Time complexity

a star search time complexity, with manhattan heuristic

O(b^average solution depth)

MSA O(b^average solution depth) \* O(N)

Find neighbor iteration

For every node, get distance, compare with the max distance.

Table

Description automatically generated

MSA\*

Average search depth

Each iteration:

pseudocode

O(b^4)

Text

Description automatically generated

Since the neibor for each node is unknown.

(N\*N\*1)^4

Experience results:

Problem with A\*

Static, high variance

Mean, max, min

1. all use a\*, minimum moving time: t=1s.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Total travel time  Flying time + delay time | move-step | Mean Length of the path |
| 10 | 953 300 | 725 | 414.7 |
| 20 | 5323 | 1157 | 472.9 |
| 30 | 12863 | 1466 | 515.9 |
| 40 | 15950 | 1359 | 470.53 |
| 50 |  |  |  |

2. all use msa\*, very poor performance, alpha, beta choice

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Total search time | move-step | Mean Length of the path | Fail rate |
| 10 |  |  |  |  |
| 20 |  |  |  |  |
| 30 |  |  |  |  |
| 40 |  |  |  |  |
| 50 |  |  |  |  |

3, mix a\* and msa\*, use a\* if you can report under t=5s, otherwise, switch to msa\*.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Total travel time | move-step | Mean Length of the path |
| 10 | 1079 | 720 | 430.3 |
| 20 | 1721 | 800 | 447 |
| 30 | 1874 | 846 | 429.85 |
| 40 | 2422 | 752 | 459 |
| 50 | 5215 | 1082 | 473.16 |