# Heuristic Analysis

## Part 1

air\_cargo\_p1

|  |  |  |  |
| --- | --- | --- | --- |
|  | breadth\_first\_search | depth\_first\_graph\_search | uniform\_cost\_search |
| number of node expansions required | 43 | 12 | 55 |
| number of goal tests | 56 | 13 | 57 |
| time elapsed (seconds) | 0.06364409137670042 | 0.017920003267464985 | 0.07676354676030482 |
| optimality | Plan length 6  Load(C2, P2, JFK)  Load(C1, P1, SFO)  Fly(P2, JFK, SFO)  Unload(C2, P2, SFO)  Fly(P1, SFO, JFK)  Unload(C1, P1, JFK) | Plan length 12  Fly(P1, SFO, JFK)  Fly(P2, JFK, SFO)  Load(C1, P2, SFO)  Fly(P2, SFO, JFK)  Fly(P1, JFK, SFO)  Unload(C1, P2, JFK)  Fly(P2, JFK, SFO)  Fly(P1, SFO, JFK)  Load(C2, P1, JFK)  Fly(P2, SFO, JFK)  Fly(P1, JFK, SFO)  Unload(C2, P1, SFO) | Plan length: 6  Load(C1, P1, SFO)  Load(C2, P2, JFK)  Fly(P1, SFO, JFK)  Fly(P2, JFK, SFO)  Unload(C1, P1, JFK)  Unload(C2, P2, SFO) |

air\_cargo\_p2

|  |  |  |  |
| --- | --- | --- | --- |
|  | breadth\_first\_search | depth\_first\_graph\_search | uniform\_cost\_search |
| number of node expansions required | 3343 | 582 | 4853 |
| number of goal tests | 4609 | 583 | 4855 |
| time elapsed (seconds) | 14.82378517584687 | 4.133117471565579 | 21.932443338109326 |
| optimality | Plan length: 9  Load(C2, P2, JFK)  Load(C1, P1, SFO)  Load(C3, P3, ALT)  Fly(P2, JFK, SFO)  Unload(C2, P2, SFO)  Fly(P1, SFO, JFK)  Unload(C1, P1, JFK)  Fly(P3, ALT, SFO)  Unload(C3, P3, SFO) | Plan length: 575  （too long to include） | Plan length: 9  Load(C1, P1, SFO)  Load(C2, P2, JFK)  Load(C3, P3, ALT)  Fly(P1, SFO, JFK)  Fly(P2, JFK, SFO)  Fly(P3, ALT, SFO)  Unload(C1, P1, JFK)  Unload(C2, P2, SFO)  Unload(C3, P3, SFO) |

air\_cargo\_p3

|  |  |  |  |
| --- | --- | --- | --- |
|  | breadth\_first\_search | depth\_first\_graph\_search | uniform\_cost\_search |
| number of node expansions required | 14663 | 627 | 18151 |
| number of goal tests | 18098 | 628 | 18153 |
| time elapsed (seconds) | 69.38180583599879 | 4.175201764139353 | 87.36087290910503 |
| optimality | Plan length: 12  Load(C2, P2, JFK)  Load(C1, P1, SFO)  Fly(P2, JFK, ORD)  Load(C4, P2, ORD)  Fly(P1, SFO, ALT)  Load(C3, P1, ALT)  Fly(P1, ALT, JFK)  Unload(C1, P1, JFK)  Unload(C3, P1, JFK)  Fly(P2, ORD, SFO)  Unload(C2, P2, SFO)  Unload(C4, P2, SFO) | Plan length: 596  （too long to include） | Plan length: 12  Load(C1, P1, SFO)  Load(C2, P2, JFK)  Fly(P1, SFO, ALT)  Load(C3, P1, ALT)  Fly(P2, JFK, ORD)  Load(C4, P2, ORD)  Fly(P2, ORD, SFO)  Fly(P1, ALT, JFK)  Unload(C1, P1, JFK)  Unload(C2, P2, SFO)  Unload(C3, P1, JFK)  Unload(C4, P2, SFO) |

## Summary

From the above metrics, it’s obvious that depth\_first\_graph\_search always runs the fastest, but with much longer plan steps, which I think is not optimal in really life when it comes to execution (e.g. a lot of unnecessary fly, load and unload actions) compared to the other two algorithms.