|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Search | expansions | goal tests | New nodes | Time elapsed(sec) | Plan length | Optimality of solution |
| P1 | bfs | 43 | 56 | 180 | 0.0317 | 6 | Yes. Bfs always produces Optimal Solution |
| P1 | dfs | 21 | 22 | 84 | 0.0167 | 20 | No |
| P1 | ucs | 55 | 57 | 224 | 0.0397 | 6 | Yes |
| P1 | depth limited search | 101 | 271 | 414 | 0.0870 | 50 | No |
| P1 | A\*\_h1 | 55 | 57 | 224 | 0.0431 | 6 | Yes |
| P1 | A\*\_ignore\_precond | 41 | 43 | 170 | 0.0424 | 6 | Yes |
| P1 | A\* levelsum | 11 | 13 | 50 | 0.5396 | 6 | Yes |
| P2 | bfs | 3346 | 4612 | 30534 | 13.6629 | 9 | Yes |
| P2 | dfs | 107 | 108 | 959 | 0.3194 | 105 | No |
| P2 | ucs | 4853 | 4855 | 44041 | 11.9557 | 9 | Yes |
| P2 | dls | Does not | terminate |  |  |  |  |
| P2 | A\*\_h1 | 4853 | 4855 | 44041 | 11.6739 | 9 | Yes |
| P2 | A\*\_ignore\_precond | 1450 | 1452 | 13303 | 4.6215 | 9 | Yes |
| P2 | A\* levelsum | 86 | 88 | 841 | 45.7576 | 9 | Yes |
| P3 | bfs | 14120 | 17673 | 124926 | 100.7464 | 12 | yes |
| P3 | dfs | 292 | 293 | 2388 | 1.0934 | 288 | No |
| P3 | ucs | 18223 | 18225 | 159618 | 52.5074 | 12 | Yes |
| P3 | dls | Does not | terminate |  |  |  |  |
| P3 | A\*\_h1 | 18223 | 18225 | 159618 | 57.2000 | 12 | Yes |
| P3 | A\*\_ignore\_precond | 5040 | 5042 | 44944 | 20.8681 | 12 | Yes |
| P3 | A\* levelsum | 325 | 327 | 3002 | 259.9800 | 12 | Yes |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

**Problem 1**

Problem initial state and goal is:

Init(At(C1, SFO) ∧ At(C2, JFK)

∧ At(P1, SFO) ∧ At(P2, JFK)

∧ Cargo(C1) ∧ Cargo(C2)

∧ Plane(P1) ∧ Plane(P2)

∧ Airport(JFK) ∧ Airport(SFO))

Goal(At(C1, JFK) ∧ At(C2, SFO))

Optimal Solution is:

Load(C1, P1, SFO)

Load(C2, P2, JFK)

Fly(P2, JFK, SFO)

Unload(C2, P2, SFO)

Fly(P1, SFO, JFK)

Unload(C1, P1, JFK)

**Problem 2**

Problem initial state and goal is:

Init(At(C1, SFO) ∧ At(C2, JFK) ∧ At(C3, ATL)

∧ At(P1, SFO) ∧ At(P2, JFK) ∧ At(P3, ATL)

∧ Cargo(C1) ∧ Cargo(C2) ∧ Cargo(C3)

∧ Plane(P1) ∧ Plane(P2) ∧ Plane(P3)

∧ Airport(JFK) ∧ Airport(SFO) ∧ Airport(ATL))

Goal(At(C1, JFK) ∧ At(C2, SFO) ∧ At(C3, SFO))

Optimal Solution is:

Load(C1, P1, SFO)

Load(C2, P2, JFK)

Load(C3, P3, ATL)

Fly(P1, SFO, JFK)

Unload(C1, P1, JFK)

Fly(P2, JFK, SFO)

Unload(C2, P2, SFO)

Fly(P3, ATL, SFO)

Unload(C3, P3, SFO)

**Problem 3**

Problem initial state and goal is:

Init(At(C1, SFO) ∧ At(C2, JFK) ∧ At(C3, ATL) ∧ At(C4, ORD)

∧ At(P1, SFO) ∧ At(P2, JFK)

∧ Cargo(C1) ∧ Cargo(C2) ∧ Cargo(C3) ∧ Cargo(C4)

∧ Plane(P1) ∧ Plane(P2)

∧ Airport(JFK) ∧ Airport(SFO) ∧ Airport(ATL) ∧ Airport(ORD))

Goal(At(C1, JFK) ∧ At(C3, JFK) ∧ At(C2, SFO) ∧ At(C4, SFO))

Optimal Solution is:

Load(C1, P1, SFO)

Fly(P1, SFO, ATL)

Load(C3, P1, ATL)

Fly(P1, ATL, JFK)

Unload(C1, P1, JFK)

Unload(C3, P1, JFK)

Load(C2, P2, JFK)

Fly(P2, JFK, ORD)

Load(C4, P2, ORD)

Fly(P2, ORD, SFO)

Unload(C2, P2, SFO)

Unload(C4, P2, SFO)