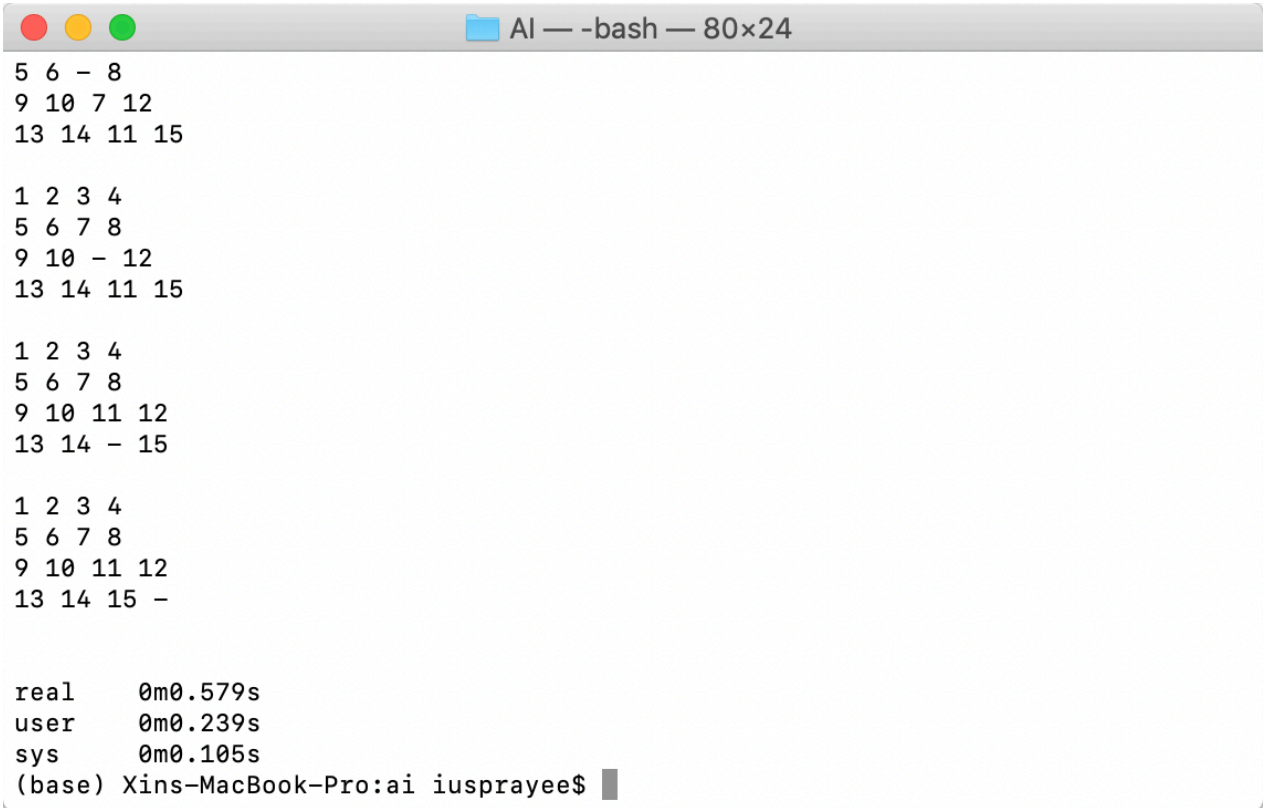
1. A count of number of tiles out of place an admissible heuristic if the blank is not counted as a tile. It will never overestimate the number of moves left, which ensures the optimality for A* algorithm. If the blank is counted as a tile, sometimes the moves left will be overestimate. For example, if we calculate the misplacement of the puzzle:

1 2 3 4
5 6 7 8
9 10 11 12
13 14 _ 15

1 2 3 4
5 6 7 8
9 10 11 15
13 14 12 _

In these case, the misplacement numbers are both 2 if we count the blank as a tile, but apparently the first one is more likely to complete.

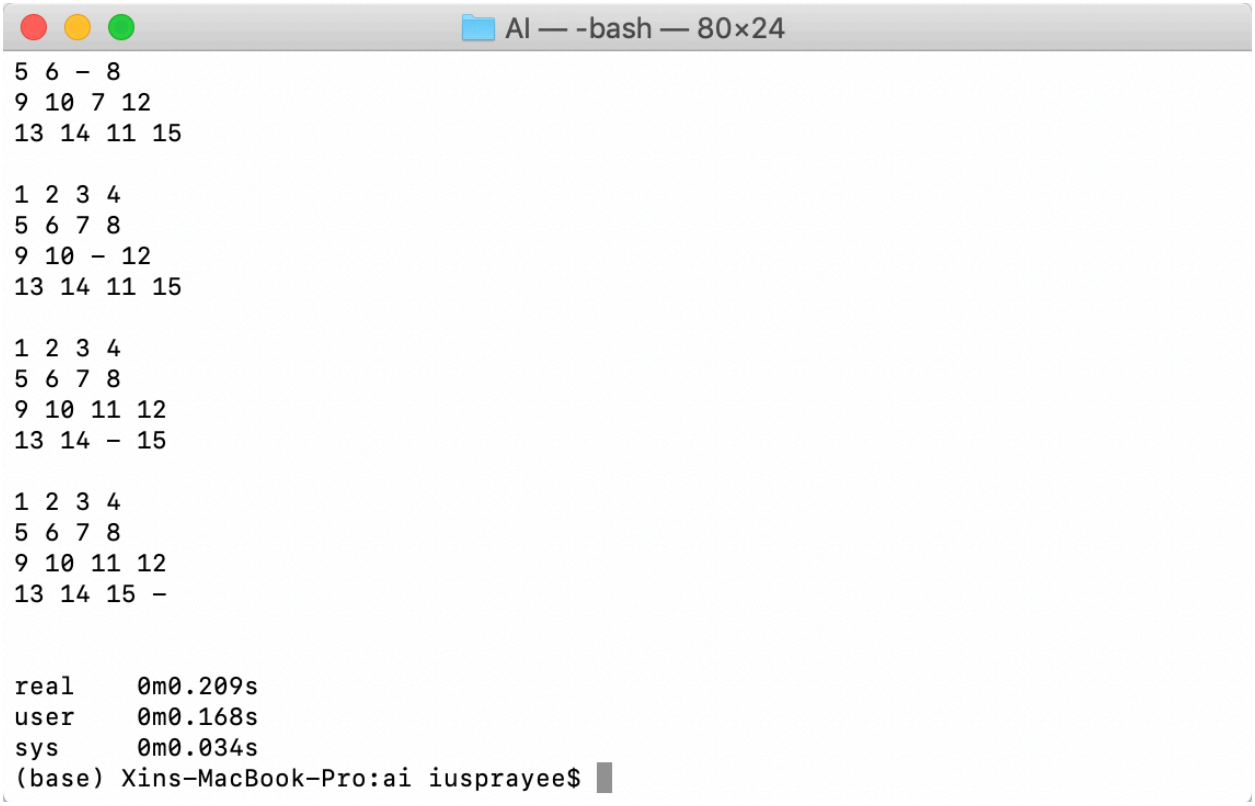
2.



So the running time is 0.239s.

3. It is also admissible heuristic because Manhattan is similar as the misplacement. The Manhattan distance can calculate the moves left more precisely, thus if it is without the blank as a tile. It would be admissible. If we see the blank as a tile, it would be not because something similar as above will happen.

4.



Thus, the running time is 0.168s, so Manhattan is faster algorithm.

5. The A* algorithm have cost function c and heuristic function g. Square root some time will have different result in Euclidean as the same distance in Manhattan. For Manhattan, 3 + 1 = 2+2, but it is different in Euclidean. Thus, Euclidean will cost longer.

6. This would not produce the optimal solution because the bug is not choosing the shortest path.