Chapter 2.2 Report for A\* planning algorithms by ROS

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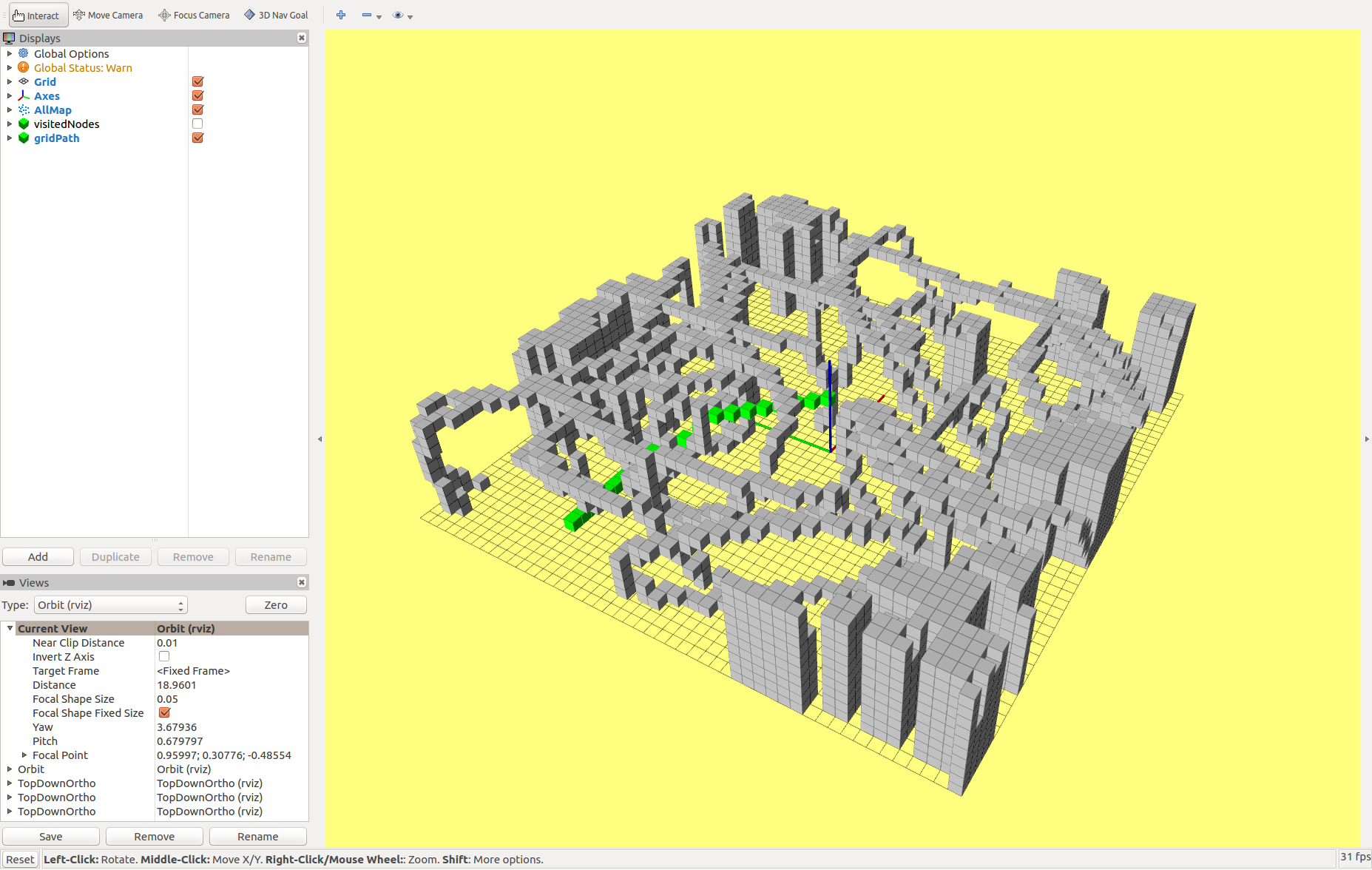
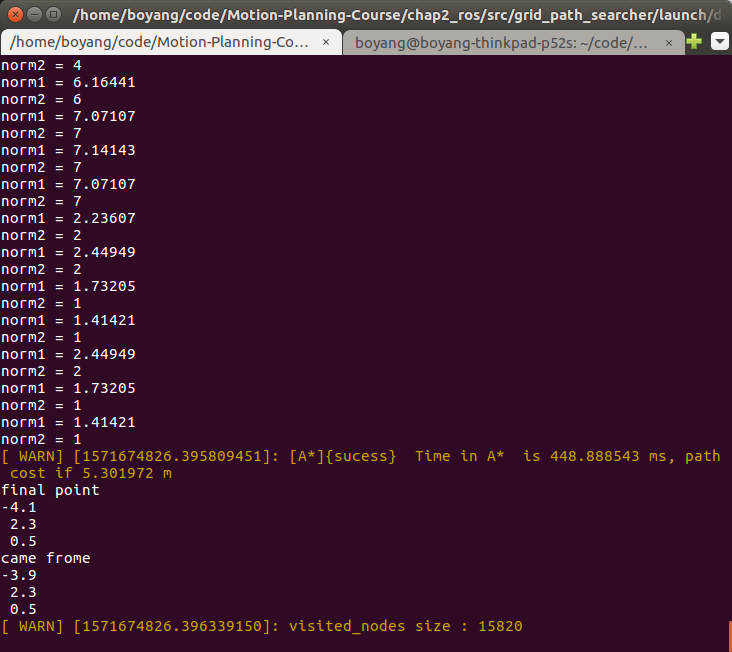
1. Algorithm Flowchart

When the main() function in demo\_note.cpp calls “\_astar\_path\_finder->AstarGraphSearch(start\_pt, target\_pt);”, the planning function receive the start and end points of planning task.

Then the “AstarGraphSearch” fuction in “Astar\_searcher.cpp” start.

1. Recode current time time\_1
2. Initial the start point pointer startPtr
3. Main loop for expanding
   1. if open list is empty or reach the goal, finish the cicle
   2. get the minimum f node from the open list, delete it and mark it as visited
   3. get all the neighbours of current node
   4. decide whether to put the neighbours to the open list or change the g value in the open list
4. Get current time time\_2 and print the search time
5. Track the path back from the terminatePtr to the start
6. Show the path at RVIZ interface

2. Planning Results

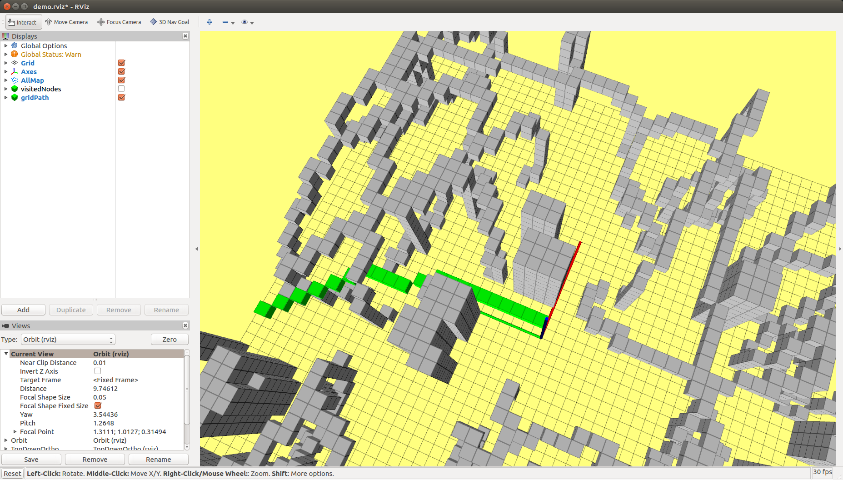


3. Comparison of different heuristic functions for the performance of A star planning

Goad: -1.0 4.0 1.5

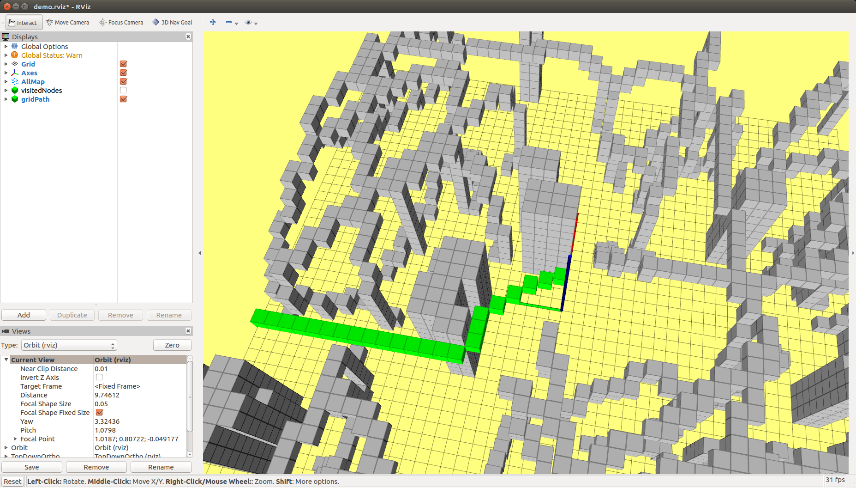
3.1 Euclidean

Time in A\* is 42.324343 ms, path cost is 4.789877 m, visited\_nodes size : 14642



3.2 Manhattan

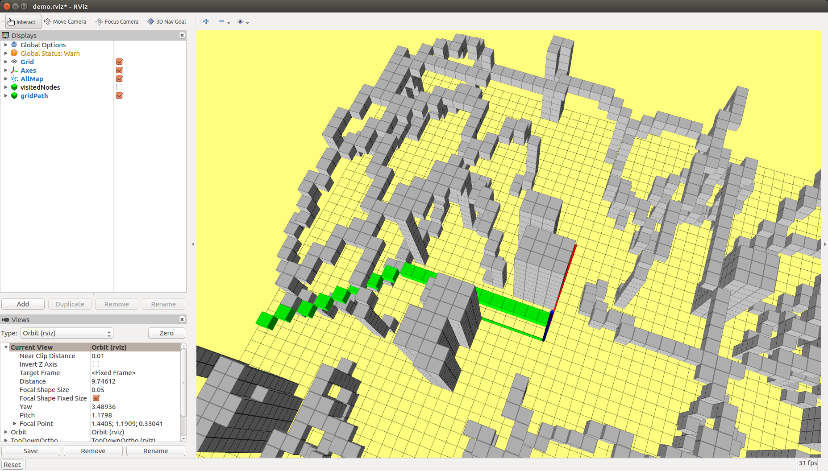
Time in A\* is 0.297402 ms, path cost is 5.024191 m, visited\_nodes size : 22



Fast, but does not get optimal result, due to over estimate of distance and lead to inadmissible.

3.3 Diagonal Heuristic

Time in A\* is 43.626084 ms, path cost is 4.789877 m, visited\_nodes size : 4642



The visited node will be much less

3.4 The effect of Tie Breaker

Further reduce the visited node size for open area.

4. The comparison of A\* and JPS (when to use A\* and when to use JPS)

Randomly selected two goal points from the map. It is shown that the JPS is faster and has less visited nodes.

[A\*]{sucess} Time in A\* is 29.629715 ms, path cost is 2.892820 m, visited\_nodes size : 7137

[JPS]{sucess} Time in JPS is 1.745710 ms, path cost if 2.892820 m visited\_nodes size : 129

[A\*]{sucess} Time in A\* is 6.634882 ms, path cost is 3.175663 m, visited\_nodes size : 1323

[JPS]{sucess} Time in JPS is 6.469833 ms, path cost if 3.175663 m visited\_nodes size : 286

