MOTION PLANNING
Programming Assignment 2

1.1. (10 points) Which heuristic seems superior for 4-connected? Explain your answer.

The heuristic for Manhattan is superior to Euclidean, as the superior heuristic has to be as close as possible for actual cost (true cost). In the 4 connected case, the heuristic of Euclidean is over estimating and hence Euclidean is inadmissible in 4-connected search. Manhattan heuristic is superior in 4 connected.

Condition for admissibility is:

$g(n) < h(n) + h'$

1.2. (10 points) Which heuristic seems superior for 8-connected? Explain your answer.

For 8 connected, the heuristic for Euclidean is superior to Manhattan. The heuristic of Euclidean is close to the actual cost for this scenario and the Euclidean search gives an optimal solution. The 8 connected search for Euclidean and Manhattan are both admissible. The diagonal movement in 8 connected configuration illustrates that Euclidean distance estimate is closer to the optimal path as the Euclidean distance is calculated diagonally whereas the Manhattan distance is not calculated along the diagonal.

1.3. (10 points) For the four variants above, which, if any, variants have an admissible heuristic and which, if any, do not? Explain your answers.

Admissibility: An admissible heuristic is used to estimate the cost of reaching the goal state in an informed search algorithm. In order for a heuristic to be admissible to the search problem, the estimated cost must always be lower than or equal to the actual cost of reaching the goal state. The search algorithm uses the admissible heuristic to find an estimated optimal path to the goal state from the current node.

With a non-admissible heuristic, the A* algorithm could overlook the optimal solution to a search problem due to an overestimation in

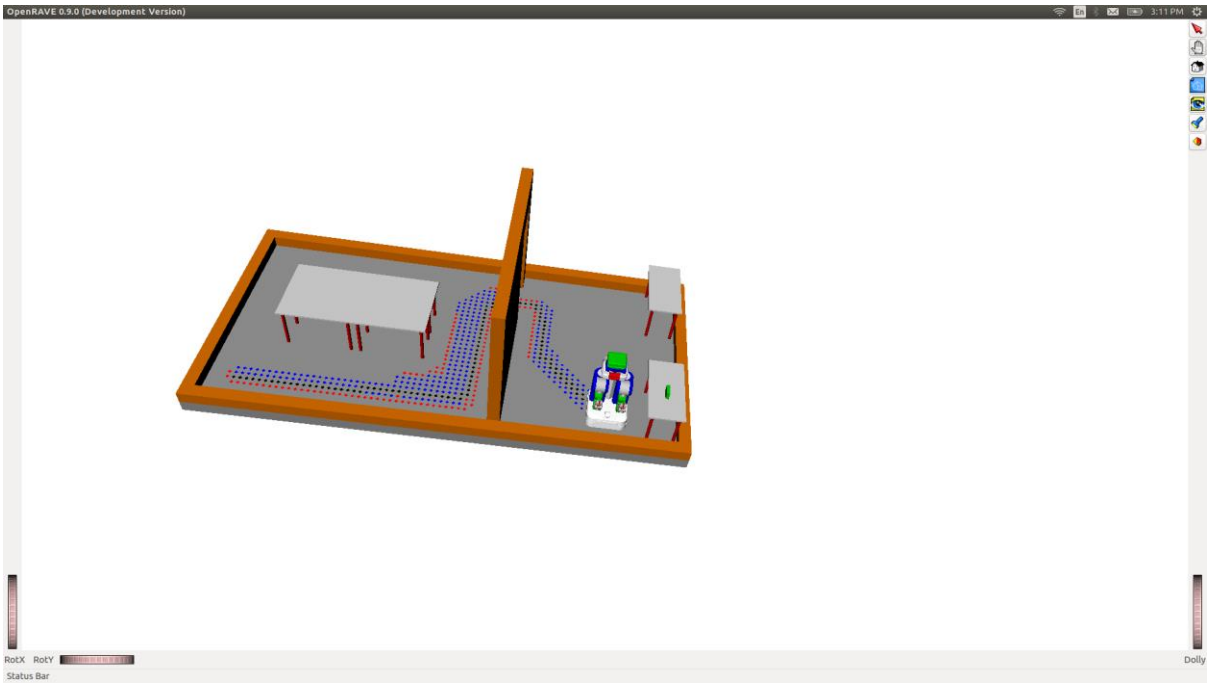
4-connected Euclidean is underestimating as it estimates distance as 1.5 but actual distance traversed in 2 and it is admissible.

4-connected Manhattan and 8 connected Euclidean heuristic is admissible.

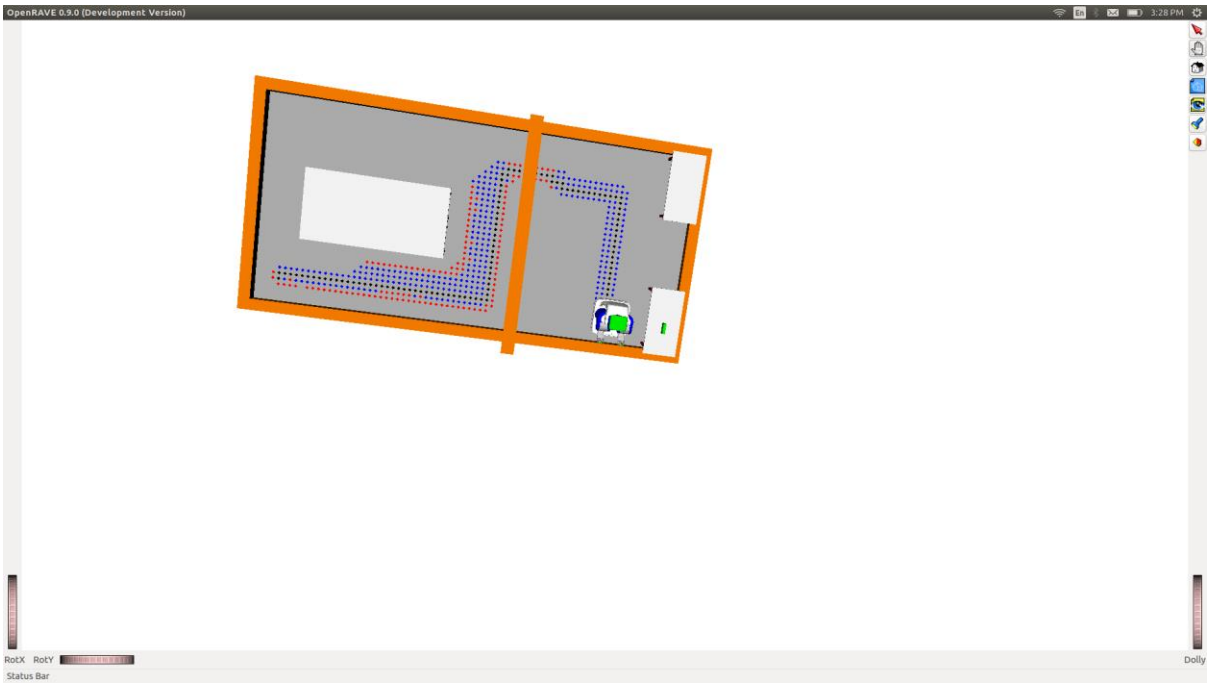
8-connected Manhattan Heuristic is not admissible as it is over estimating the heuristic. The Manhattan calculates the distance as 2 but the actual cost would be 1.5 for travelling along the diagonal.

RESULTS:

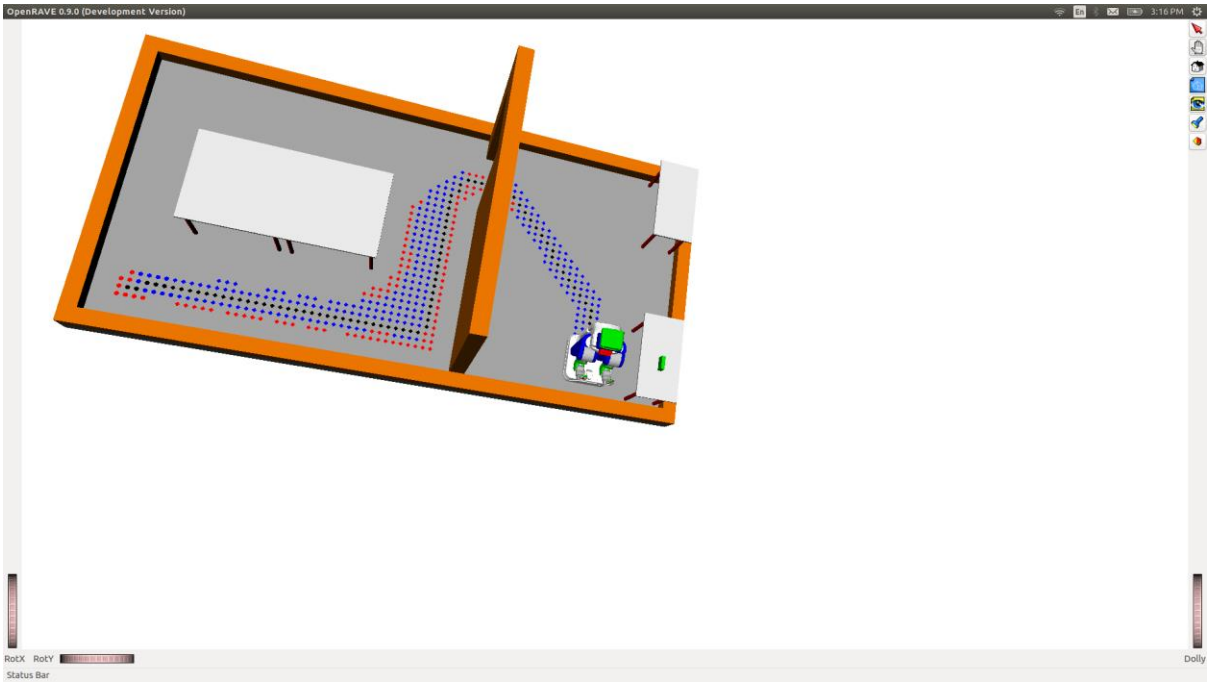
4 connected Euclidean



4 connected Manhattan



8 connected Euclidean



8 connected Manhattan