lazy(alt([
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true),
    single(sum([g(),weight(hCg,10)])),
    single(sum([g(),weight(hCg,10)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,10)])),
    single(sum([g(),weight(hGoalCount,10)]),pref_only=true)],
    boost=1768),preferred=[hFF,hCg,hGoalCount],reopen_closed=false,
    cost_type=0)

15,
--landmarks lmg=lm_rhw(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    lm_cost_type=1,cost_type=0)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search lazy(alt([
    single(sum([g(),weight(hLM,10)])),
    single(sum([g(),weight(hLM,10)]),pref_only=true),
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true)],boost=2000),
    preferred=[hLM,hFF],reopen_closed=true,cost_type=1)

59,
--landmarks lmg=lm_merged([lm_rhw(),lm_hm(m=1)],reasonable_orders=false,
    only_causal_landmarks=false,disjunctive_landmarks=true,
    conjunctive_landmarks=true,no_orders=true,lm_cost_type=2,cost_type=2)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=true)
--search lazy(alt([
    single(sum([g(),weight(hLM,10)])),
    single(sum([g(),weight(hLM,10)]),pref_only=true),
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true)],boost=2123),
    preferred=[hFF],reopen_closed=false,cost_type=0)

36,
--landmarks lmg=lm_rhw(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    lm_cost_type=1,cost_type=0)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--heuristic hGoalCount=goalcount(cost_type=2)
--heuristic hCg=cg(cost_type=2)
--search lazy(alt([
    single(sum([g(),weight(hLM,5)])),
    single(sum([g(),weight(hLM,5)]),pref_only=true),
    single(sum([g(),weight(hFF,5)])),
    single(sum([g(),weight(hFF,5)]),pref_only=true),
    single(sum([g(),weight(hCg,5)])),
    single(sum([g(),weight(hCg,5)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,5)])),
    single(sum([g(),weight(hGoalCount,5)]),pref_only=true)],boost=3881),
    preferred=[hFF,hCg],reopen_closed=false,cost_type=0)
```

```
17,
--landmarks lmg=lm_rhw(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    lm_cost_type=2,cost_type=2)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search lazy(alt([
    single(hLM),
    single(hLM,pref_only=true),
    single(hFF),
    single(hFF,pref_only=true)],boost=2459),preferred=[hLM,hFF],
    reopen_closed=false,cost_type=0)

60,
--heuristic hGoalCount=goalcount(cost_type=0)
--heuristic hFF=ff(cost_type=2)
--search lazy(alt([
    single(sum([g(),weight(hFF,7)])),
    single(sum([g(),weight(hFF,7)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,7)])),
    single(sum([g(),weight(hGoalCount,7)]),pref_only=true)],boost=4159),
    preferred=[hFF,hGoalCount],reopen_closed=true,cost_type=1)

59,
--landmarks lmg=lm_rhw(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    lm_cost_type=1,cost_type=2)
--heuristic hCg=cg(cost_type=2)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--heuristic hGoalCount=goalcount(cost_type=2)
--search lazy(alt([
    single(sum([g(),weight(hLM,10)])),
    single(sum([g(),weight(hLM,10)]),pref_only=true),
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true),
    single(sum([g(),weight(hCg,10)])),
    single(sum([g(),weight(hCg,10)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,10)])),
    single(sum([g(),weight(hGoalCount,10)]),pref_only=true)],
    boost=2000),preferred=[hLM,hFF,hCg,hGoalCount],reopen_closed=false,
    cost_type=1)
```

- depots

```
8,
--landmarks lmg=lm_merged([lm_rhw(),lm_hm(m=1)],reasonable_orders=true,
    only_causal_landmarks=true,disjunctive_landmarks=true,
    conjunctive_landmarks=true,no_orders=false,cost_type=0)
--heuristic hBlind=blind()
--heuristic hHMax=hmax()
--heuristic hLM=lmcount(lmg,admissible=false,pref=false,cost_type=0)
--heuristic hFF=ff(cost_type=1)
--search lazy(alt([
    tiebreaking([sum([g(),weight(hBlind,3)]),hBlind]),
    tiebreaking([sum([g(),weight(hFF,3)]),hFF]),
    tiebreaking([sum([g(),weight(hLM,3)]),hLM]),
    tiebreaking([sum([g(),weight(hHMax,3)]),hHMax])],boost=1352),
    preferred=[],reopen_closed=true,cost_type=0)

5,
--landmarks lmg=lm_merged([lm_rhw(),lm_hm(m=1)],reasonable_orders=true,
    only_causal_landmarks=false,disjunctive_landmarks=true,
    conjunctive_landmarks=true,no_orders=false,cost_type=1)
--heuristic hLM=lmcount(lmg,admissible=false,pref=false,cost_type=1)
```

```
--heuristic hBlind=blind()
--search eager(alt([
    single(sum([g(),weight(hBlind,2)])),
    single(sum([g(),weight(hLM,2)]))],boost=2768),preferred=[],
    reopen_closed=true,pathmax=false,cost_type=0)

1,
--landmarks lmg=lm_rhw(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=true,
    cost_type=1)
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=1)
--search eager(
    single(sum([g(),weight(hLM,3)])),preferred=[],reopen_closed=false,
    pathmax=true,cost_type=0)

3,
--landmarks lmg=lm_hm(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=true,
    m=1,cost_type=1)
--heuristic hLM=lmcount(lmg,admissible=false,pref=false,cost_type=1)
--heuristic hGoalCount=goalcount(cost_type=0)
--search lazy(alt([
    tiebreaking([sum([g(),weight(hLM,3)]),hLM]),
    tiebreaking([sum([g(),weight(hLM,3)]),hLM],pref_only=true),
    tiebreaking([sum([g(),weight(hGoalCount,3)]),hGoalCount]),
    tiebreaking([sum([g(),weight(hGoalCount,3)]),hGoalCount],
    pref_only=true)],boost=1112),preferred=[hGoalCount],
    reopen_closed=true,cost_type=1)

19,
--landmarks lmg=lm_zg(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    cost_type=0)
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=0)
--heuristic hHMax=hmax()
--heuristic hBlind=blind()
--search lazy(alt([
    single(sum([g(),weight(hBlind,3)])),
    single(sum([g(),weight(hLM,3)])),
    single(sum([g(),weight(hHMax,3)]))],boost=1721),preferred=[],
    reopen_closed=true,cost_type=0)

5,
--landmarks lmg=lm_merged([lm_rhw(),lm_hm(m=1)],reasonable_orders=false,
    only_causal_landmarks=true,disjunctive_landmarks=true,
    conjunctive_landmarks=true,no_orders=false,cost_type=1)
--heuristic hLM=lmcount(lmg,admissible=false,pref=false,cost_type=1)
--heuristic hCea=cea(cost_type=1)
--heuristic hHMax=hmax()
--heuristic hAdd=add(cost_type=2)
--heuristic hGoalCount=goalcount(cost_type=0)
--search eager(alt([
    single(hLM),
    single(hHMax),
    single(hAdd),
    single(hCea),
    single(hGoalCount)],boost=485),preferred=[],reopen_closed=true,
    pathmax=false,cost_type=1)

6,
--landmarks lmg=lm_zg(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=true,
    cost_type=0)
```

```
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=0)
--heuristic hGoalCount=goalcount(cost_type=2)
--search lazy(alt([
    single(sum([g(),weight(hLM,3)])),
    single(sum([g(),weight(hLM,3)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,3)])),
    single(sum([g(),weight(hGoalCount,3)]),pref_only=true)],boost=2687),
    preferred=[hGoalCount],reopen_closed=true,cost_type=1)

3,
--landmarks lmg=lm_merged([lm_rhw(),lm_hm(m=1)],reasonable_orders=false,
    only_causal_landmarks=true,disjunctive_landmarks=false,
    conjunctive_landmarks=true,no_orders=false,cost_type=0)
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=0)
--heuristic hGoalCount=goalcount(cost_type=1)
--search eager(alt([
    tiebreaking([sum([g(),weight(hLM,3)]),hLM]),
    tiebreaking([sum([g(),weight(hLM,3)]),hLM],pref_only=true),
    tiebreaking([sum([g(),weight(hGoalCount,3)]),hGoalCount]),
    tiebreaking([sum([g(),weight(hGoalCount,3)]),hGoalCount],
    pref_only=true)],boost=2970),preferred=[hGoalCount],
    reopen_closed=false,pathmax=true,cost_type=0)

5,
--landmarks lmg=lm_merged([lm_rhw(),lm_hm(m=1)],reasonable_orders=true,
    only_causal_landmarks=true,disjunctive_landmarks=false,
    conjunctive_landmarks=true,no_orders=false,cost_type=1)
--heuristic hLM=lmcount(lmg,admissible=false,pref=false,cost_type=1)
--heuristic hGoalCount=goalcount(cost_type=0)
--search eager(alt([
    tiebreaking([sum([g(),weight(hLM,7)]),hLM]),
    tiebreaking([sum([g(),weight(hLM,7)]),hLM],pref_only=true),
    tiebreaking([sum([g(),weight(hGoalCount,7)]),hGoalCount]),
    tiebreaking([sum([g(),weight(hGoalCount,7)]),hGoalCount],
    pref_only=true)],boost=3143),preferred=[hGoalCount],
    reopen_closed=false,pathmax=true,cost_type=1)

5,
--landmarks lmg=lm_hm(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=false,
    no_orders=false,m=1,cost_type=2)
--heuristic hHMax=hmax()
--heuristic hBlind=blind()
--heuristic hGoalCount=goalcount(cost_type=0)
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=2)
--search eager(alt([
    single(sum([g(),weight(hBlind,3)])),
    single(sum([g(),weight(hBlind,3)]),pref_only=true),
    single(sum([g(),weight(hLM,3)])),
    single(sum([g(),weight(hLM,3)]),pref_only=true),
    single(sum([g(),weight(hHMax,3)])),
    single(sum([g(),weight(hHMax,3)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,3)])),
    single(sum([g(),weight(hGoalCount,3)]),pref_only=true)],boost=4477),
    preferred=[hGoalCount],reopen_closed=false,pathmax=false,cost_type=0)

5,
--landmarks lmg=lm_merged([lm_rhw(),lm_hm(m=1)],reasonable_orders=false,
    only_causal_landmarks=false,disjunctive_landmarks=true,
    conjunctive_landmarks=true,no_orders=false,cost_type=2)
--heuristic hGoalCount=goalcount(cost_type=0)
--heuristic hLM=lmcount(lmg,admissible=false,pref=true,cost_type=2)
--heuristic hCea=cea(cost_type=2)
```

```
--search lazy(alt([
    single(sum([weight(g(),2),weight(hLM,3)])),
    single(sum([weight(g(),2),weight(hCea,3)])),
    single(sum([weight(g(),2),weight(hGoalCount,3)]))],boost=3552),
    preferred=[],reopen_closed=true,cost_type=1)
```

- gripper

```
60,
--heuristic hAdd=add(cost_type=2)
--search lazy(alt([
    single(sum([g(),weight(hAdd,2)])),
    single(sum([g(),weight(hAdd,2)]),pref_only=true)],boost=2000),
    preferred=[hAdd],reopen_closed=false,cost_type=1)

62,
--heuristic hAdd=add(cost_type=2)
--search lazy(alt([
    single(sum([weight(g(),2),weight(hAdd,3)])),
    single(sum([weight(g(),2),weight(hAdd,3)]),pref_only=true)],
    boost=2000),preferred=[hAdd],reopen_closed=true,cost_type=1)

59,
--heuristic hAdd=add(cost_type=2)
--search ehc(hAdd,preferred=[hAdd],preferred_usage=1,cost_type=1)

61,
--heuristic hAdd=add(cost_type=2)
--search ehc(hAdd,preferred=[hAdd],preferred_usage=1,cost_type=0)

59,
--heuristic hAdd=add(cost_type=2)
--search ehc(hAdd,preferred=[hAdd],preferred_usage=1,cost_type=1)
```

- parking

```
5,
--landmarks lmg=lm_hm(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=false,
    no_orders=false,m=1,cost_type=1)
--heuristic hLM=lmcount(lmg,admissible=false,pref=false,cost_type=1)
--heuristic hFF=ff(cost_type=0)
--search lazy(alt([
    tiebreaking([sum([g(),weight(hFF,2)]),hFF]),
    tiebreaking([sum([g(),weight(hFF,2)]),hFF],pref_only=true),
    tiebreaking([sum([g(),weight(hLM,2)]),hLM]),
    tiebreaking([sum([g(),weight(hLM,2)]),hLM],pref_only=true)],
    boost=2530),preferred=[hFF],reopen_closed=true,cost_type=1)

3,
--heuristic hFF=ff(cost_type=2)
--heuristic hGoalCount=goalcount(cost_type=2)
--search lazy(alt([
    single(sum([g(),weight(hFF,7)])),
    single(sum([g(),weight(hFF,7)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,7)])),
    single(sum([g(),weight(hGoalCount,7)]),pref_only=true)],boost=4030),
    preferred=[hFF],reopen_closed=false,cost_type=0)

3,
--heuristic hCg=cg(cost_type=0)
--search lazy(alt([
    single(sum([g(),weight(hCg,2)])),
    single(sum([g(),weight(hCg,2)]),pref_only=true)],boost=7),
```

```
    preferred=[hCg],reopen_closed=false,cost_type=1)

7,
--heuristic hFF=ff(cost_type=2)
--heuristic hCg=cg(cost_type=0)
--heuristic hGoalCount=goalcount(cost_type=0)
--heuristic hCea=cea(cost_type=1)
--search lazy(alt([
    tiebreaking([sum([g(),weight(hFF,2)]),hFF]),
    tiebreaking([sum([g(),weight(hFF,2)]),hFF],pref_only=true),
    tiebreaking([sum([g(),weight(hCg,2)]),hCg]),
    tiebreaking([sum([g(),weight(hCg,2)]),hCg],pref_only=true),
    tiebreaking([sum([g(),weight(hCea,2)]),hCea]),
    tiebreaking([sum([g(),weight(hCea,2)]),hCea],pref_only=true),
    tiebreaking([sum([g(),weight(hGoalCount,2)]),hGoalCount]),
    tiebreaking([sum([g(),weight(hGoalCount,2)]),hGoalCount],
    pref_only=true)],boost=3256),preferred=[hFF,hCg,hCea,hGoalCount],
    reopen_closed=true,cost_type=1)

9,
--heuristic hCg=cg(cost_type=2)
--heuristic hGoalCount=goalcount(cost_type=1)
--search lazy(alt([
    single(sum([weight(g(),2),weight(hCg,3)])),
    single(sum([weight(g(),2),weight(hCg,3)]),pref_only=true),
    single(sum([weight(g(),2),weight(hGoalCount,3)])),
    single(sum([weight(g(),2),weight(hGoalCount,3)]),pref_only=true)],
    boost=1226),preferred=[hCg,hGoalCount],reopen_closed=true,
    cost_type=0)

40,
--landmarks lmg=lm_hm(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=false,
    no_orders=false,m=1,cost_type=0)
--heuristic hLM=lmcount(lmg,admissible=true,pref=false,cost_type=0)
--heuristic hFF=ff(cost_type=1)
--heuristic hCg=cg(cost_type=0)
--search lazy(alt([
    tiebreaking([sum([weight(g(),2),weight(hFF,3)]),hFF]),
    tiebreaking([sum([weight(g(),2),weight(hFF,3)]),hFF],pref_only=true),
    tiebreaking([sum([weight(g(),2),weight(hLM,3)]),hLM]),
    tiebreaking([sum([weight(g(),2),weight(hLM,3)]),hLM],pref_only=true),
    tiebreaking([sum([weight(g(),2),weight(hCg,3)]),hCg]),
    tiebreaking([sum([weight(g(),2),weight(hCg,3)]),hCg],
    pref_only=true)],boost=3185),preferred=[hCg],reopen_closed=false,
    cost_type=1)

44,
--heuristic hGoalCount=goalcount(cost_type=1)
--heuristic hCg=cg(cost_type=2)
--search lazy(alt([
    tiebreaking([sum([g(),hCg]),hCg]),
    tiebreaking([sum([g(),hCg]),hCg],pref_only=true),
    tiebreaking([sum([g(),hGoalCount]),hGoalCount]),
    tiebreaking([sum([g(),hGoalCount]),hGoalCount],pref_only=true)],
    boost=4698),preferred=[hCg],reopen_closed=false,cost_type=1)

27,
--landmarks lmg=lm_rhw(reasonable_orders=false,
    only_causal_landmarks=true,disjunctive_landmarks=false,
    conjunctive_landmarks=true,no_orders=false,lm_cost_type=2,
    cost_type=1)
--heuristic hGoalCount=goalcount(cost_type=2)
```

```
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=true)
--heuristic hCg=cg(cost_type=1)
--heuristic hCea=cea(cost_type=1)
--search lazy(alt([
    single(sum([g(),weight(hLM,2)])),
    single(sum([g(),weight(hLM,2)]),pref_only=true),
    single(sum([g(),weight(hFF,2)])),
    single(sum([g(),weight(hFF,2)]),pref_only=true),
    single(sum([g(),weight(hCg,2)])),
    single(sum([g(),weight(hCg,2)]),pref_only=true),
    single(sum([g(),weight(hCea,2)])),
    single(sum([g(),weight(hCea,2)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,2)])),
    single(sum([g(),weight(hGoalCount,2)]),pref_only=true)],boost=2720),
    preferred=[hFF,hCg,hCea,hGoalCount],reopen_closed=true,cost_type=0)

13,
--landmarks lmg=lm_rhw(reasonable_orders=false,
    only_causal_landmarks=false,disjunctive_landmarks=true,
    conjunctive_landmarks=true,no_orders=false,
    lm_cost_type=0,cost_type=0)
--heuristic hCea=cea(cost_type=0)
--heuristic hGoalCount=goalcount(cost_type=1)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=true)
--search lazy(alt([
    single(sum([g(),weight(hLM,10)])),
    single(sum([g(),weight(hLM,10)]),pref_only=true),
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true),
    single(sum([g(),weight(hCea,10)])),
    single(sum([g(),weight(hCea,10)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,10)])),
    single(sum([g(),weight(hGoalCount,10)]),pref_only=true)],
    boost=2902),preferred=[hFF,hCea,hGoalCount],reopen_closed=false,
    cost_type=0)

36,
--heuristic hCg=cg(cost_type=0)
--search lazy(alt([
    single(sum([g(),hCg])),
    single(sum([g(),hCg]),pref_only=true)],boost=4577),preferred=[hCg],
    reopen_closed=true,cost_type=1)
```

- rover

```
41,
--heuristic hGoalCount=goalcount(cost_type=0)
--heuristic hFF=ff(cost_type=1)
--search lazy(alt([
    single(hFF),
    single(hFF,pref_only=true),
    single(hGoalCount),
    single(hGoalCount,pref_only=true)],boost=2400),preferred=[hFF,
    hGoalCount],reopen_closed=true,cost_type=1)

59,
--heuristic hFF=ff(cost_type=1)
--search lazy(alt([
    single(hFF),
    single(hFF,pref_only=true)],boost=2000),preferred=[hFF],
    reopen_closed=false,cost_type=1)

60,
--landmarks lmg=lm_rhw(reasonable_orders=true,
```

```
    only_causal_landmarks=false,disjunctive_landmarks=true,
    conjunctive_landmarks=true,no_orders=false,lm_cost_type=2,
    cost_type=1)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search lazy(alt([
    single(sum([g(),weight(hLM,10)])),
    single(sum([g(),weight(hLM,10)]),pref_only=true),
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true)],boost=970),
    preferred=[hLM],reopen_closed=false,cost_type=0)

34,
--heuristic hGoalCount=goalcount(cost_type=1)
--heuristic hFF=ff(cost_type=2)
--search lazy(alt([
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,10)])),
    single(sum([g(),weight(hGoalCount,10)]),pref_only=true)],
    boost=2000),preferred=[hFF,hGoalCount],reopen_closed=false,
    cost_type=1)

60,
--landmarks lmg=lm_exhaust(reasonable_orders=true,
    only_causal_landmarks=false,disjunctive_landmarks=true,
    conjunctive_landmarks=true,no_orders=false,lm_cost_type=2,
    cost_type=2)
--heuristic hBlind=blind()
--heuristic hHMax=hmax()
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--heuristic hCg=cg(cost_type=1)
--search lazy(alt([
    single(sum([g(),weight(hBlind,10)])),
    single(sum([g(),weight(hBlind,10)]),pref_only=true),
    single(sum([g(),weight(hLM,10)])),
    single(sum([g(),weight(hLM,10)]),pref_only=true),
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true),
    single(sum([g(),weight(hHMax,10)])),
    single(sum([g(),weight(hHMax,10)]),pref_only=true),
    single(sum([g(),weight(hCg,10)])),
    single(sum([g(),weight(hCg,10)]),pref_only=true)],boost=2000),
    preferred=[hLM],reopen_closed=false,cost_type=1)

60,
--landmarks lmg=lm_exhaust(reasonable_orders=true,
    only_causal_landmarks=false,disjunctive_landmarks=true,
    conjunctive_landmarks=true,no_orders=false,lm_cost_type=2,
    cost_type=1)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search lazy(alt([
    single(sum([g(),weight(hLM,10)])),
    single(sum([g(),weight(hLM,10)]),pref_only=true),
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true)],boost=2000),
    preferred=[hLM],reopen_closed=false,cost_type=1)

60,
--landmarks lmg=lm_zg(reasonable_orders=true,
    only_causal_landmarks=false,disjunctive_landmarks=true,
    conjunctive_landmarks=true,no_orders=false,lm_cost_type=2,
    cost_type=1)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
```

```
--heuristic hCg=cg(cost_type=0)
--search lazy(alt([
    single(sum([g(),weight(hLM,7)])),
    single(sum([g(),weight(hLM,7)]),pref_only=true),
    single(sum([g(),weight(hFF,7)])),
    single(sum([g(),weight(hFF,7)]),pref_only=true),
    single(sum([g(),weight(hCg,7)])),
    single(sum([g(),weight(hCg,7)]),pref_only=true)],boost=2000),
    preferred=[hLM,hCg],reopen_closed=true,cost_type=1)

40,
--heuristic hFF=ff(cost_type=2)
--search lazy(alt([
    single(hFF),
    single(hFF,pref_only=true)],boost=3695),preferred=[hFF],
    reopen_closed=true,cost_type=0)

60,
--landmarks lmg=lm_zg(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    lm_cost_type=2,cost_type=0)
--heuristic hBlind=blind()
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search lazy(alt([
    single(sum([g(),weight(hBlind,7)])),
    single(sum([g(),weight(hBlind,7)]),pref_only=true),
    single(sum([g(),weight(hLM,7)])),
    single(sum([g(),weight(hLM,7)]),pref_only=true),
    single(sum([g(),weight(hFF,7)])),
    single(sum([g(),weight(hFF,7)]),pref_only=true)],boost=3177),
    preferred=[hLM],reopen_closed=true,cost_type=0)

58,
--heuristic hFF=ff(cost_type=2)
--search lazy(alt([
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true)],boost=1153),
    preferred=[hFF],reopen_closed=false,cost_type=1)

60,
--heuristic hFF=ff(cost_type=1)
--search lazy(alt([
    single(sum([g(),weight(hFF,7)])),
    single(sum([g(),weight(hFF,7)]),pref_only=true)],boost=440),
    preferred=[hFF],reopen_closed=false,cost_type=1)

66,
--heuristic hFF=ff(cost_type=1)
--heuristic hGoalCount=goalcount(cost_type=2)
--search lazy(alt([
    single(hFF),
    single(hFF,pref_only=true),
    single(hGoalCount),
    single(hGoalCount,pref_only=true)],boost=2000),preferred=[hFF,
    hGoalCount],reopen_closed=true,cost_type=1)

60,
--heuristic hFF=ff(cost_type=0)
--heuristic hGoalCount=goalcount(cost_type=2)
--search lazy(alt([
    single(hFF),
    single(hFF,pref_only=true),
    single(hGoalCount),
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    single(hGoalCount,pref_only=true)],boost=2345),preferred=[hFF,
    hGoalCount],reopen_closed=false,cost_type=0)

41,
--heuristic hFF=ff(cost_type=1)
--search lazy(alt([
    tiebreaking([sum([g(),weight(hFF,10)]),hFF]),
    tiebreaking([sum([g(),weight(hFF,10)]),hFF],pref_only=true)],
    boost=4023),preferred=[hFF],reopen_closed=true,cost_type=0)
```

- satellite

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21,
--landmarks lmg=lm_zg(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=true,
    cost_type=2)
--heuristic hCg=cg(cost_type=1)
--heuristic hCea=cea(cost_type=0)
--heuristic hLM=lmcount(lmg,admissible=false,pref=true,cost_type=2)
--search lazy(alt([
    tiebreaking([sum([g(),weight(hLM,3)]),hLM]),
    tiebreaking([sum([g(),weight(hLM,3)]),hLM],pref_only=true),
    tiebreaking([sum([g(),weight(hCg,3)]),hCg]),
    tiebreaking([sum([g(),weight(hCg,3)]),hCg],pref_only=true),
    tiebreaking([sum([g(),weight(hCea,3)]),hCea]),
    tiebreaking([sum([g(),weight(hCea,3)]),hCea],pref_only=true)],
    boost=3430),preferred=[hCg,hCea],reopen_closed=true,cost_type=0)

13,
--heuristic hCea=cea(cost_type=1)
--heuristic hCg=cg(cost_type=1)
--search lazy(alt([
    single(sum([g(),weight(hCg,7)])),
    single(sum([g(),weight(hCg,7)]),pref_only=true),
    single(sum([g(),weight(hCea,7)])),
    single(sum([g(),weight(hCea,7)]),pref_only=true)],boost=3453),
    preferred=[hCg,hCea],reopen_closed=true,cost_type=0)

27,
--heuristic hFF=ff(cost_type=1)
--heuristic hCg=cg(cost_type=1)
--heuristic hCea=cea(cost_type=1)
--search lazy(alt([
    single(hFF),
    single(hFF,pref_only=true),
    single(hCg),
    single(hCg,pref_only=true),
    single(hCea),
    single(hCea,pref_only=true)],boost=2252),preferred=[hCg,hCea],
    reopen_closed=true,cost_type=0)

31,
--landmarks lmg=lm_hm(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    m=1,lm_cost_type=0,cost_type=1)
--heuristic hCea=cea(cost_type=2)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search lazy(alt([
    single(sum([g(),weight(hLM,2)])),
    single(sum([g(),weight(hLM,2)]),pref_only=true),
    single(sum([g(),weight(hFF,2)])),
    single(sum([g(),weight(hFF,2)]),pref_only=true),
    single(sum([g(),weight(hCea,2)])),
    single(sum([g(),weight(hCea,2)]),pref_only=true)],boost=1721),
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    preferred=[hLM,hFF,hCea],reopen_closed=false,cost_type=1)

60,
--landmarks lmg=lm_hm(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    m=1,lm_cost_type=1,cost_type=1)
--heuristic hCg=cg(cost_type=2)
--heuristic hCea=cea(cost_type=0)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search lazy(alt([
    single(sum([g(),weight(hLM,3)])),
    single(sum([g(),weight(hLM,3)]),pref_only=true),
    single(sum([g(),weight(hFF,3)])),
    single(sum([g(),weight(hFF,3)]),pref_only=true),
    single(sum([g(),weight(hCg,3)])),
    single(sum([g(),weight(hCg,3)]),pref_only=true),
    single(sum([g(),weight(hCea,3)])),
    single(sum([g(),weight(hCea,3)]),pref_only=true)],boost=2347),
    preferred=[hLM,hCea],reopen_closed=false,cost_type=1)

60,
--landmarks lmg=lm_rhw(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    lm_cost_type=2,cost_type=1)
--heuristic hCg=cg(cost_type=0)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--heuristic hGoalCount=goalcount(cost_type=1)
--search lazy(alt([
    single(sum([g(),weight(hLM,5)])),
    single(sum([g(),weight(hLM,5)]),pref_only=true),
    single(sum([g(),weight(hFF,5)])),
    single(sum([g(),weight(hFF,5)]),pref_only=true),
    single(sum([g(),weight(hCg,5)])),
    single(sum([g(),weight(hCg,5)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,5)])),
    single(sum([g(),weight(hGoalCount,5)]),pref_only=true)],boost=2000),
    preferred=[hLM,hFF,hCg,hGoalCount],reopen_closed=false,cost_type=1)

18,
--heuristic hGoalCount=goalcount(cost_type=0)
--heuristic hCg=cg(cost_type=2)
--heuristic hCea=cea(cost_type=2)
--search lazy(alt([
    single(sum([g(),weight(hCg,10)])),
    single(sum([g(),weight(hCg,10)]),pref_only=true),
    single(sum([g(),weight(hCea,10)])),
    single(sum([g(),weight(hCea,10)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,10)])),
    single(sum([g(),weight(hGoalCount,10)]),pref_only=true)],boost=388),
    preferred=[hCg,hCea],reopen_closed=true,cost_type=1)

59,
--heuristic hCg=cg(cost_type=2)
--heuristic hBlind=blind()
--heuristic hCea=cea(cost_type=2)
--heuristic hFF=ff(cost_type=2)
--search lazy(alt([
    single(sum([g(),weight(hBlind,2)])),
    single(sum([g(),weight(hBlind,2)]),pref_only=true),
    single(sum([g(),weight(hFF,2)])),
    single(sum([g(),weight(hFF,2)]),pref_only=true),
    single(sum([g(),weight(hCg,2)])),
    single(sum([g(),weight(hCg,2)]),pref_only=true),
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    single(sum([g(),weight(hCea,2)])),
    single(sum([g(),weight(hCea,2)]),pref_only=true)],boost=2000),
    preferred=[hCg,hCea],reopen_closed=true,cost_type=0)

48,
--landmarks lmg=lm_hm(reasonable_orders=false,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    m=1,lm_cost_type=2,cost_type=1)
--heuristic hCg=cg(cost_type=0)
--heuristic hGoalCount=goalcount(cost_type=2)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--heuristic hBlind=blind()
--search lazy(alt([
    single(sum([g(),weight(hBlind,5)])),
    single(sum([g(),weight(hBlind,5)]),pref_only=true),
    single(sum([g(),weight(hLM,5)])),
    single(sum([g(),weight(hLM,5)]),pref_only=true),
    single(sum([g(),weight(hFF,5)])),
    single(sum([g(),weight(hFF,5)]),pref_only=true),
    single(sum([g(),weight(hCg,5)])),
    single(sum([g(),weight(hCg,5)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,5)])),
    single(sum([g(),weight(hGoalCount,5)]),pref_only=true)],boost=520),
    preferred=[hLM,hFF,hGoalCount],reopen_closed=false,cost_type=1)

60,
--landmarks lmg=lm_rhw(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    lm_cost_type=0,cost_type=1)
--heuristic hAdd=add(cost_type=0)
--heuristic hGoalCount=goalcount(cost_type=2)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--heuristic hBlind=blind()
--search lazy(alt([
    single(sum([g(),weight(hBlind,10)])),
    single(sum([g(),weight(hBlind,10)]),pref_only=true),
    single(sum([g(),weight(hLM,10)])),
    single(sum([g(),weight(hLM,10)]),pref_only=true),
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true),
    single(sum([g(),weight(hAdd,10)])),
    single(sum([g(),weight(hAdd,10)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,10)])),
    single(sum([g(),weight(hGoalCount,10)]),pref_only=true)],
    boost=2000),preferred=[hLM,hAdd,hGoalCount],reopen_closed=false,
    cost_type=1)
```

- spanner

```
24,
--heuristic hBlind=blind()
--heuristic hAdd=add(cost_type=2)
--search eager(alt([
    single(sum([g(),weight(hBlind,10)])),
    single(sum([g(),weight(hBlind,10)]),pref_only=true),
    single(sum([g(),weight(hAdd,10)])),
    single(sum([g(),weight(hAdd,10)]),pref_only=true)],boost=4356),
    preferred=[hAdd],reopen_closed=false,pathmax=false,cost_type=0)

72,
--heuristic hBlind=blind()
--heuristic hGoalCount=goalcount(cost_type=2)
--heuristic hCea=cea(cost_type=1)
--search eager(alt([
```

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    single(sum([g(),weight(hBlind,5)])),
    single(sum([g(),weight(hBlind,5)]),pref_only=true),
    single(sum([g(),weight(hCea,5)])),
    single(sum([g(),weight(hCea,5)]),pref_only=true),
    single(sum([g(),weight(hGoalCount,5)])),
    single(sum([g(),weight(hGoalCount,5)]),pref_only=true)],boost=3680),
    preferred=[hCea],reopen_closed=false,pathmax=false,cost_type=0)
```

- tpp

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46,
--heuristic hFF=ff(cost_type=1)
--search lazy(alt([
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true)],boost=227),
    preferred=[hFF],reopen_closed=false,cost_type=1)

55,
--heuristic hFF=ff(cost_type=1)
--heuristic hCg=cg(cost_type=2)
--search lazy(alt([
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true),
    single(sum([g(),weight(hCg,10)])),
    single(sum([g(),weight(hCg,10)]),pref_only=true)],boost=3490),
    preferred=[hFF],reopen_closed=true,cost_type=0)

57,
--landmarks lmg=lm_hm(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=true,
    m=1,lm_cost_type=2,cost_type=2)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search lazy(alt([
    single(hLM),
    single(hLM,pref_only=true),
    single(hFF),
    single(hFF,pref_only=true)],boost=2000),preferred=[hLM,hFF],
    reopen_closed=true,cost_type=1)

60,
--heuristic hFF=ff(cost_type=2)
--heuristic hCg=cg(cost_type=2)
--search lazy(alt([
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true),
    single(sum([g(),weight(hCg,10)])),
    single(sum([g(),weight(hCg,10)]),pref_only=true)],boost=1420),
    preferred=[hFF,hCg],reopen_closed=true,cost_type=1)

17,
--heuristic hFF=ff(cost_type=1)
--search lazy(alt([
    single(hFF),
    single(hFF,pref_only=true)],boost=2475),preferred=[hFF],
    reopen_closed=false,cost_type=1)

58,
--heuristic hCg=cg(cost_type=0)
--heuristic hFF=ff(cost_type=0)
--search lazy(alt([
    tiebreaking([sum([g(),weight(hFF,7)]),hFF]),
    tiebreaking([sum([g(),weight(hFF,7)]),hFF],pref_only=true),
    tiebreaking([sum([g(),weight(hCg,7)]),hCg]),
    tiebreaking([sum([g(),weight(hCg,7)]),hCg],pref_only=true)],
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    boost=741),preferred=[hFF],reopen_closed=false,cost_type=0)

59,
--heuristic hFF=ff(cost_type=1)
--heuristic hCg=cg(cost_type=2)
--search lazy(alt([
    single(sum([g(),weight(hFF,10)])),
    single(sum([g(),weight(hFF,10)]),pref_only=true),
    single(sum([g(),weight(hCg,10)])),
    single(sum([g(),weight(hCg,10)]),pref_only=true)],boost=2847),
    preferred=[hFF],reopen_closed=true,cost_type=1)

60,
--heuristic hFF=ff(cost_type=2)
--heuristic hCg=cg(cost_type=0)
--search lazy(alt([
    tiebreaking([sum([g(),weight(hFF,7)]),hFF]),
    tiebreaking([sum([g(),weight(hFF,7)]),hFF],pref_only=true),
    tiebreaking([sum([g(),weight(hCg,7)]),hCg]),
    tiebreaking([sum([g(),weight(hCg,7)]),hCg],pref_only=true)],
    boost=1044),preferred=[hFF,hCg],reopen_closed=true,cost_type=0)

41,
--heuristic hFF=ff(cost_type=1)
--search lazy(alt([
    single(sum([g(),weight(hFF,7)])),
    single(sum([g(),weight(hFF,7)]),pref_only=true)],boost=553),
    preferred=[hFF],reopen_closed=false,cost_type=0)

58,
--heuristic hFF=ff(cost_type=0)
--search lazy(alt([
    tiebreaking([sum([g(),weight(hFF,7)]),hFF]),
    tiebreaking([sum([g(),weight(hFF,7)]),hFF],pref_only=true)],
    boost=3912),preferred=[hFF],reopen_closed=true,cost_type=0)

37,
--heuristic hGoalCount=goalcount(cost_type=2)
--heuristic hFF=ff(cost_type=0)
--search lazy(alt([
    single(hFF),
    single(hFF,pref_only=true),
    single(hGoalCount),
    single(hGoalCount,pref_only=true)],boost=2000),preferred=[hFF,
    hGoalCount],reopen_closed=true,cost_type=1)

60,
--landmarks lmg=lm_rhw(reasonable_orders=true,only_causal_landmarks=false,
    disjunctive_landmarks=true,conjunctive_landmarks=true,no_orders=false,
    lm_cost_type=2,cost_type=1)
--heuristic hLM,hFF=lm_ff_syn(lmg,admissible=false)
--search lazy(alt([
    single(hLM),
    single(hLM,pref_only=true),
    single(hFF),
    single(hFF,pref_only=true)],boost=2000),preferred=[hLM,hFF],
    reopen_closed=false,cost_type=0)
```

References

[1] Jendrik Seipp, Silvan Sievers, Malte Helmert, and Frank Hutter. Automatic configuration of sequential planning portfolios. In *Proceedings of the Twenty-Ninth AAAI Conference on Artificial Intelligence (AAAI 2015)*. AAAI Press, 2015.